GTAA
PARTNERS IN PROJECT GREEN
A PEARSON ECO-BUSINESS ZONE

CHARGE UP ONTARIO

A GUIDE FOR BUSINESSES TO INVEST IN ELECTRIC VEHICLE CHARGING STATIONS

December 23, 2016

About Partners in Project Green

Initiated by the Greater Toronto Airports Authority (GTAA) and Toronto and Region Conservation Authority (TRCA), Partners in Project Green is dedicated to creating the biggest eco-business zone in the world. A large and growing community comprising businesses, government bodies, institutions and utilities, Partners in Project Green strives to build a stronger and greener economy in the Toronto region – and beyond.

In 2015 Partners in Project Green worked with 15 organizations in this business community to install 84 electric vehicle (EV) charging stations across the Greater Toronto Area. Several of these installations were the first large-scale deployments of their kind in Ontario and participating organizations continue to be leaders in supporting EV infrastructure.

Thank you to our funders

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Ontario

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EXECUTIVE SUMMARY

Business leadership is essential to accelerate EV adoption

THE TRANSITION TO ELECTRIFIED TRANSPORTATION IS IN FULL SWING

You may not notice electric vehicles (EVs) on your daily commute, but the wheels are in motion to build infrastructure that will fuel our future modes of personal transportation.

An analysis of global EV market trends and Ontario's local context show that now is the time for businesses and municipal government to lead the adoption of electrified transportation.

As EV technologies become more prevalent, drivers benefit from increased affordability and convenience. Society benefits from dramatic improvements in air quality and mitigation of the effects of climate change. The total cost of vehicle ownership can be reduced by 25% and reduced air pollution can save Ontario's healthcare system $570 million annually.

ONTARIO BUSINESSES CAN LEAD THE WAY

Over the last two years, Ontario's government has developed several of the world's most progressive EV adoption strategies establishing the province's position to not just to lead the country in consumer adoption, but also set the stage for a reinvigoration of the auto manufacturing sector.

What can businesses do to support this transition? Charging stations to refuel EVs – also called electric vehicle supply equipment (EVSE) – at workplaces, retail locations and parking facilities help to accelerate the growth of EV sales. Installation of EVSE has been shown to be the most effective strategy for stimulating EV adoption.

Scaling up EVSE presents both a challenge and an opportunity for early-adopting organizations. Project champions will be asked to justify an unproven investment– but those who are first to provide the service will project a green image to their employees, customers and peers, while tapping into a strategy to meet corporate social responsibility (CSR) goals.

This report is a guide for businesses to evaluate and successfully implement EV charging station installations.

Questions addressed include:

Section I: Justifying the EV Investment

- What are the environmental and financial benefits of EVs?
- Is this the right time to invest?
- Where does Ontario rank in a global movement?
- How will Ontario's EV landscape change over the next few years?
- Are the EV charging stations currently installed being used?

Section II: Developing a Project

- What are the key considerations to ensure a successful project?
- What are typical costs?
- Who are the service providers?
- How can success be measured?
- What are the lessons-learned from early adopters?

Section III: Case Studies

- What are the stories behind successful EV charging station projects?

KEY FINDINGS:

- All signs point to a pending exponential growth of the EV market.
- Government support will more than triple the amount of locations to charge in 2017.
- 20,000 km of EV driving can offset over 2 tonnes eCO_2 compared to using gasoline.
- Average installed costs for Level 2 (240V) stations fall between $5,000 - $8,000 per port.
- Average installed costs for DCFC (600V) stations fall between $50,000-$100,000.
- Networked station technology makes tracking use, troubleshooting, customer service and payment processing simple for station owners.
- Data gathered from networked stations is essential to justify the success of the project and determine when it is time to scale up.
- Including extra electrical capacity at the time of the first installation is essential for future cost containment when it comes time to expand.

SECTION I: Justifying the EV Investment

Electrified transportation will improve the environment

A CLIMATE CHANGE SOLUTION

It is estimated that in order to meet the internationally agreed upon targets of limiting global temperature rise below 2°C, the transportation sector – which is responsible for a quarter of the world's carbon emissions – must reduce emissions by 50 - 85% from 2000 levels by 2050.[1] Improving fuel efficiency standards of internal combustion engines (ICEs) can potentially cut carbon dioxide (CO_2) by 19 - 50%, but this will not be enough to meet international climate goals.[2] This is especially true as the number of vehicles on the road is expected to double by 2030.

The environmental impact of electrified transportation is entwined with the evolving conversion of electricity generation to cleaner, renewable sources.

Long term power grid modelling projects total transport emissions can be reduced by 50 - 60% if half of the world's vehicles are powered by electricity by 2050.[3]

Canada has the potential to excel beyond the international emissions reductions targets of 50 - 60%. A wealth power generated by low-emitting sources makes electric powered mobility the sustainable option. The three provinces leading in EV adoption – Quebec, Ontario and BC – rely near-exclusively on clean sources such as hydro and nuclear.[4] Ontario's provincial government has made commitments to further reduce emissions created from electricity generation.[5]

As 80% of EV charging takes place at night, integrating EVs into the electricity ecosystem can benefit the grid by making use of surplus clean energy and potentially be leveraged as an energy storage resource.[6]

Electrification of transportation beyond passenger vehicles, including freight and public transit, will also contribute towards achieving Canada's commitment to reduce national carbon emissions by 30% by 2030.[7]

VEHICLE POLLUTION

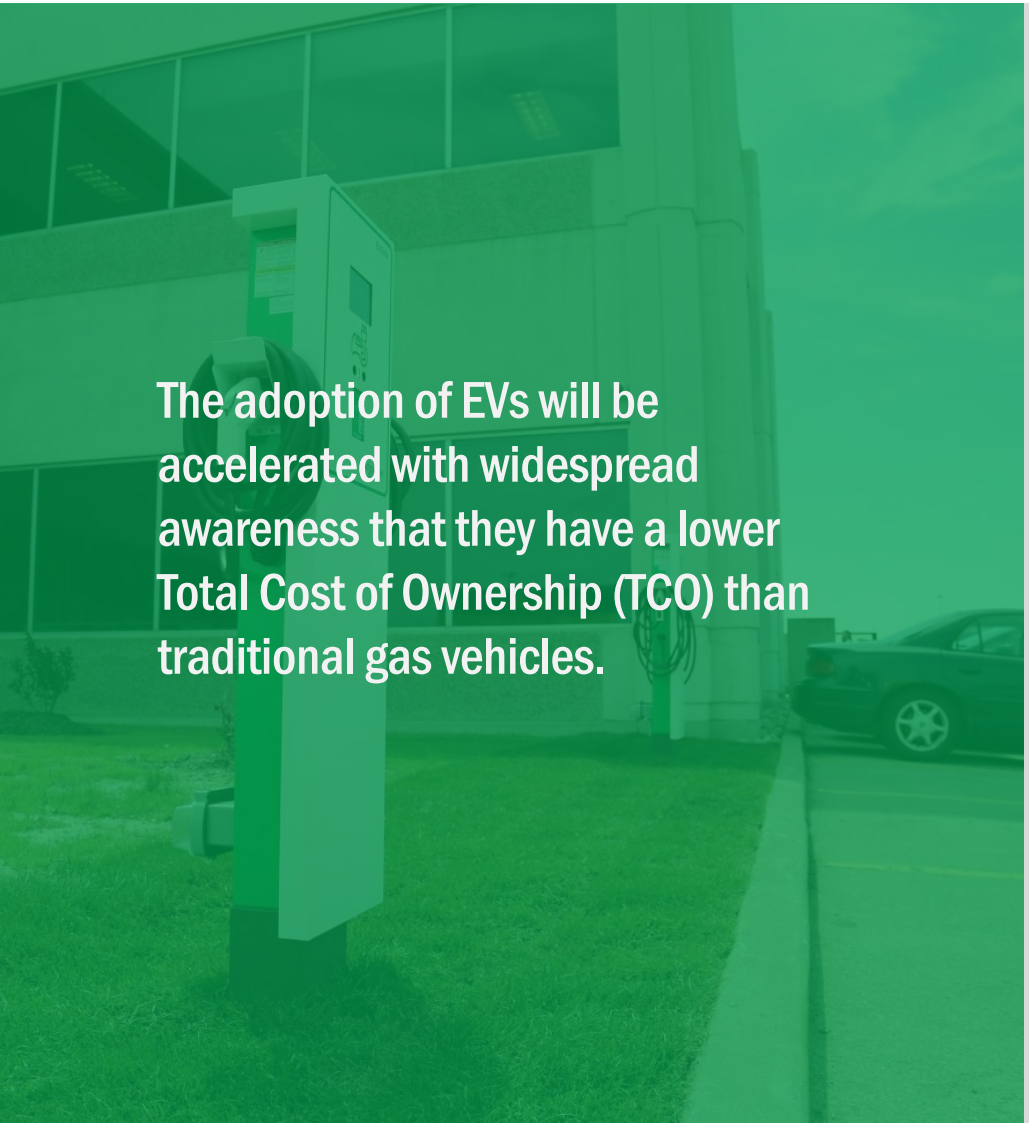
In addition to mitigating the effects of climate change, transitioning away from fossil fuelled transportation can minimize a range of health risks associated with tailpipe pollutants.

These emissions account for millions of pounds of harmful contaminants responsible for health conditions which especially affect vulnerable groups like children and the elderly. Air pollutants can cause or exacerbate conditions, such as asthma, chronic bronchitis, cardiovascular disease, birth defects and a variety of cancers.[8] In 2005, the Ontario Medical Association found that the direct annual cost to the provincial government by these pollutants totalled $507M and by 2026 the cost will grow to $702M.[9]

Another issue addressed by EVs is noise pollution. The absence of a combustion engine will virtually eliminate its associated noise in city environments.[10] Though subtle, living in a noisy environment has been connected to various health concerns, including stress on the cardiovascular system of children.[11]

Justified by the ethical and financial security, the transition to zero emission vehicles is the preferable option for future well-being.

Electric vehicles are becoming the more affordable option



The adoption of EVs will be accelerated with widespread awareness that they have a lower Total Cost of Ownership (TCO) than traditional gas vehicles.

UPFRONT VEHICLE COSTS ARE FALLING RAPIDLY

The upfront price premium is a primary barrier for consumers to purchase a new EV. The higher cost of an EV comes from manufacturing of the battery that can be up to 34% of vehicle cost.[12]

Since 2008, lithium-ion battery costs have fallen from over $1,000/kWh to around $200/kWh. The finish line for cost-competitiveness with gas vehicles is considered to be $150/kWh. [13] Continued research in EV technology combined with manufacturing efficiency improvements are expected to further decrease costs.[14]

Long-range EVs (300 km+) have much larger batteries and in the past were restricted to the luxury car market. Falling battery costs are resulting in affordable models entering the market as of 2017.

Three long-range EVs are projected to hit the market in 2017 priced between $30,000 - $45,000:

- Chevrolet's Bolt
- Tesla's Model 3
- Nissan's 2018 Leaf

Ontario's Electric Vehicle Incentive Program (EVIP) can reduce the cost of a new EV by up to $14,000 realizing cost-competitiveness with similar sized gas vehicles.

INCREASED COST SAVINGS AND CONVENIENCE

Fuel and maintenance savings help make EVs the more affordable choice. Electricity is always the lower-cost fuel source. Driving 100 km in an EV costs as little as $3.00 compared to an equivalent gas vehicle that will cost $7.30.[15] A 60% decrease in fuel costs over vehicle lifespan combined with maintenance savings means investing in an EV can pay itself back in 2-4 years.

Will these vehicles become practical for drivers to use? Consider that current vehicles can achieve 550 - 950 km per tank of gas. The next generation of affordable EVs will be capable of 350 - 400 km per charge and the technology is constantly improving.

Overnight charging at home improves convenience by eliminating trips to the gas station.

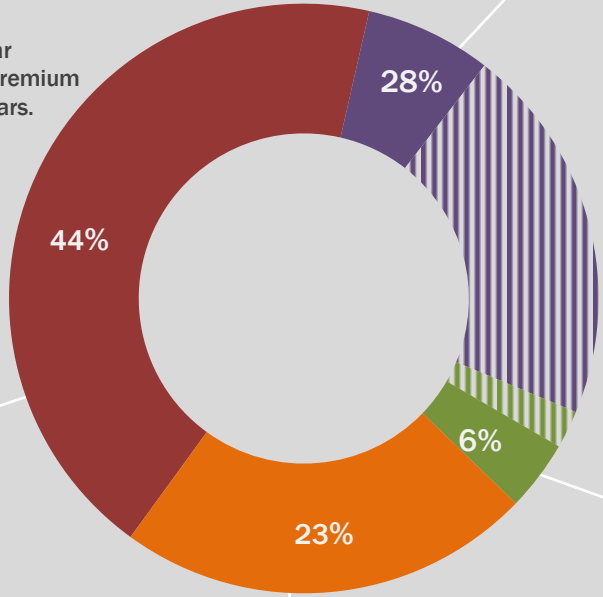
Environmental urgency and technological advancements are dove-tailing perfectly such that government support will accelerate cleaner, cheaper, and more convenient EVs, and at the same time manufacturing improvements will lower vehicle costs for the consumer.

Electric vs. gas: TCO over 8 years is always lower

As with all new technologies estimating long term costs can be difficult. However, there are many indications that EVs will be less expensive in the long-term as a result of lower fuel and maintenance costs.

AAA estimates that the cost to own and operate a passenger vehicle is $9,000-$10,000 per year.[16] Savings on the total cost of ownership (TCO) of an electric vehicle compared to a comparable gas vehicle are 20 - 25%.

With maintenance and fuel savings of $1,800 - $2,500 per year combined with incentives up to $14,000, any remaining cost premium on the purchase of an EV can be recovered in less than four years.



Fuel Costs – 60 - 70% savings

Electricity as a fuel is consistently less expensive than gasoline. At average electricity costs of $0.15/kWh and gasoline costs of $1.00/L a driver can save $1,300 - $1,900 annually.[17]

Maintenance & Repair – 30 - 35% savings

EV drivetrains are simpler than gas vehicles, which require a transmission and a cooling system to reject heat from the engine. Less moving parts means lower maintenance costs. Note that of the ten most common vehicle repairs, only one (thermostat replacement) exists on an EV.[18]

Maintenance costs of gas powered vehicles are around $860/year and this could be reduced by at least 35% over the lifetime of an EV.

The value of an EV beyond 8 years will depend on the condition of the battery and reparability. Some vehicle models are designed to allow for individual cell replacement so that a battery with reduced capacity can be restored without requiring replacement.[19]

Depreciation

Depreciation is the largest cost for vehicle ownership, but values are difficult to predict for a product that has limited data on used-vehicle or end-of-life value. Depreciation cost is determined by the continual decline in vehicle value throughout its lifetime so accurately projecting an EVs rate of depreciation is difficult at this time.

Insurance, Interest and Tax

These expenses are not expected to be different between EVs and gas vehicles. However, in some regions in the US reduced insurance rates have been leveraged as a means to incent EV adoption.[20]

Exponential scale-up is on the horizon

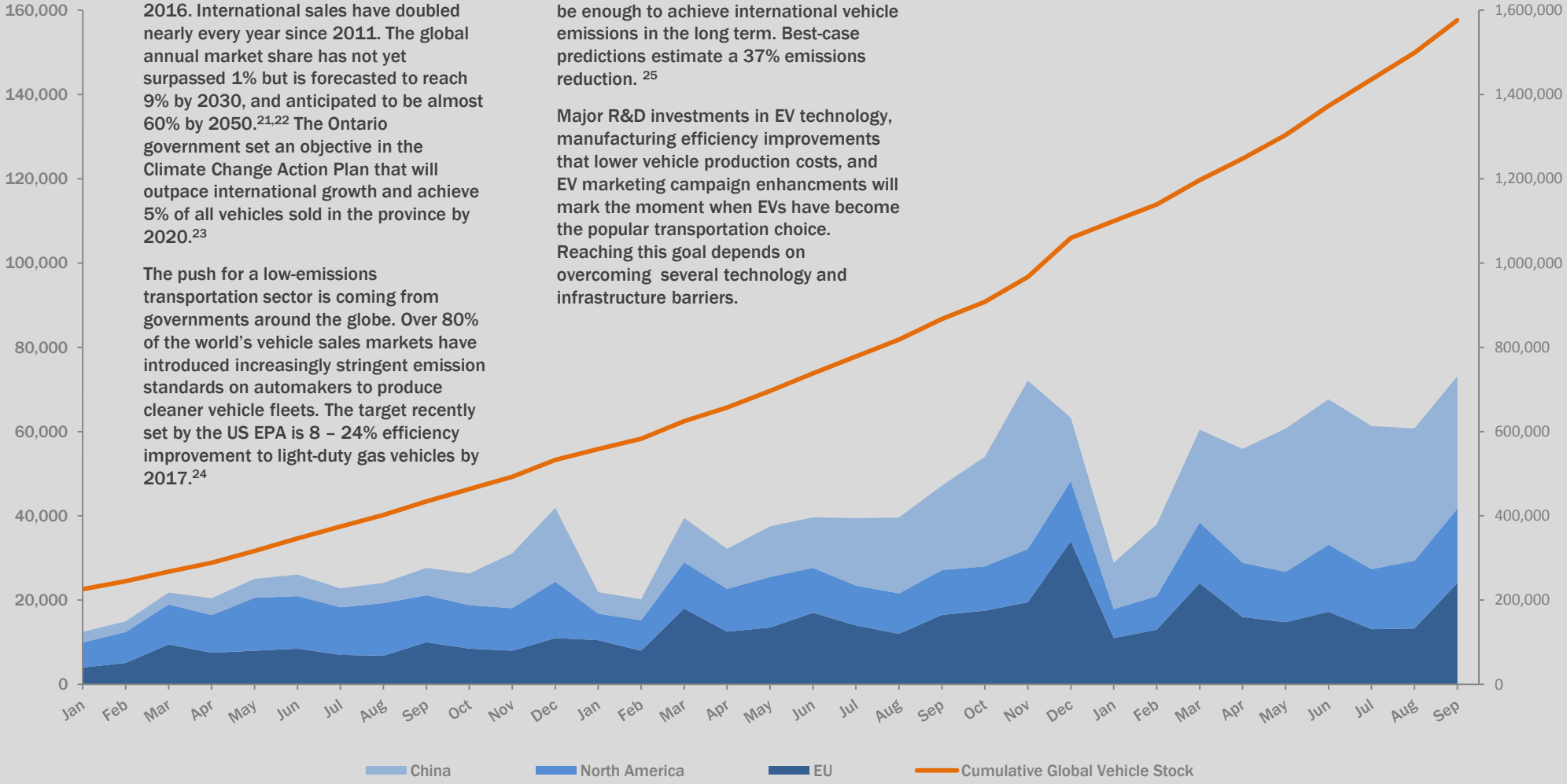
EV SALES GROWTH PICKING UP

The graph below shows EV sales growing steadily year-over-year to September 2016. International sales have doubled nearly every year since 2011. The global annual market share has not yet surpassed 1% but is forecasted to reach 9% by 2030, and anticipated to be almost 60% by 2050.[21,22] The Ontario government set an objective in the Climate Change Action Plan that will outpace international growth and achieve 5% of all vehicles sold in the province by 2020.[23]

The push for a low-emissions transportation sector is coming from governments around the globe. Over 80% of the world's vehicle sales markets have introduced increasingly stringent emission standards on automakers to produce cleaner vehicle fleets. The target recently set by the US EPA is 8 – 24% efficiency improvement to light-duty gas vehicles by 2017.[24]

Improving gas vehicle efficiency will not be enough to achieve international vehicle emissions in the long term. Best-case predictions estimate a 37% emissions reduction. [25]

Major R&D investments in EV technology, manufacturing efficiency improvements that lower vehicle production costs, and EV marketing campaign enhancments will mark the moment when EVs have become the popular transportation choice. Reaching this goal depends on overcoming several technology and infrastructure barriers.



Current barriers are being overcome

HIGH BATTERY COST AND LOW RANGE

The recent drop in battery costs has outpaced all historic projections. A common industry rule-of-thumb is that EVs will be cost competitive with standard gas vehicles once battery pack costs drop to $150/kWh. In 2014, an aggregation of predictions for this tipping point showed they varied from 2025-2035. Chevrolet's new all-electric model – the Chevy Bolt – has managed to exceed these predictions already by producing a vehicle on available by 2017 at battery cost of ~$200/kWh. The company is predicting this price will fall to ~$150 by 2020.[26]

A number of battery manufacturers are racing to achieve a technology highest energy density at the lowest cost with the aim of supplying the world's major auto manufacturers with their product. The battery in the Bolt is produced by LG Chem, which is an independent manufacturer that is already securing deals to supply a variety of vehicle manufacturers.[27]

LACK OF CHARGING INFRASTRUCTURE

Governments are escalating their investment in EV charging infrastructure. Funding in the form of grants or tax incentives helps set up charging corridors along highways or subsidize installations at the home, the workplace and commercial locations. Auto manufacturers are also contributing, investing in charging corridors in North America, Europe and Asia.[28]

Ontario has recently made one of the largest investments in EVSE infrastructure in North America. The Electric Vehicle Charging Ontario (EVCO) program will install close to 500 charging stations, creating charging corridors along major highways.

LIMITED VEHICLE VARIETY

As of 2016 there were there are 27 battery or plug-in hybrid EVs available in Ontario.[29] By the end of 2017, there could be as many as three long-range (300+km) vehicles available priced below $45,000 – the Tesla Model 3, the Chevrolet Bolt and the 2018 Nissan Leaf.

The range of vehicle options is expected to increase significantly as models produced in Asia and Europe are introduced. This includes the third best-selling model world-wide and one of the only SUVs, the Mitsubishi Outlander EV.

Numerous plug-in hybrid (PHEV) models have been from almost every major manufacturer. PHEVs use electricity for short distances such as daily commutes and gas when longer distances are required.

LOW CONSUMER EDUCATION

An important element in the growth of the electric vehicle market is consumer awareness. Once consumers possess this knowledge they will be better able to make an informed decision when purchasing a vehicle.[30]

The provincial government made a commitment of $2M in 2016 toward educating the public on available incentives, increasingly available charging infrastructure, and the financial and environmental benefits EVs bring. The funding will support Plug'n Drive – an EV advocacy not-for-profit – establish an EV Discovery Centre that will function as a location to educate consumers on all brands of available EV models at single location.[31]

Government and manufacturers commit to invest

MAJOR MANUFACTURERS TURN R&D FOCUS TO EVS

BMW: Commitment to offer electrified options for all model series.[32]

Fiat Chrysler: Begins manufacturing of their first EV in 2016 – a PHEV minivan manufactured in Ontario.[33]

GM: Executive leadership has stated that half of their engineers now are involved with electric propulsions systems.[34]

Daimler: Has announced a planned $11 billion investment in EV R&D. [35]

INCREASED CHARGING CORRIDOR DEPLOYMENT

Ontario, Quebec and BC: Have made significant investments in charging corridors and have made commitments to continue.

EU: Collaboration with BMW, Nissan, Renault and Volkswagen to install 429 DC Fast Charger stations across four zones in Europe by 2014. [38]

US: BMW and Volkswagen complete charging corridors along each of the US coasts in 2016.[39]

China: Installed 170 charging stations per day in the first half of 2016 and are now at a total of 81,000 nationally. [40]

MANY LONG-RANGE, LOW-COST MODELS ON THE NORTH AMERICAN MARKET BY 2020

Nissan, Tesla and Chevy: Will have 300+ km range vehicles on the market in 2017.

Mercedes: Has released a prototype 480+ km vehicle in the $40,000 range for release in 2019. [36]

VW: Predicting release of a 600 km-range vehicle in 2020. [37]

REMAINING GOVERNMENTS OF THE MAJOR AUTO MARKETS JOIN IN

South Korea: Makes up 8.5% of the international vehicle sales market and is home to one of the leading battery manufacturers (LG Chem). EV incentive programs began in 2016 are among highest with vehicle purchase incentives up to $23,000 and a target of charging station corridors along every expressway by 2018.[41]

Germany: Has until now invested more in R&D for EV manufacturers than direct incentives. A target of 1 million EVs on the road by 2020 has recently been set for this market with 3 million annual vehicle sales. [42]

Governments incentive programs deployed across the globe

The significant price premium on EVs versus similar gasoline vehicles has spurred governments to intercede with subsidies to accelerate adoption. Across the globe and locally in Ontario, governments are providing incentives for vehicle purchase and charging infrastructure. Incentive and regulatory strategies have taken a variety of forms – and have shown varied results.[43] The different policies can be grouped into four major categories, as highlighted in the table below.

INCENTIVE TYPE	DEPLOYMENT OVERVIEW	# COUNTRIES IMPLEMENTING	EXAMPLES OF LEADING POLICIES[44]	ONTARIO'S ACTIONS
Vehicle purchase	**REBATES TO LOWER VEHICLE COSTS** This the most commonly deployed incentive. Though effective in many cases, vehicle rebates alone do not always make a large impact on EV market growth. For example, the UK has relatively low uptake despite offering an incentive of 50% of vehicle cost, whereas Germany has seen larger uptake despite nearly no reduction to vehicle cost. Vehicle rebates must work in tandem with other types of incentives.[45]	27	**NORWAY:** Incentive offered per vehicle at up to 50% of vehicle cost. **FRANCE:** Vehicle purchases are either taxed or incentivized. EVs are incented up to $9,200 (CAD) and gas vehicles penalized up to $11,700 (CAD).	**$14,000 off a new EV purchase or a 3-year lease**
Fuel cost	**GAS TAXES AND LOWER ELECTRICITY RATES** The clearest consumer benefit to driving an EV is the fuel savings. Some governments increase the savings gap by compensating for the cost to recharge by reducing costs to charge or maintaining high taxes on gasoline. Ontario gas prices will increase by up to 4.3 cents/L in 2017 as a result of new Cap and Trade policy.[46]	7	**CALIFORNIA:** Utilities offer a special EV-owner electricity rate to encourage off-peak charging. **NORWAY:** Possess the largest difference between gas and fuel costs, as a result of high government taxes on gasoline.	***Under review:*** **Additional Cap and Trade gas cost increase of 4.3 cents/L; Compensation for nighttime charging costs**
Infrastructure	**INVESTMENT IN THE INSTALLATION OF CHARGING STATIONS** Incentive programs have been implemented to compensate equipment and installation costs for home, workplace or commercial charging stations as well as networks of charging stations owned and operated by third-parties. One study concluded there was a higher impact on EV adoption from EV infrastructure investments than vehicle purchase incentives and mathematical modelling has also predicted that installing charging stations is the more cost effective incentive.[47]	16	**USA:** Federal tax rebates for businesses to install charging stations up to $30,000 (or 30%) of costs. **AMSTERDAM:** Municipal government installs on-street chargers within 1 - 2 months of a request from EV drivers who lack private parking.	**50% rebate for a home charger** **100% costs covered for a public charger (already distributed)**
Regulatory	**ACCESS TO RESTRICTED LANES AND WAIVED TOLLS** Governments have gotten creative, offering privileges such as reduced fees for express lanes, highway tolls, ferry tolls, or parking fees. A survey of Norway EV drivers showed that the top incentive provided by government was free access to road and ferry tolls. Regulatory requirements to include charging capacity in newly constructed buildings has been implemented in many regions.[48]	14	**NORWAY:** EVs enjoy free toll access across highways, bridges, ferries, etc. **DENMARK:** Companies that supply charging commercially are discounted on electricity costs.	**Access to HOV lanes** ***Under review:*** **Access to High Occupancy Toll (HOT) lanes; Building code revisions to require EV charging capacity**

Ontario has plenty of surplus clean electricity to power EVs

OVER 90% OF ELECTRICITY COMES FROM CLEAN SOURCES

Ontario is powered largely from low-carbon generation sources – namely nuclear, hydro and wind. Electricity generation from natural gas makes up only 10% of the province's energy supply mix.[49]

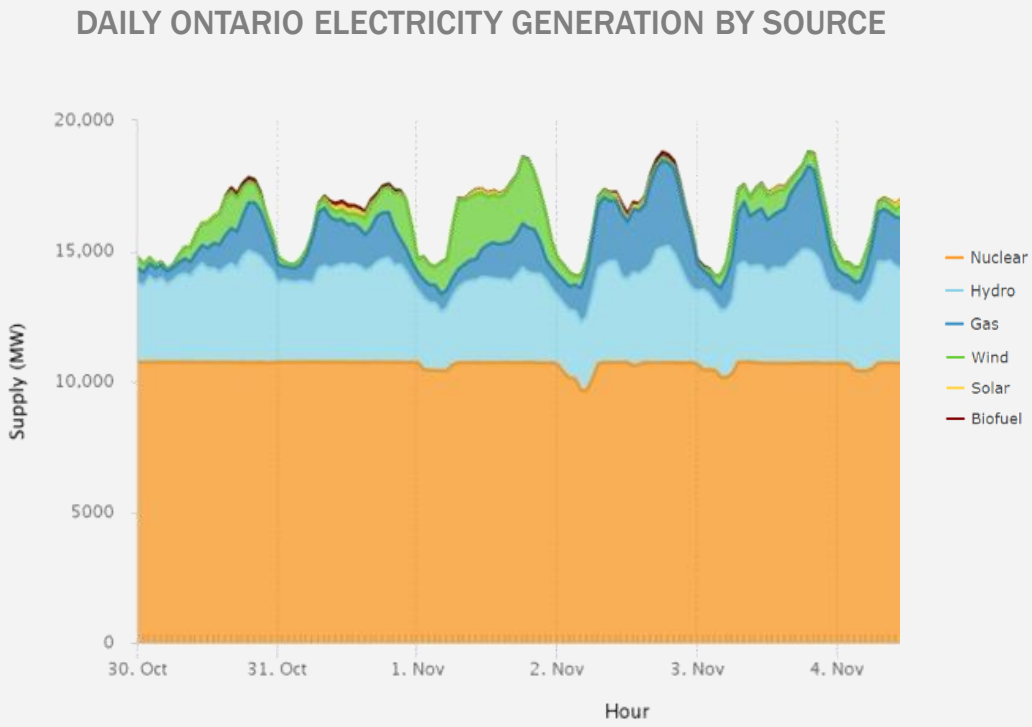
The graph to the right is an example of electricity demand by generation source over five days in the fall of 2016. It shows that natural gas generation is far less than 10% of the supply mix at night. EVs charge 80% of the time overnight.[50] Therefore, the majority of electricity used to power EVs can be close to carbon-free.

USING SURPLUS ELECTRICITY AT NIGHT SAVES MONEY FOR TAX-PAYERS

While EV drivers save money by avoiding gas costs, the province as a whole saves money when consumers use electricity at night.

When demand for electricity falls below generation capacity, the surplus is exported to neighbouring markets at very low prices or curtailed. In 2014, it is estimated that the 7% of Ontario's generated electricity (10.6 TWh) was surplus – and more than half was from clean sources that were exported. It is more cost-effective to consume surplus energy within the province when demand is low (at night) than it is to export or curtail generation.[51]

Time-of-Use rates offer residents lower electricity prices during off-peak hours (7pm – 7am). During these times, EV drivers are able to take full advantage of the reduced cost to recharge.[52]

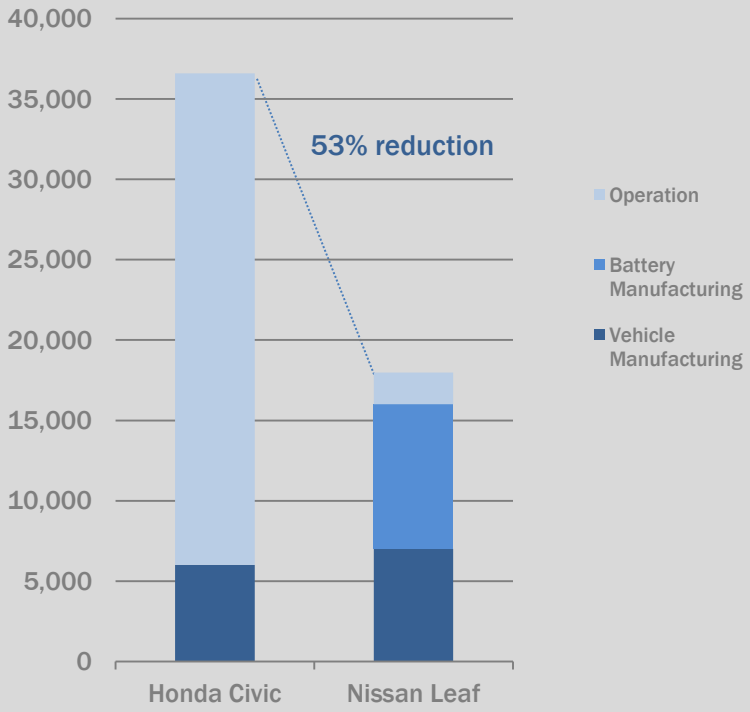


Source: http://www.ieso.ca/Pages/Power-Data/default.aspx

A clean grid means reduced lifecycle emissions

A LIFE CYCLE CARBON EMISSIONS COMPARISON[53]

The chart below shows the emissions in kg CO_2 per year of a gas-powered Honda Civic vs. a Nissan Leaf EV. Emissions from vehicle and battery manufacturing sources are amortized over the vehicle lifespan.



EMISSIONS FROM DRIVING AN EV ARE UP TO 95% LESS THAN A GAS VEHICLE. EMISSIONS REDUCTIONS OVER THE LIFECYCLE ARE LESS BECAUSE OF THE ENERGY-INTENSIVE BATTERY PRODUCTION PROCESS – BUT THE CARBON FOOTPRINT IS STILL REDUCED BY AROUND 50%.

Carbon emissions produced from an EV compared to a similar gas vehicle from manufacturing stage to disposal stage (the lifecycle) are far less overall when powered by Ontario's clean electricity. Lifecycle carbon emissions from EV manufacturing can vary widely – from 17 - 73% of the total emissions of a gas vehicle. The key factor is battery size, because the battery manufacturing process makes up the largest portion of carbon emissions across an EV's lifecycle.

However, an EV is always the cleaner choice for Ontarians because the low-carbon electricity supply mix offsets far more emissions than is created from battery manufacturing. The results of an analysis comparing an Nissan Leaf to a Honda Civic (see graph to the left) resulted in 53% less carbon emitted from the EV over the lifetime of the vehicles.

Emissions from battery production primarily occur at the assembly phase, from energy used in "dry-room" assembly areas. Inefficiency is increased during times of low factory throughput. As demand for EVs scales up, plants will operate closer to full load and carbon emissions per battery will decrease.

Battery manufacturing emissions are projected to fall over time.[44] This is important because the next generation of game-changing long-range EVs coming to market will require increasingly larger battery sizes.

Recent announcements of development of gigafactories (large manufacturing plants dedicated to battery production) by Tesla, Panasonic, BYD, LG Chem and others will achieve increased efficiency in both final product cost and energy consumed during manufacturing.[54]

Ontario is becoming a world leader of EV adoption

ACTION HAS BEEN TAKEN BY THE PROVINCIAL GOVERNMENT ON ALL FRONTS

In Canada, only the provinces where EV incentives have been implemented – Ontario, Quebec and British Columbia – have seen a significant rise in EV sales in the past three years. As of 2016 there are over 7,000 EVs on the road in Ontario. Ontario was well behind both Quebec and British Columbia in EVs per capita at the start of 2015, but is set to quickly catch up as a result of more generous vehicle rebates and large charging infrastructure investments that are timed well at a turning point where falling vehicle prices with higher ranges are arriving on the market. Two important programs have been developed by Ontario's Ministry of Transportation (MTO) to support EV adoption:

Electric Vehicle Incentive Program (EVIP) [55] – Up to $14,000 off new vehicle costs and a $1,000 rebate for the equipment and installation of a home charging station. This program is unique in that vehicle purchase incentives are taken off retail prices instead of requiring customers pay full upfront and wait for a cheque or tax rebate to be processed.[56]

Electric Vehicle Chargers Ontario (EVCO) [57] – At the end of 2015, the province opened up a one-time competitive application-based grant for up to 100% of charging station equipment and installation costs for businesses, municipalities and other organizations to install publicly available charging stations. Locations were selected along major inter-city transportation corridors and in urban centres to optimize station usage.

WHAT FUTURE EV ADOPTION SUPPORT PROGRMS ARE NEXT?

Ontario has set an ambitious target achieve as much as 14,000 EV annual EV sales by 2020. To put this in perspective, under 2,000 were sold in the province in 2015. To ensure this target is met, incentive strategies beyond the EVIP and EVCO program are under review by the provincial government. Some of these include[58]:

- A trade-in program that will offer a special rebate on new or used EVs when an older gas-guzzler is taken off the road
- A reduction of the 13% HST on EV sales
- A rebate on electricity costs for overnight charging
- Continued funding for public chargers
- Revisions to the Ontario Building Code to require "rough-in" for EV chargers at the time of building construction
- Creation of High Occupancy Toll (HOT) lanes on highways with free access for EVs

Ontario's public charging stations are getting used

CHARGING PORTS ARE USED ONCE EVERY 2 – 4 DAYS

A common barrier for businesses to justify installing stations is lack of certainty about whether an station will get used. Data shows that a public charging station will attract a user to the site as much as every other day on average.

The graph to the right is an analysis of the majority of installed networked charging. Data was collected from 350 ports on the ChargePoint network. ChargePoint currently hosts the largest group of networked stations in Ontario (~70%).

The sessions per port (bars) identifies the number of times the stations were used and the energy per port (dots) identifies how much energy was supplied. Lower consumption relative to amount of sessions indicates a shorter charging period – as in the case of retail locations.

BUSINESSES INSTALL STATIONS TO HIT SUSTAINABILITY TARGETS RATHER THAN TO GENERATE REVENUE

Partners in Project Green surveyed 22 (of ~80) organizations with public networked charging stations installed in Ontario on motivations, challenges and lessons-learned. Frequency of use was considered the most important success metric when evaluating success of the project.

While 100% of respondents identified achieving corporate sustainability goals as a reason for taking on the project, 90% said that an ROI was not relevant at this time. Communicating a green image, attracting users to a site and contributing to carbon emission reduction targets were the primary motivators to install chargers.

WORKPLACE
The location where drivers spend the most amount of time after their home is their place of work. Charging availability can double the acceptable range an employee can commute by EV as well a vehicle to be used throughout the day.

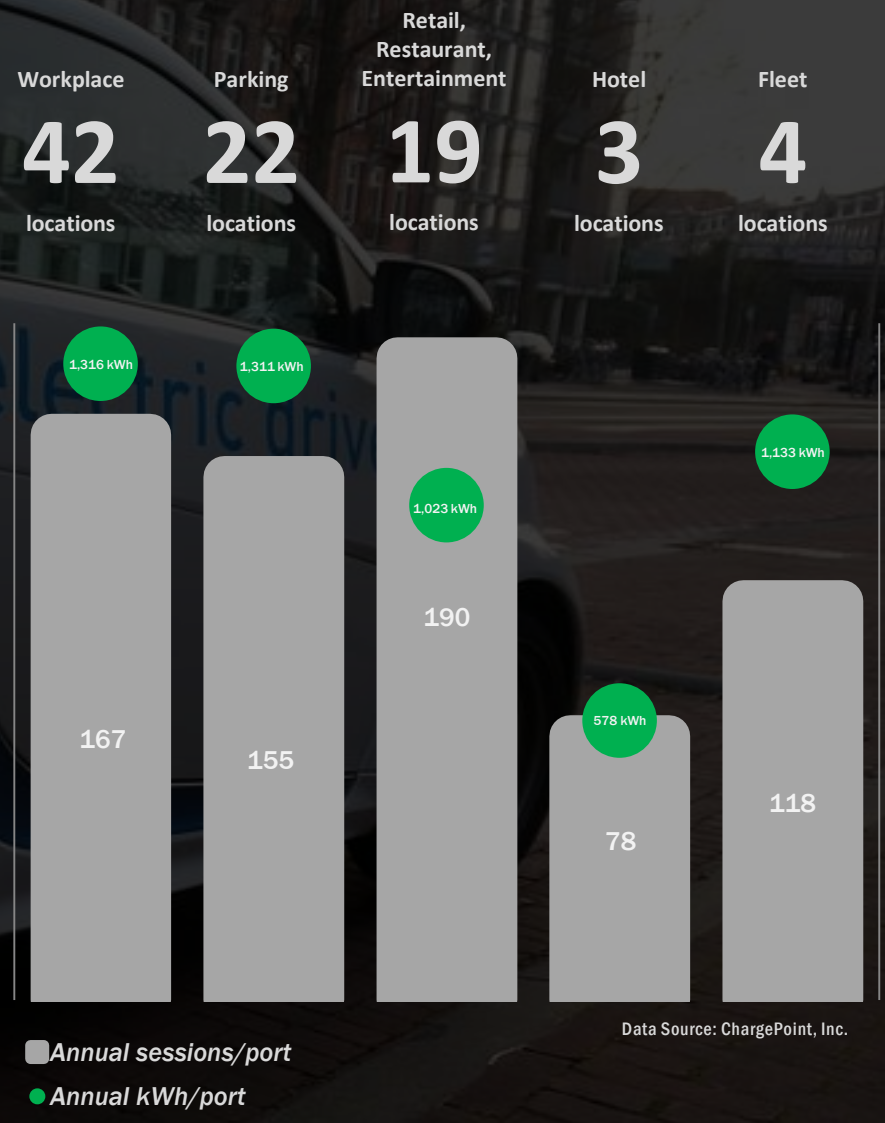
Survey results indicate that 25% of employees are "highly likely" to consider an EV as their next vehicle purchase if a charger is installed at work.[59]

PARKING
Municipal and public parking facilities consume the most electricity per session after fleet stations, indicating that these locations may have the best potential for revenue generation from charging.

RETAIL, RESTAURANT, ENTERTAINMENT
On average ports in this category are being used more than every other day – the highest of any category. This shows demand for short-term top-up charging is high. There is opportunity here to attract users to your site, as there are very few retail locations in the province currently.

HOTEL
While hotels have low use at the moment, there is high potential to grow since an overnight stay means ample time to charge.

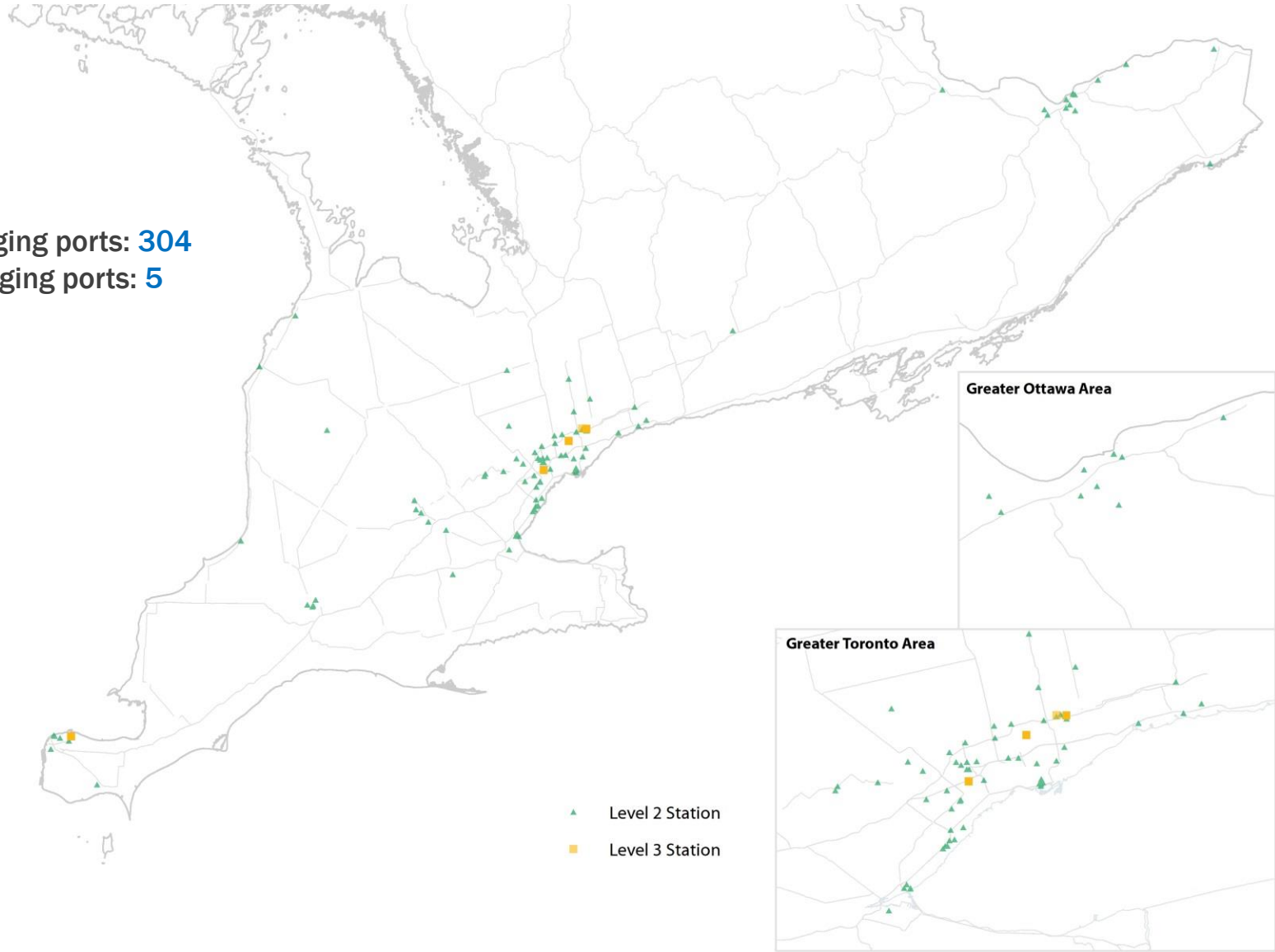
FLEET
The highest level of use per session. Fleet vehicles typically get heavy use and therefore offer quickest return-on-investment from fuel savings.



Charging locations in Ontario as of 2016

The map below shows public networked charging locations as of mid-2016. Level 2 stations are identified by green markers and DC Fast Charging locations by yellow markers.[60]

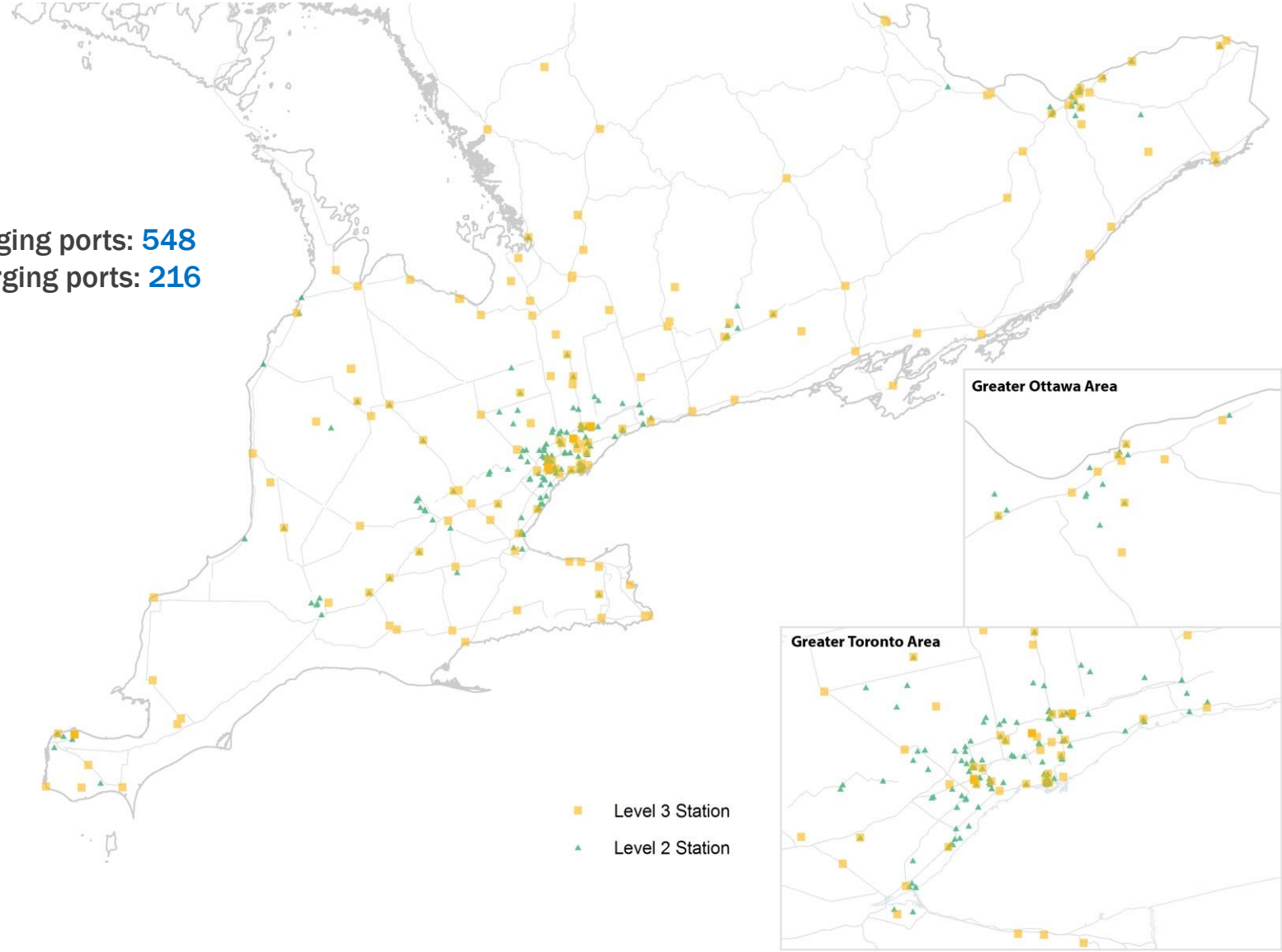
Level 2 charging ports: 304
DC Fast charging ports: 5



Charging locations in Ontario after deployment of EVCO

The Electric Vehicle Chargers Ontario (EVCO) program was commenced by the Ontario government in spring 2016. Twenty-seven public and private sector partners are expected to install almost 500 new stations by March 31, 2017, Stations displayed in this map include existing station locations plus planned locations through the program.[61]

Level 2 charging ports: 548
DC Fast charging ports: 216



Questions to ask when evaluating a project

1. What key considerations will ensure project success?
2. What are the charging station hardware options?
3. What possible additional hardware costs may be encountered?
4. What capabilities are gained from a networked station?
5. How can installation costs be minimized?
6. What codes and regulations need to be considered?
7. Who are the solutions providers who can help?
8. How is success evaluated?
9. Are there alternative financing options?

1 What key considerations will ensure project success?

	STATION PURPOSE			
	Employee Use	Fleet Vehicles	Customer Attraction	Public Parking
Dwell Time	The expected length of time a typical user will remain at a location will determine the type of hardware required. Select the charging capacity best suited to your facility: • More than 8 hrs. = Level 1 charger (120V) • 30 mins to 8 hrs. = Level 2 charger (240V) • Less than 30 mins. = DC Fast Charger (480V)			
Accessibility	Create user groups to set different access rules, such as: • Employees • Fleet vehicles • General public Different pricing or ability to access throughout the day can be programmed easily from an online platform.		Charging can be triggered by one of the below options: • RFID card provided by software network provider • Smart phone application • Tap credit card Leveraging the network to activate charging allows the number of unique users to be identified and alerts to be sent when charging is complete	
Station Visibility	Typically not a high priority when stations are only used by employees. If your organization would like to provide the service to visitors, a more prominent location should be selected and appearance on public station maps is possible.		A front-and-centre location with adequate signage will assist with way-finding for EV drivers and prevent additional time spent by employees to redirect station users. Networked stations will be visible on the online maps of the software provider. You can also add the stations to third-party mapping platforms to increase visibility to drivers (Plug Share or ChargeHub)	
User Payments	Options include: • Charging as a free amenity to employees • Fees to recover operational expenses • Fees to recover project costs • Fee structures to manage station use	Track internal accounting easily by distributing RFID cards to different groups of users in the organization.	Businesses that install EVSE to attract customers to the site typically waive charging fees. Revenue generated from charging is small compared to the benefits of attracting a customer. As the demand for the charging increases, more businesses may consider setting a price for use. Typical fees currently in Ontario for Level 2s are $2 – 3/session or $1 – 2/hour. Typical fees for DC Fast Charger are $10 - $20/hour.	
Success Metrics	• Carbon emission reductions • Number of employees that purchase an EV	• Fuel costs avoided • Carbon emission reductions	• Number of users • Carbon emission reductions • Revenue generated	
Future Expansion	As new vehicles are incorporated into the fleet or purchased by employees, more stations may need to be added. Future expansion costs can be contained by ensuring buried conduit and transformer capacity are sized for additional stations. The location selected will also require free adjacent parking locations that can be converted to EV parking in the future.		Monitoring station use will allow you to stay ahead of user concerns that all stations are occupied. Adequate reporting capabilities of your software platform will ensure you can easily see how often all available stations reach full capacity.	
Advertising	Station branding can be used to promote the organizations corporate sustainability efforts through painted or decaled program logos or videos in stations on station screens.		While not common yet, there are some examples in the United States of companies that have secured advertising contracts large enough to fully finance EV charging station infrastructure. Retailers may want to target EV drivers with sales videos on screens	

2 What are the hardware options?

Level 1	120 Vac/1.5kW/15A	Delivers 3 – 8 km range/hour	$400 - $1,250/port

Equivalent to a common wall outlet, Level 1s are sometimes called “trickle chargers” because of the slow rate of charge. Giving EV drivers access to Level 1s may be a good initial step to address requests by employees with short-range commutes, but in the medium to long term, higher rates of delivery will be the expectation. Simply mounting an outlet to a wall or on installing on a pedestal (similar to a block heater) is an option. Drivers will have to use their on-board connector cable. This setup can be an inconvenience and potentially a safety hazard, especially in exterior settings during poor weather conditions. Commercial-grade Level 1 outlets will have an all-weather connector that will avoid and safety issues in wet and icy conditions. Networked models are typically not available because the incremental cost drives up costs close to a Level 2 station.

Level 2	240 Vac/8kW/32A	Delivers 15 – 30 km range/hour	$2,500 - $4,000/port

The most common type of charger installed are Level 2s. A vehicle can be fully charged in 2 - 4 hours, so this type of charger is adequate for locations where drivers remain on site for more than 30 minutes and can get a significant top-up. Retail or entertainment locations with dwell times of 2 - 3 hours allow EV drivers to travel from longer distances and the time spent on site is perfect for Level 2 applications. Level 2s allow more flexibility at the workplace for employee and fleet vehicles to travel throughout the day and still have enough power for the commute home. A single port of a Level 2 can be used by multiple users throughout a day, since charging is typically required for only half a day.

Single or dual port models are available. Dual-port units are much more common since the cost premium is minimal and installation costs are lower since the number of locations where chargers have to be mounted is halved. Dual-port stations are placed between two parking spots to allow two vehicles to access the station at simultaneously.

DC Fast Charger	480 Vac 3-ph/50kW/125A	Delivers 80 – 100 km range/30 mins	$30,000 - $55,000/port

For dwell times shorter than 30 minutes, DC Fast Chargers (DCFCs) are ideal. DCFCs convert 480 Vac 3-phase power into 600 Vdc.

These chargers are not typically relied on for daily charging, because if used too frequently they can depreciate a vehicle’s battery capacity over the long term. Their strength is to provide a safety net to allow drivers the flexibility to go off their expected route or to make longer-distance trips. Installing a DCFC at a facility location near a major highway or at a location where there are no DCFC stations within a 40 – 100 km radius in any direction will make your location a useful stop-over for drivers making longer trips. Providing reassurance that an EV will not be stranded on the road is the primary reason the Ontario’s EVCO program focused on installing a network of DCFCs.

As DCFC are relied upon by drivers to charge in urgent situations, it is essential they are accessible and operational 24/7 to avoid drivers becoming stranded. Facilities that are open 24/7 with access to food and washrooms are ideal. On-call customer service and maintenance packages are often seen as necessities by station hosts in order to ensure issues are addressed immediately.

3 What possible additional hardware costs may be encountered?

	Transformer	Upgrading electrical capacity may be required. DCFC projects almost always require a step-down transformer from the main 600V feed to the 480V input required for the charger. Transformer size is a critical consideration for cost-containment when accommodating future expansions.	$1,000 - $4,000
	New Electrical Panel	Each port requires a dedicated dual-pole 40A breaker at 240V by code. If there is no accessible panel with spare breakers or extra capacity, a new one will have to be installed. Electrical panel size is a critical consideration for cost-containment when accommodating future expansions.	$200 - $300
	Cord Management System	A mechanism can be installed to manage cord retraction and avoid cables being strewn across the ground. This important to avoid liability issues from tripping hazards or cord damage from snow removal equipment.	$500 - $1,000 per station
	Bollards	This feature is almost always selected by station hosts to protect equipment from vehicle damage. While not currently specified in the Ontario Building Code (OBC), it may be added in the next revision (2018).	$200 - $300 per station
	Signage and Site Painting	Signage will assist drivers in finding the station and prevent non-EVs from occupying the parking spaces required to access the chargers. It was noted by a majority respondents in Partners in Project Green's Station Owners Survey that increased signage would be a key consideration for their next install.	$100 - $300 per station
	Station Branding	Station wrapping and decals can be added to remind users who is responsible for supporting the transition to electrified transportation. Some stations offer LED screens where videos of your choosing can be played on loop.	Free - $300 per station

4 What capabilities are gained from a networked station?

Networked stations are essential to avoid equipment obsolesce over time. As demand for EV stations rise, management features offered by software platforms will become a need-to-have rather than a nice-to-have. Drivers will need to know if the station is available before they arrive, payments will have to be managed smoothly and clear and easy internal reporting on station use will be more important as the number of units grow.

Typical Software Costs: $12-$30/port/month

USER ACCESS	**Determine who can use the station**	Easily customize user groups who can access the station and create different fees for each. Stations that are to be shared between employees, fleet vehicles and the general public can be set to require payment only for certain groups.
REPORTING	**Track costs**	Track amount of electricity provided to vehicles, monitor peak demand, and determine costs based on utility rates.
	Track frequency of use	Ensure stations are getting expected use. Monitor usage trends including time of day, length of session, unnecessary dwell time, and percentage of time at capacity to optimize station use management and justify adding additional stations when required.
	Track unique users	Track number of individual drivers using stations (valuable for retail and public locations); determine use by user group or department for accounting purposes (valuable for office and fleet applications).
	Report on environmental impact	Track amount of electricity provided to EVs and equate with mileage. Calculate comparable carbon emissions from similar mileage with gas fueled vehicle to determine the offset. Integrate into corporate sustainability targets.
PRICING	**Pricing modules**	The station owner has freedom to set prices by hour, kWh, or session. Time-based charging is most common, since this deters vehicles from remaining plugged in when fully charged. Session costs can be used in conjunction with time-based or energy-based pricing to ensure a minimum fee is collected, while also encouraging drivers to move the vehicle once charged.
	Manage use through pricing	Encourage drivers to move vehicles when fully charged by setting penalty pricing for sessions over 2-3 hours.
	Outsource administration	Generated revenues can be directly deposited into your account. Some vendors charge commission between 10-15% to manage administration costs.
USER EXPERIENCE	**Easily locate the station**	Each software platform will offer drivers an online map and mobile device applications to locate stations. Third party maps also can also host your station location and most will even manage payments.
	Determine if the station is in use	Before arriving at a station, drivers can check if the station is currently in use and in operation.
	Reserve a port	Drivers can reserve a period of time when they will need to use a station to ensure it is available when they arrive.
	Get alerts on your mobile device	When a vehicle is charged, an email or text can be sent to the driver as a reminder to move the vehicle. This assists in ensuring stations achieve maximum use.
	Manage queues	Customers can enter their name in a queue if all stations are occupied and be notified when a station becomes free.
STATION HOST EXPERIENCE	**Limit total current across multiple stations**	When total load of the chargers is above breaker capacity, software can limit the total load across all chargers to prevent tripping breakers. Using this feature as a means of over-sizing the load is not yet specified in the Ontario Building Code (OBC) but may be added in 2018. Load-limiting software is also useful in preventing costly peak electricity spikes.
	BAS integration	Most stations can be integrated into a facility's building automation system (BAS) for single point access and control by facility managers.
	Improved Customer Service	Avoid staff time dedicated to assisting drivers with station access. Online station maps can provide instructions to find exact location on site. Station screens and customer support lines can interface directly with station users.
	Troubleshooting	Station operation issues can be identified and staff alerted via email/text. Issues can be diagnosed and sometimes resolved from off-site.

5 How can installation costs be minimized?

The most cost-effective set-up will be wall-mounted, in a parking garage or on the exterior wall of a building and close to an electrical room with sufficient capacity. The table below outlines variables that can affect installation costs.

Typical Installation Costs: $2,000-$4,000/port

ELECTRICAL CAPACITY

First, assess building electrical capacity. While the load for an individual station is not large, multiple stations can quickly add up. If needed, coordinate with the local utility to increase supply from the main feed.

Level 1: 15A breaker circuit
Level 2: 40A breaker/port
Level 3: 60A 3-ph

*Note that current electrical code requirements demand each port be on its own dedicated circuit.

STATION LOCATION

Indoor vs outdoor location – Indoor parking installations tend achieve lower installation costs, as conduit can run along the ceiling of the parking garage and the structural support for a station can be mounted on an existing pillar or wall. Exterior installations often require trenching , pouring a concrete base on which to mount a pedestal station.

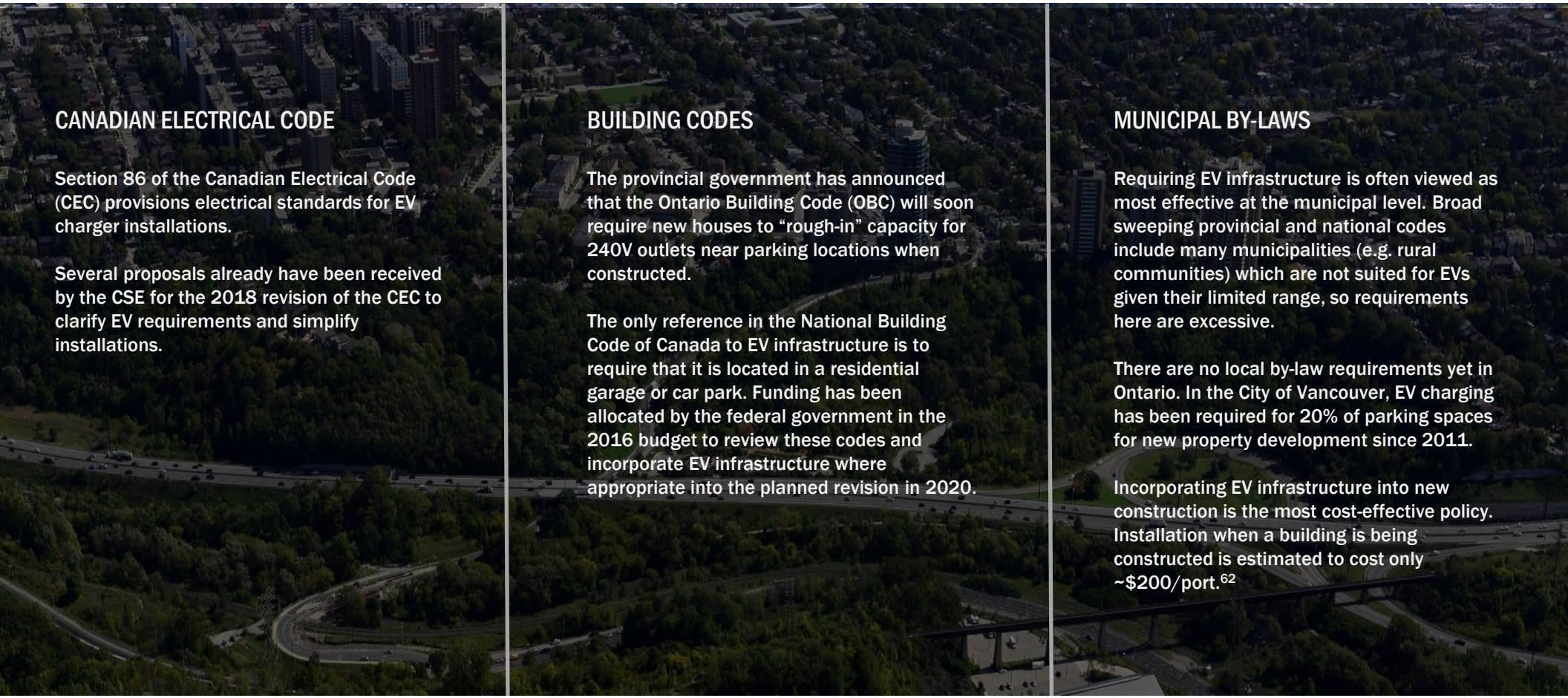
Wall vs pedestal mounted – Cost from pouring footing for pedestal-mounted units can be avoided by mounting units on a wall. If there is available parking space near an exterior wall of your facility, consider these locations first. Installing pedestals for each charger will increase upfront installation costs.

Proximity to electrical panel– If possible, select a location closest to the panel with available capacity.

Trenching – Trenching can drive up costs significantly. If possible, select an electrical run through unpaved areas compared asphalt or concrete. Direction-drilling is an option when disruptions to operations and use of the roadways are required, but is typically less cost-effective.

X-rays and locates – Check to see if any recent scans have been completed to avoid duplicating costs.

6 What codes and regulations need to be considered?



CANADIAN ELECTRICAL CODE

Section 86 of the Canadian Electrical Code (CEC) provisions electrical standards for EV charger installations.

Several proposals already have been received by the CSE for the 2018 revision of the CEC to clarify EV requirements and simplify installations.

BUILDING CODES

The provincial government has announced that the Ontario Building Code (OBC) will soon require new houses to “rough-in” capacity for 240V outlets near parking locations when constructed.

The only reference in the National Building Code of Canada to EV infrastructure is to require that it is located in a residential garage or car park. Funding has been allocated by the federal government in the 2016 budget to review these codes and incorporate EV infrastructure where appropriate into the planned revision in 2020.

MUNICIPAL BY-LAWS

Requiring EV infrastructure is often viewed as most effective at the municipal level. Broad sweeping provincial and national codes include many municipalities (e.g. rural communities) which are not suited for EVs given their limited range, so requirements here are excessive.

There are no local by-law requirements yet in Ontario. In the City of Vancouver, EV charging has been required for 20% of parking spaces for new property development since 2011.

Incorporating EV infrastructure into new construction is the most cost-effective policy. Installation when a building is being constructed is estimated to cost only ~$200/port.[62]

7 Who are the solutions providers?

COMMERCIAL-GRADE NETWORKED CHARGING STATIONS

Level 2

AddENERGIE, chargepoint, GE, Schneider Electric, AV, opconnect, SemaConnect, SIEMENS

DCFC

AddENERGIE, chargepoint, ABB, efacec, AV, Schneider Electric

NON-NETWORKED COMMERCIAL

Various

SUN COUNTRY HIGHWAY, BOSCH

NETWORK OPERATORS

Hardware Specific

AddENERGIE, chargepoint, AV, SemaConnect

Hardware Agnostic

chargepoint, greenlots, evconnect

User Managed Maps

PlugShare, ChargeHub

TURN-KEY INSTALLATION SERVICES

Distribution, Installation, Operation

AddENERGIE, Schneider Electric, autochargers.ca, KSI, Distributor for: chargepoint, Distributor for: GE ABB

8 How is success evaluated?

AN ROI FOR CHARGING STATIONS IS STILL TO BE DETERMINED

Charging stations do not yet demonstrate a lucrative return-on-investment (ROI). However, EVs make up less than 0.1% of vehicle sales so it is difficult to fully judge the business case for EVSE in a fully developed EV eco-system.

Of the respondents to Partners in Project Green's EV Charging Station Owners Survey, only 10% answered that the ROI was relevant to the project. Current project drivers are sustainability targets, employee retention, and public image, but cost recovery is essential to make the business case to justify an expansion. Many of the stations installed are being used to monitor station demand and revenue generation before scaling up.

As demand for charging stations escalates, user fees will be able to cover operating costs and generate a small amount of revenue, but corporate sustainability and customer attraction will likely remain the main drivers over the medium-term.

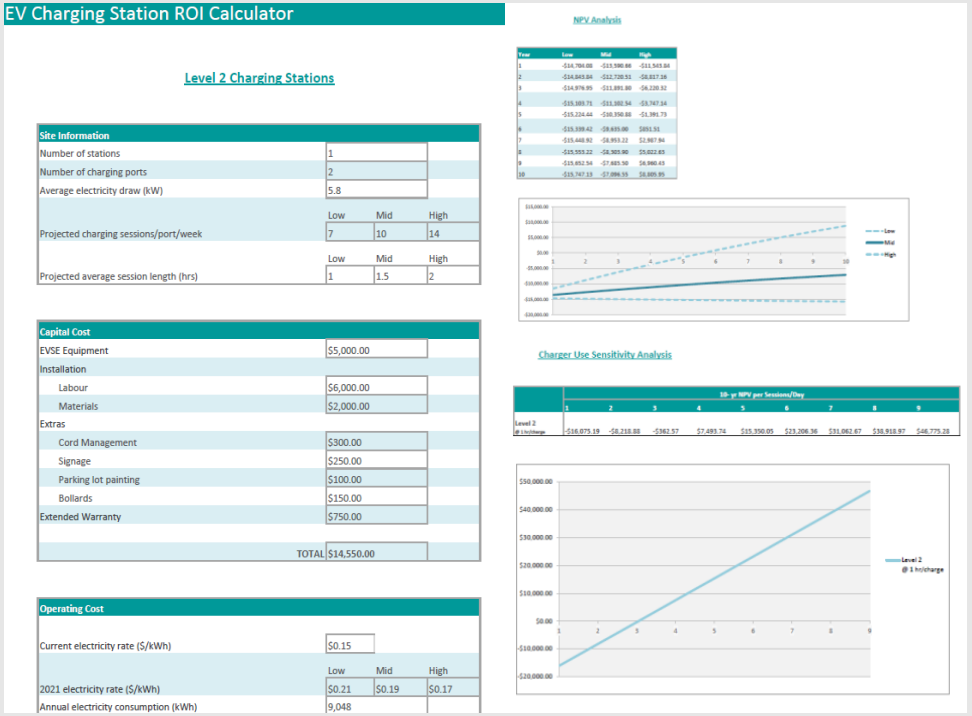
EVALUATING REVENUE AND OPERATING COSTS

Station hosts are typically charging $2 - $3/hr for Level 2 and $10 - $20/hr for DCFC. Since only 5% of charging takes place at public locations, adding a fee to charge at a public station only adds a fractional increase to the total cost of fuel for an EV driver and is still far less than gasoline.

When deciding whether to use time-, energy- or session-based pricing, consider that electricity draw can vary by vehicle and fluctuate over the course of a charging session. Batteries charge much faster when they are empty and progressively slower after reaching 50%. Charging by time has the advantage of being able to retain consistent revenue as vehicle draw declines, while also encouraging drivers to move their car after an adequate top-up.

Partners in Project Green's EVSE ROI Calculator is a tool for businesses to evaluate financial project success. The sheet can be used as a template to evaluate the sensitivity of revenue generation in multiple use scenarios. Compare low, mid and high use and include a variety of cost or revenue generation factors, including electricity rates, usage frequency length, advertising revenue, etc. Compare Net Present Value over 10 years and determine how much station use is required to meet internal payback thresholds.

In the screenshots below, the top graph to the right simulates a Net Present Value for a Level 2 charging station used 1 to 2 times per day. The lower graph evaluates how many uses per day are required for the "mid-use" simulation. At 1.5 hours per session priced at $2.50/hr, each port would need to be used 3 times per day for a payback of 4 years.



Get started on your own calculations by downloading a version from our website at:
www.partnersinprojectgreen.com/your-needs/energy-performance/evse-roi-calculator/

8 How is success evaluated?

SUCCESS METRICS

Carbon emissions reductions, fuel savings, and employees engaged are examples of success metrics commonly used by businesses who have invested in EV charging stations. 100% of Partner's in Project Green's Station Owner's Survey respondents said Corporate Sustainability Goals was one of the reasons the stations were installed.

Businesses offering workplace charging may look to influence their purchasing decisions for their next vehicle. Often a charging station is installed because an early adopter employee has purchased an EV. Employees are 20 times more likely to consider buying an EV if there is a charger installed at work.[63]

Emissions from employee commutes can be an important metric for companies to track. Using the province's target in the Climate Change Action Plan of 5% of all vehicles sales will EVs by 2020, every office building of 1,000 employees can expect to provide 4 employee vehicles with charging.[64]

QUALITATIVE RESULTS

For businesses who are beginning to track emissions from employee commutes, charging station usage data can be used to determine associated reductions. A consumer-facing business like a shopping centre may look for positive customer feedback. Orlando Corporation received much more positive than expected positive feedback from customers through social media feeds. Customers indicated they had elected to shop at the plaza as a result of available charging.

EXAMPLES OF NON-FINANCIAL SUCCESS METRICS

WORKPLACE	✓ Air pollutants avoided ✓ Number of employee EV purchases ✓ Obtained credits for green building certification (LEED, BOMA BEST, etc)
RETAIL	✓ Air pollutants avoided ✓ Number of unique visitors using the service ✓ Length of time visitors stay while charging ✓ Impressions on social media ✓ Obtained credits for green building certification (LEED, BOMA BEST, etc)
FLEET	✓ Air pollutants avoided ✓ Frequency of use vs. gas fleet vehicles

Results of PPG's Station Owners Survey: What those who have installed stations are saying

TOP 3 LESSONS-LEARNED FOR THE NEXT INSTALLATION:

- More signage to find and use stations
- Installations will be future-proofed to reduce
- Improved networking capabilities are important

SUGGESTED SOLUTIONS TO OVERCOME BARRIERS

- Government can collect data on station use by area to help businesses project station usage
- Consider Level 1 charging for long-term parking (8+ hrs) to increase cost-effectiveness

9 Are there alternative financing options?

FINANCING STATIONS WITH ADVERTISING

Station users have an up-close experience with chargers. Typical charging locations are close to entrances at retail facilities, maximizing the number of passerbys who will take note of the novel technology. These locations offer great opportunity for ad space – potentially adding another $500-$1,000/month of revenue.

A case study showcasing advertising revenue potential is California startup Volta Charging, a third party service provider who owns and operate stations while banking on static and dynamic advertising to finance installations. The company covers all equipment and operating costs, offering free installation to station hosts and free charging to drivers. Volta has already installed over 200 stations at shopping centres across the US.[65]

Image Source: Maui Now

CHARGING-AS-A-SERVICE

A new business model in the EV charger space is Charging-as-a-Service (EV CaaS). Essentially, it eliminates upfront costs to station hosts in place of an ongoing lease. This creative cost-sharing strategy minimizes risk to the property owner and relieves them of operation and administrative responsibilities. The risk of minimal station use is taken on by the third-party, who are able to relocate the equipment to a higher-use area if necessary.

The first North American EV CaaS offering was launched in 2015 by EV Connect. Since then EV Connect has secured a $4M contract with New York Power Authority to install and manage 300 stations across the state. The chance of recouping charging revenue is relinquished by the station host, but many companies would not blink at a small ongoing cost of $99/month per port to offer the service to their employees and customers – and simultaneously reduce risks and resources associated with increased asset management.[66]

EV Connect also hosts an open-source network platform that is currently being integrated into General Electric's large network of chargers, among others.

SECTION III: Case Studies

425
Unique customers serviced

58 mins
Average session length

6.2 tonnes
eCO_2 avoided

STATION PURPOSE: Customer Attraction
PORTS INSTALLED: 28
DATE OPERATIONAL: November 2015

PROJECT STORY
Orlando's foresight of the oncoming wave of EV adoption drove the company to be the first in Canada to build an "EV friendly" shopping centre. Heartland Town Centre is now home to the largest installation of public charging stations at a single location in the country, with a total of 28 Level 2 charging ports. The location can attract over 50,000 visitors on any given Saturday and the charging stations have served over 425 different drivers in the past year. This accounts for 6 - 7% of all the EV drivers in the province.

VENDOR SELECTION
ChargePoint was selected for the accessible software platform and hardware that includes an LCD screen to easily communicate user instructions, a cord management system, and lockable handles to prevent vandalism.

CHALLENGES OVERCOME
While monitoring station use on the online portal, Orlando noticed that some users were taking advantage of the free service by remaining connected to the stations far longer than necessary – one user stayed for over 13 hours! By implementing a pricing model allowing free charging for the first two hours and $2/hr afterwards, Orlando was able to virtually eliminate EV drivers that were taking advantage of the amenity. Now only 4% of users remain at the station beyond three hours.

SECTION III: Case Study – TRCA's Head Office

46,000 kms
Of EV driving

$3,400
Vehicle savings

9.7 tonnes
eCO_2 avoided

STATION PURPOSE: Employee and fleet vehicles use
PORTS INSTALLED: 4
DATE OPERATIONAL: March 2015

PROJECT STORY

As an organization that leads by example in green infrastructure development, TRCA's fleet management team decided to invest in electric and plug-in hybrid vehicles. The vehicles are used by head office employees who typically travel within the GTA at distances around 50 km per day. The conversion of three of twelve fleet vehicles to EV reduces emissions by up to 90% for each vehicle allowing employees to test the new technology and consider an EV for their next vehicle purchase. A 3 - 4 year payback from fuel savings is targeted.

After one year of installation, employee EV ownership rose from one to three. TRCA is now installing two more General Electric Level 2 stations, and two ABB DC Fast Chargers at their head office in Vaughan with funding provided through the EVCO program.

VENDOR SELECTION

Schneider Electric hardware was selected with ChargePoint for the software platform. Reasons included the affordability of the station equipment backed by a Tier 1 electrical equipment brand combined with a leading software platform to meet high corporate sustainability reporting standards.

SECTION III: Case Study – Woodbine Entertainment

1,000 kms
Delivered to drivers

16
Customers serviced

<2km
To two 400-series highways

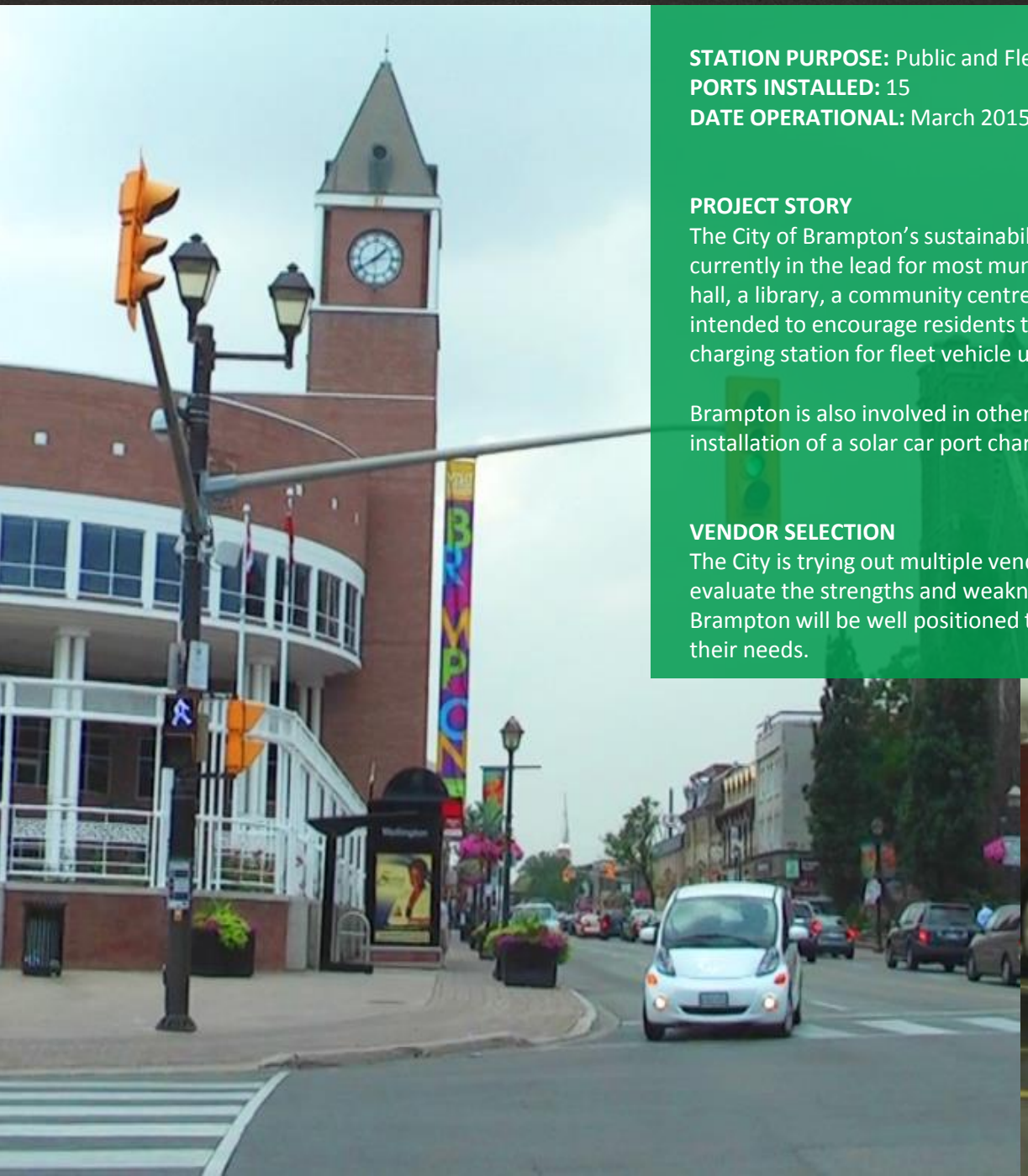
STATION PURPOSE: Customer Amenity
PORTS INSTALLED: 2
DATE OPERATIONAL: April 2016

PROJECT STORY
Woodbine Entertainment's corporate sustainability goals were the central driver for this initiative. Located just off two major highways, the racetrack and gaming facility provides a great location for drivers to charge and take advantage of dining and 24/7 entertainment amenities.

VENDOR SELECTION
AddENERGIE was selected for their reputation as a highly durable, Canadian manufactured product. A custom cord management system was installed to neatly suspend connector cables above the asphalt, addressing the operations team's concerns about potential damage if customers fail to properly return them the holder.

CHALLENGES OVERCOME
The public parking facilities are set at quite a distance from the main building, potentially a cost-prohibitive barrier if trenching were the only way to go. However, the operations team was able to locate an ideal spot in the parking lot that could draw power from a utilities building. With ample power available and more parking nearby, Woodbine is capable of cost-effectively scaling up this installation to ten or more once current capacity is met.

SECTION III: Case Study – City of Brampton



STATION PURPOSE: Public and Fleet Vehicle Use
PORTS INSTALLED: 15
DATE OPERATIONAL: March 2015-July 2016

PROJECT STORY

The City of Brampton's sustainability team has decided to champion EV use in the community and are currently in the lead for most municipally-installed charging stations in Ontario. Locations include the city hall, a library, a community centre, and a theatre. Charging is provided to the public free of charge and is intended to encourage residents to adopt environmentally-friendly alternatives to traditional cars. A charging station for fleet vehicle use has been installed at a transit facility.

Brampton is also involved in other innovative electric transportation initiatives, including a planned installation of a solar car port charging location and participating in a provincial pilot of electric buses.

VENDOR SELECTION

The City is trying out multiple vendors – currently Sun Country Highway, Eaton, and General Electric – to evaluate the strengths and weaknesses of each. When the time comes for a large-scale municipal roll-out, Brampton will be well positioned to select the most appropriate technology and software platform for their needs.

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