Accelerating the Deployment of Plug-In Electric Vehicles in Canada and Ontario

Building on existing federal and provincial policies and action to maximize decarbonization of the transportation sector, and help achieve climate change commitments

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About

BRUCE POWER

Bruce Power is Canada's first private nuclear generator, providing 30 per cent of Ontario's power. The company is committed to providing clean energy to the province beyond 2060, to help the province continue to achieve reduction in Greenhouse Gas Emissions (GHG). Since 2013, Bruce Power has been involved in the promotion of electric vehicles and energy supply mix, bringing focus to the extensive opportunity Ontario has to leverage the clean supply mix in helping to reduce Greenhouse Gas contributions from its transportation sector.

PLUG'N DRIVE

Plug'n Drive is a non-profit organization committed to accelerating the adoption of electric vehicles to maximize their environmental and economic benefits. Since 2011, Plug'n Drive has established itself as a leader in the electric vehicle industry. A trusted source of unbiased information about electric cars, charging stations and the electricity sector.

POLLUTION PROBE

Pollution Probe is a national, not-for-profit, charitable organization that works to improve the health and well-being of Canadians by advancing policy and delivering programs that achieve positive, tangible environmental change. Pollution Probe has a proven track record of working in successful partnership with industry and government to develop practical solutions for shared environmental challenges.

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Purpose of Report

Over the past few years, significant progress has been made at the federal and provincial levels of government to outline and support climate change action. Aggressive greenhouse gas (GHG) emission reduction targets have been set by the federal government, committing the country to reduce GHGs by 30 per cent below 2005 levels by 2030, which means reducing emissions between 200-300 megatonnes (Mt) from projected levels. Federal, provincial and territorial governments are working together to develop a pan-Canadian Framework for Clean Growth and Climate Change, which will include plans on how they will each help achieve this common goal.

The transportation sector is the second largest contributor to GHG emissions in Canada. Electric vehicle (EV) technology presents an enormous opportunity to help provinces and territories achieve decreased GHG emissions. Canada, as a whole, is blessed with a relatively low-carbon electricity mix, making it an optimal country to adopt EVs and realize deep decarbonization benefits. The governments of British Columbia, Quebec and Ontario are leading the way for EV adoption at the provincial level. Each province is unique, with respect to the potential for GHG emissions reduction benefits realized through EVs and as such, each has their own specific EV approach. However, each successful strategy, no matter where it is located, should consider the following elements: electricity supply mix, electricity distribution, demand and grid stability, public charging infrastructure, retail experience, public awareness and government co-ordination. This report recognizes that there are many other potential transportation emission reduction technologies and strategies, but the focus here is on EV adoption.

Accelerating the Deployment of Plug-In Electric Vehicles in Canada and Ontario explores ways to build upon existing policy frameworks at the federal and provincial level with respect to plug-in EVs (PEVs), and highlights opportunities to accelerate and optimize the decarbonization capability of EVs.

SECTION 1

Introduction

Introduction

Climate change is one of the top issues our global community faces. GHG emissions from human activity are one of the major contributing factors in climate change, which causes erratic weather conditions such as increased drought, flooding and fast temperature shifts that are now threatening basic necessities of life, such as food production and water quality.

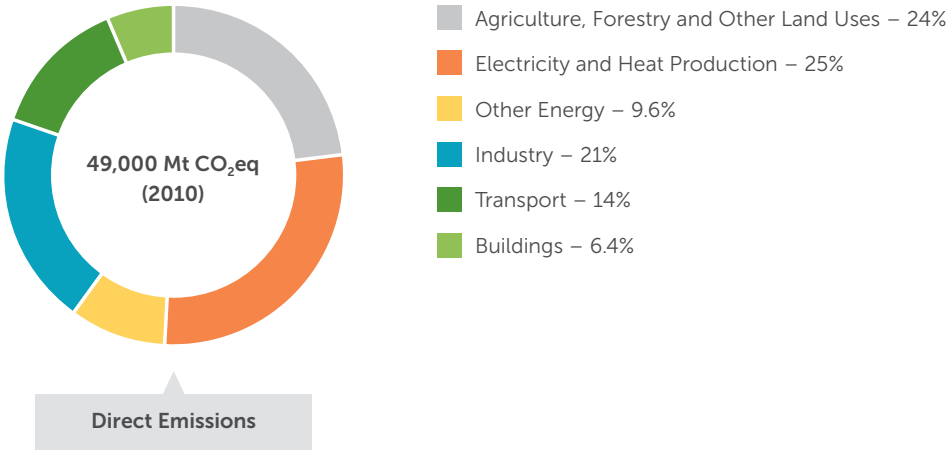
In December of 2015, 195 countries reached the monumental Paris Agreement, which strengthens the effort to tackle climate change through a decrease of global GHG emissions and limits the global average temperature rise to well below 2°C. The 2°C rise in global temperature is the threshold the Intergovernmental Panel on Climate Change has indicated as the point in which irreversible climate harm will have occurred, and as such we must not reach that level and need to begin to lower GHG emissions to avoid unsustainable climate conditions.

A variety of sectors contribute to the GHG emissions profiles for different countries (Figure 1). It is anticipated that each country will meet their climate commitments differently, with no two efforts being identical.

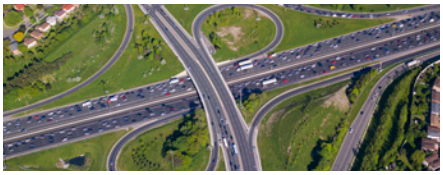
FIGURE 1
2010 Total Global Greenhouse Gas Emissions by Economic Sectors

(Source: Intergovernmental Panel on Climate Change, 2014)

Mt = Megatonnes



Transportation is one sector where countries will be able to realize large and relatively quick decarbonization. Globally, this sector accounts for 14 per cent of the world's GHG emissions (Figure 1), and has viable clean technology options, including plug-in electric vehicles PEVs. This report recognizes there are many other potential transportation emission reduction technologies and strategies, such as: public transportation, vehicle light weighing, start-stop drive trains, improved engine technology, fuel substitution and production improvement, hydrogen, power-to-gas and natural gas heavy fleets. However the focus of the report is on EV adoption.



PLUG-IN ELECTRIC VEHICLES

This report considers two broad categories of PEVs: plug-in hybrid electric vehicles (PHEV)s, which are powered by electricity and also gasoline, and battery electric vehicles (BEV)s, which are powered solely by electricity. More specifically, a PHEV has both an electric motor and an internal combustion engine (ICE); the engine will run off of the electric motor until a limited charge remains and then it switches over to gasoline. PHEVs use rechargeable batteries, or another energy storage device, that can be recharged by plugging it into an external source of electric power. A BEV is the simplest form of automotive design; the power train consists of a battery, power converter, and an electric motor. There is no engine, few belts or pulleys – the only moving parts are an electric motor, the wheels, and cooling fluid pumps. PHEVs and BEVs are the most common types of EVs. The most optimal GHG reduction benefit is realized from BEVs, there is still benefit in people moving from solely ICEs to PHEVs, however the emission reductions will not be as great. For the purposes of this report, both PHEVs and BEVs will be referred to as EVs.

ELEMENTS OF A SUCCESSFUL EV STRATEGY

We can look to the United States, Japan, China and several European countries, to see benefits of EV technology adoption in the area of GHG reductions. Experience in other countries shows that challenges to expand the use of EVs exist in a variety of areas. When compared, common elements of a successful EV strategy emerge including:

Electricity Supply Mix

Electricity Distribution, Demand and Grid Stability

Public Charging Infrastructure

Government Co-ordination

Retail Experience

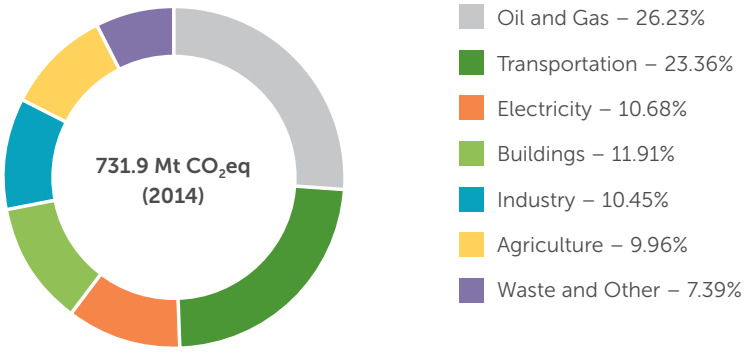
Public Awareness

It is imperative that all of these areas are evaluated during strategy development to understand where barriers and opportunities lie so that countries can realize maximum benefits of EVs. Canada and Ontario have made significant strides over the past few years through policy and action, in deploying EVs and beginning the transition to a low-carbon transportation sector. This report explores the key elements of a successful EV strategy and identifies opportunities to further build on existing policy and action resulting in an enhanced and accelerated deep decarbonization of the transportation sector.

CANADA'S EMISSIONS, TARGETS & POLICY

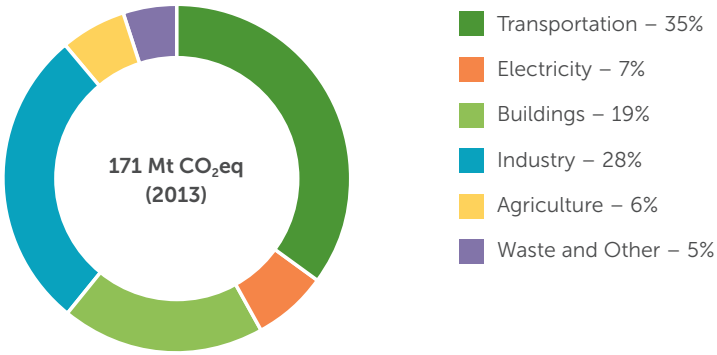
Canada was one of the 195 countries that reached the Paris Agreement and signed its formal commitment in April of 2016. It committed to reducing GHGs by 30 per cent below 2005 levels by 2030, which means reducing emissions between 200-300 megatonnes (Mt) from projected levels. Currently, the transportation sector is the second highest contributor of GHG emissions (Figure 2). As of 2015, there were over 33 million vehicles registered in the country. To put Canada's emission reduction targets into perspective, it would be equivalent to removing all emissions from today's 33 million vehicles. With this agreement in place, the Canadian government has committed to working with provinces and territories to ensure its achievement. The Government of Canada is currently working with provincial and territorial governments to develop a framework for combating climate change, and has made significant investment in clean technology and innovation.

FIGURE 2
Canada's 2014 Greenhouse Gas Emissions Breakdown by Sector
(Source: Environment and Climate Change Canada, 2014)



Canada contributed a total of 731.9 Mt CO_2 equivalent. Transportation is the second highest GHG emitter in Canada.

FIGURE 3
Province of Ontario's 2013 Greenhouse Gas Emissions Breakdown by Sector
(Source: Ontario Ministry of Environment and Climate Change, 2016)



Ontario's transportation sector accounts for 35% of its overall GHG emissions.

ONTARIO EMISSIONS, TARGETS, AND POLICY

Ontario is one of the provinces Canada will rely heavily on to continue to realize reductions in GHG emissions. The province itself has come a long way in GHG emission reductions to date through its phase out of coal, refurbishment of nuclear reactors and enhancements of renewables. However, transportation within the province is now its number one GHG contributor (Figure 3) and a main area of focus for decarbonization.

In June of 2016, Ontario released its Climate Change Action Plan, which outlines its commitments to reduce GHG emissions in the province over the next five years (Figure 4), and beyond. A large portion of the province's action under the transportation sector involves significantly accelerating the uptake of EVs into the market. This is not the first time that EVs have been supported in Ontario — this technology has had government support since at least 2010 (Figure 5).

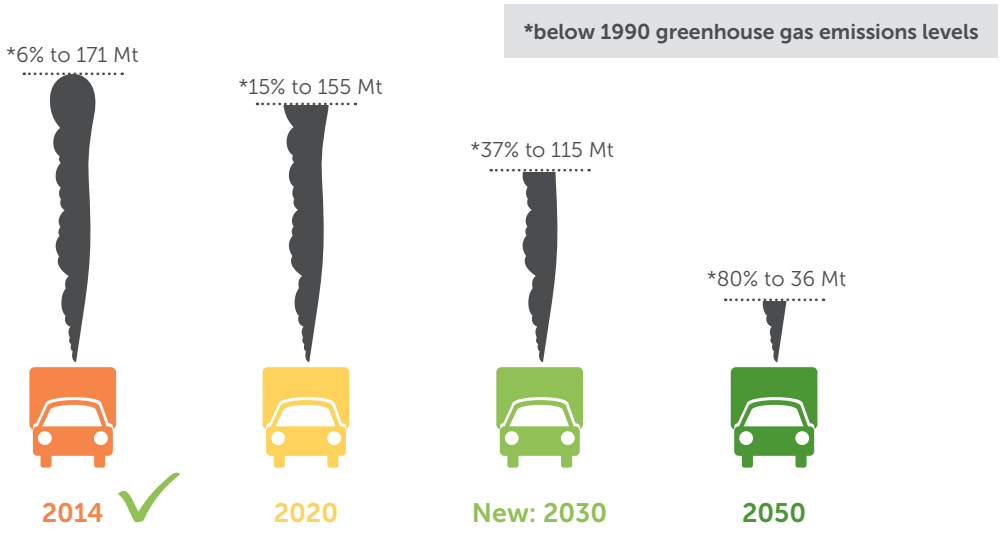


FIGURE 4
Ontario's Greenhouse Gas Reduction Targets
(Source: Ontario Climate Change Strategy 2015)

FIGURE 5
Timeline of Electric Vehicle Policy Support in Ontario

2007

- Ontario establishes climate change targets for 2014, 2020, 2050.

2009

- Ontario Ministry of Transportation (MTO) sets goal to have 1 in 20 vehicles driven in Ontario by 2020 be EV.

2010

- MTO launches Green Licence Plate Program – EVs are granted access to High Occupancy Vehicle (HOV) lanes on 400-series highways and the QEW until 25 per cent of passenger vehicles have green plates. The province committed to continuing the program under the Climate Change Action Plan.
- MTO introduces capital funding for EVs via the Electric Vehicle Incentive Program (EVIP) to reward early adopters, and to create market demand for new technology. Provides up to $8,500 per EV and up to $1,000 for charging stations.
- The Federal government publishes GHG tailpipe emission standards for passenger and light duty trucks for 2011-2016 model years.

2014

- Federal standards are revised to establish progressively more stringent annual fleet average GHG emission standards over the 2017 to 2025 model years.

2015

- May: Ontario announces 2030 climate change target.
- April: Ontario announces that it plans to pursue a Cap and Trade program, the price at the pump is expected to rise 4.3 cents/L.
- November: In Ontario's Fall Economic Statement the $325 million Green Investment Fund commits money for projects that reduce GHG pollution and specifically cites support for more EV charging stations across Ontario.

- December: Ontario releases Climate Change Strategy which specifies that the government will promote the uptake of zero emission and plug-in hybrid vehicles by ensuring access to affordable and fast public charging, an updated vehicle price incentive, making the green plate program permanent, and reducing emissions through use of automated vehicles.
- December: Electric Vehicles Chargers Ontario (EVCO) – To help address range anxiety, the Province announces $20 million Request For Proposal (RFP) for Fast Charging Level 3 Stations and Level 2 stations to be built by March 2017. Stations were announced in April 2016 and will be built along major highways close to the US border, and located near retail, workplaces and condominiums.

2016

- February: EVIP Update increases the value of the capital cost rebate to $14,000; for one of Ontario's best-selling EVs, the Chevy Volt, the EVIP will now cover 30 per cent of the price of the car. Incentive increases with battery size and number of passengers but is maxed at $3,000 for luxury vehicles.
- February: Electric Vehicle Charging Incentive Program (EVCIP) – Continued funding for Level 2 charging stations for homes and businesses. The incentives cover purchase and installation costs up to $1,000.
- March: Federal Budget announces $62.5 million over two years to support infrastructure for charging and refuelling stations and also tax incentives for EV charging stations.
- May: Climate Change Mitigation and Low-Carbon Economy Act – which makes Cap and Trade official in Ontario starting in 2017 and allows the revenue collected from the program to be invested in activities that will reduce GHGs.
- June: Ontario releases Climate Change Action Plan, which promises to get at least 1.7 million electric and hybrid cars in use by 2024, take seven million ICEs off the road by 2030.

SECTION ②

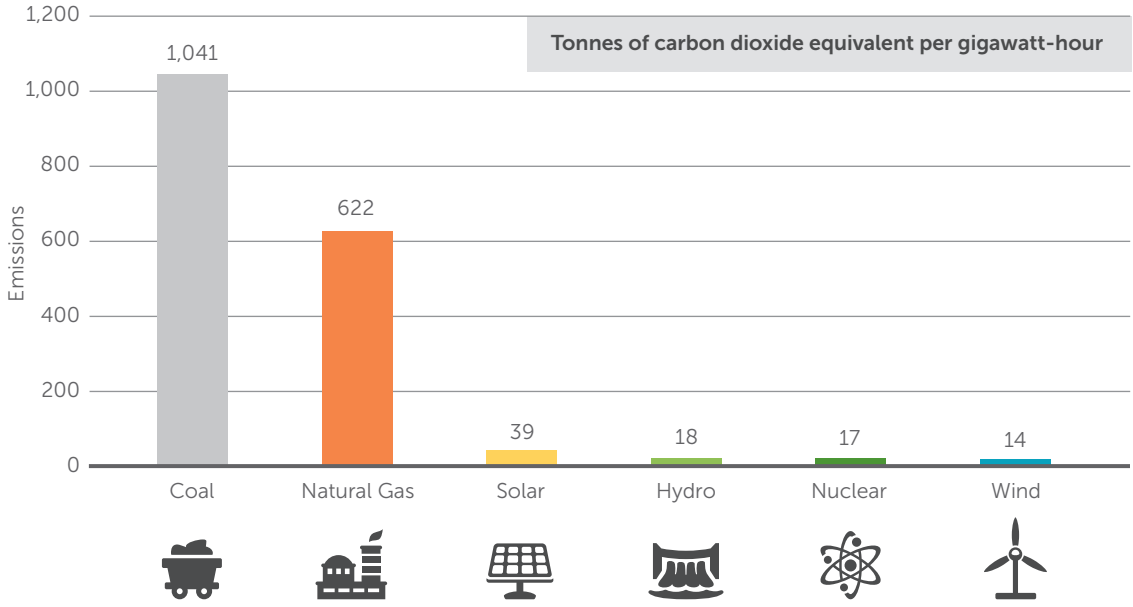
Policy Recommendations

1. Electricity Supply Mix and Electric Vehicles

Clean transportation technology presents enormous opportunities for reducing GHG emissions for a wide range of stakeholders across a variety of sectors. EV technology alone has no tailpipe emissions, and if it is 'refuelled' by an electricity supply mix that is relatively low-carbon, additional GHG emissions reduction benefits can be realized in decarbonization.

While a clean electricity supply mix in itself is an important element to reduce GHG emissions, it is also a critical component for promoting the adoption of clean transportation. If a supply mix is comprised of a large volume of high-emitting sources of electricity generation, it reduces the emissions benefits of EVs. When you look specifically at Canada, the good news is that the country as a whole has a relatively clean electricity supply mix, setting it up for success with increasing adoption of EVs.

FIGURE 6
Comparison of Life-Cycle Emissions
(Source: Clean Air Ontario, 2014)



Energy supply can be thought of as the 'fuel' for the EV. While EVs have no tailpipe emissions, electricity must be generated to charge the vehicle's battery, which creates some amount of GHG emissions depending on source. Thus it is critical to consider the 'life cycle' emissions of the vehicle. Figure 6 shows the overall life cycle emissions created by all major global energy sources. Since supply mix makeup varies across jurisdictions, in places where energy demand is high and the supply mix is carbon intensive GHG emissions reductions may not be maximized as 'refuelling' needs will be fulfilled through carbon intensive energy sources (Figure 7). This does not mean that areas with more carbon intensive supply mixes should not consider EVs, but rather that a more detailed emissions analysis should



take place to fully realize the decarbonization potential of EVs. There is an opportunity for some regions or jurisdictions to also focus on strategies for moving towards a cleaner energy supply mix in order to maximize the emissions benefits potential of EV technology. Note that this report focuses on the energy requirements for the vehicle operation, and not those required to manufacture the vehicle. While the manufacturing environmental impacts are more for EVs than conventional vehicles, over a vehicle life of 100,000 km the impacts associated with the operation of the vehicle are less significant than ICEs. Thus the operation phase is a significant opportunity based on Canada's clean supply mix and is an area where Canadian policy can have the most influence.

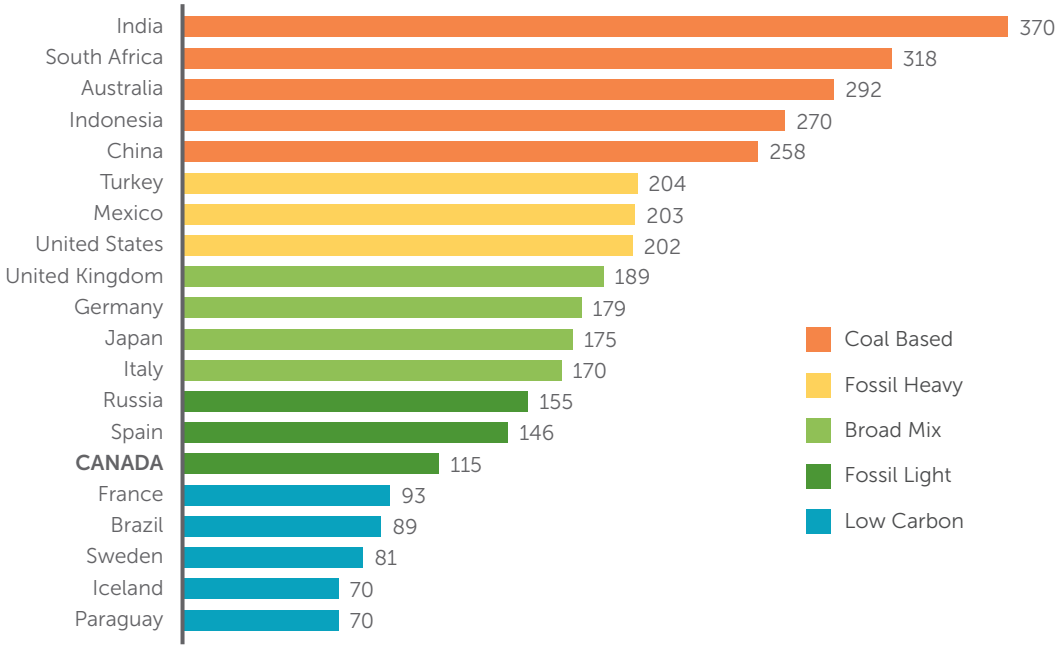


FIGURE 7
Electric Vehicle Emissions (g CO2e/km)

Note: Results include emissions for vehicle manufacturing, direct grid emissions, indirect grid emissions and losses.

(Sources: DEFRA, GHG protocol, IEA, EPA, LCA literature)

This figure shows the GHG emissions from driving an electric vehicle based on the electricity mix of the country. There is a strong correlation between high GHG producing energy sources such as coal, and high GHG emissions from EVs based on the battery charging requirements or 'fuelling.'

The following section looks at how electricity supply mix across Canada can be leveraged to obtain optimal GHG reductions through the adoption of EV technology. Specific focus is given to Ontario to demonstrate the opportunities that exist within the province.

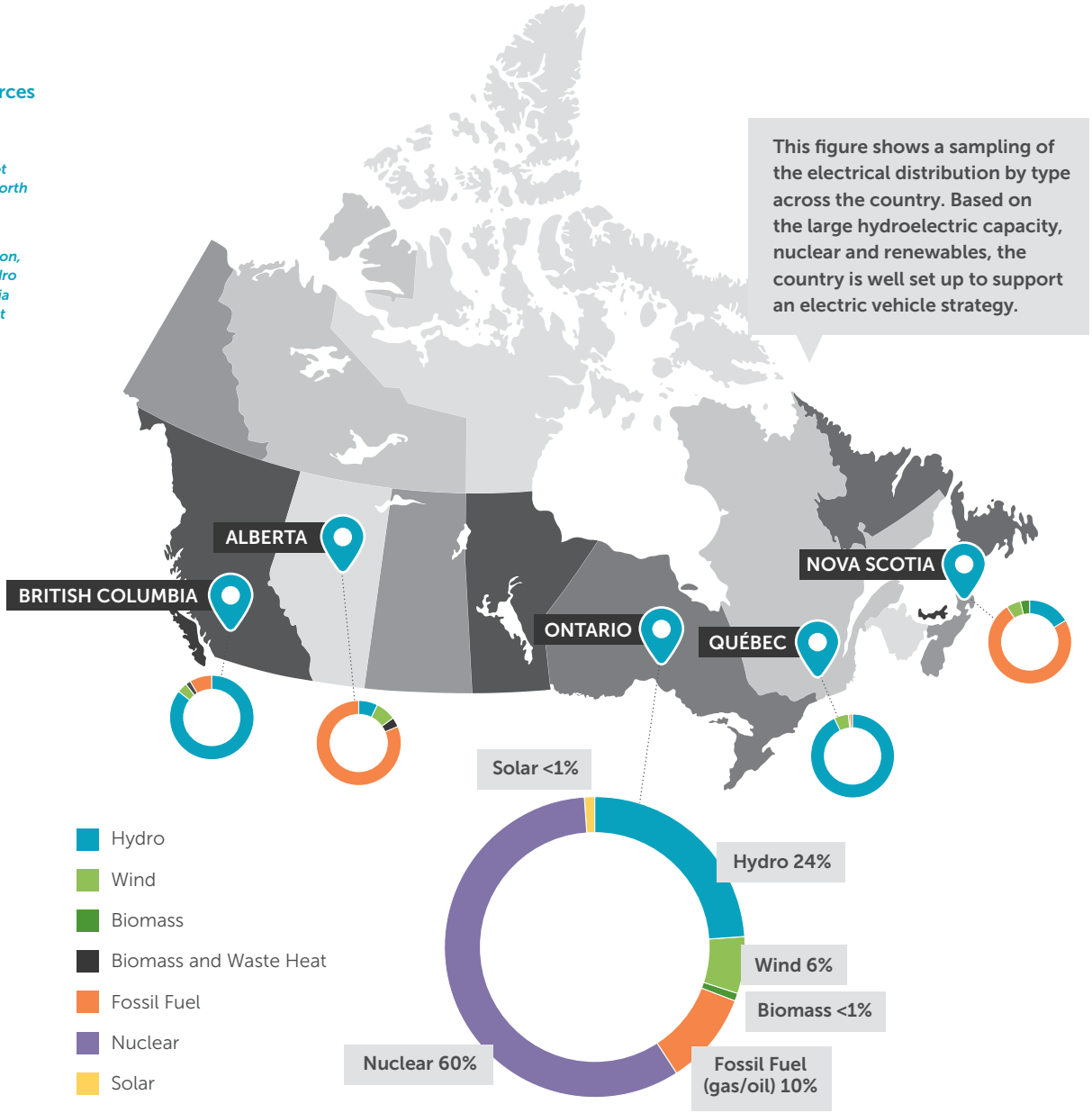
CANADA'S SUPPLY MIX

Each province and territory within Canada has a unique energy supply mix, made up of various combinations of hydroelectric, nuclear, coal, natural gas, fuel oil, diesel, solar, wind, waste or biomass (Figure 8). Each energy supply mix varies which means each contribution to overall national GHG emissions will vary. Figure 6 provides a life-cycle analysis of GHG emissions for the major sources of energy, demonstrating that jurisdictions that rely more heavily on coal for their supply mix will have higher GHG emissions. As provinces and territories move to adopt some capacity of clean transportation strategies, it is imperative that they balance emissions benefits realized through elimination of tailpipe emissions, with the emissions generated through 'refuelling' of EVs.

FIGURE 8
A Sampling of Provincial Electricity Sources Across Canada

Note: Yukon, NWT and Nunavut are not connected to the North American grid

(Source: Canadian Electricity Association, Alberta Energy, Hydro Québec, Nova Scotia Power, Independent Electricity System Operator)



ONTARIO'S SUPPLY MIX

In 2013, the Ministry of Energy outlined in its Long Term Energy Plan (LTEP) a low-carbon supply mix, which will see the refurbishment of eight nuclear reactors, increased renewables and continued use of hydroelectric and natural gas. As a result, the province has transitioned to a cleaner electricity supply mix made up of hydroelectric, nuclear, natural gas, wind, and solar. This supply mix results in low GHG contributions from the electricity sector in Ontario (Figure 9), and makes an optimal scenario to support the province's EV strategy and overall electrification of transportation. The low GHG emissions from the supply mix combined with EV technology can ensure Ontario achieves its climate change goals as well as supporting national and international climate commitments.

Additional to the emissions benefits from a clean supply mix, there is also an economic benefit of EVs for Ontario. Currently, there is a surplus of power at night in the province which is often sold off. EVs have the ability to make use of our surplus power, as they typically charge overnight. This results in a mutually beneficial situation as the surplus power is used in Ontario and EVs are being charged with clean electricity sources.

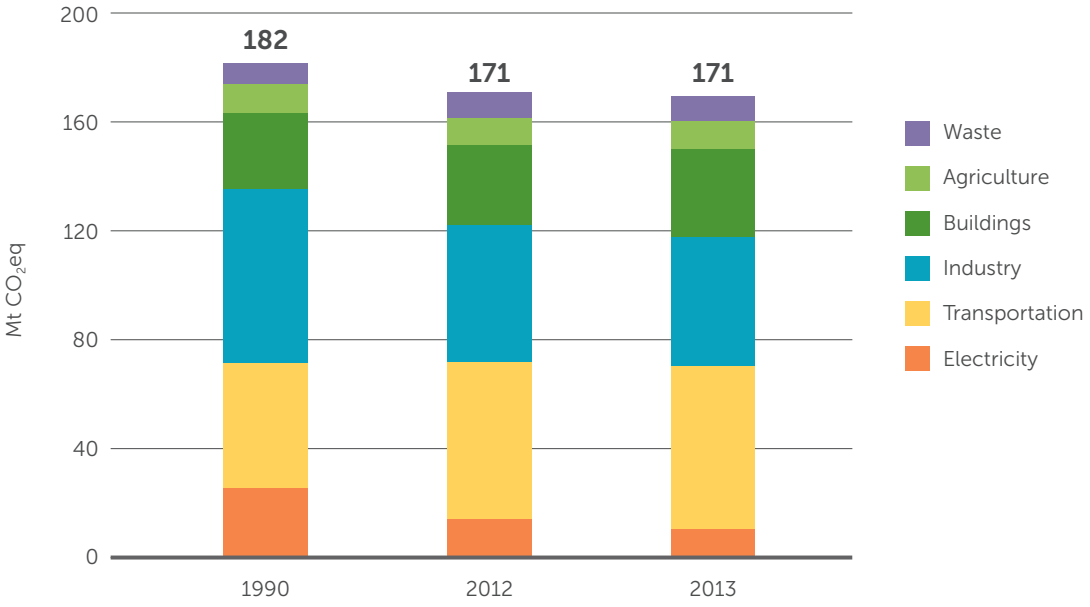


FIGURE 9
Ontario's GHG Emissions by Sector

(Source: Environment and Climate Change Canada, Ministry of Environment and Climate Change)

Canada, as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), is obligated to submit an annual national GHG inventory. The latest Environment Canada numbers were published in July 2015 and use 2013 data. Note that these numbers do not take into account the complete phase out of coal in 2014 which will reduce the electricity sector's share of GHG emissions even further to roughly 3 per cent.

1. Electricity Supply Mix and Electric Vehicles

POLICY RECOMMENDATIONS

PROVINCIAL GOVERNMENT

1.1 Ensure Ontario maintains and continues to improve its low-carbon energy supply mix made-up of hydroelectric, nuclear, solar, wind and natural gas to support its enhanced EV Adoption.

Ontario has made great strides in reducing GHG emissions from their electricity sector through the phase out of coal, refurbishment of nuclear reactors, and the enhancements of renewables. In addition to contributing to low GHG emissions from the electricity sector over the long term, the province's supply mix will also maximize EV emissions reductions by minimizing upstream source emissions resulting from the generation of electricity to charge the vehicles.

FEDERAL GOVERNMENT

1.2 Federal government should work with provinces and territories to develop individual clean transportation plans that account for energy supply mix. Those locations with more carbon intensive supply mixes should be encouraged to create a strategy that balances emissions reductions realized from EVs and those from the electricity sector.

Every province and territory has a unique energy supply mix, and therefore a standardized EV strategy will not result in optimal GHG emission reductions. It is imperative that federal government work with provinces and territories individually to develop strategies that take the unique provincial and regional supply mix into consideration. There are still advantages for a jurisdiction's transportation sector to transition to EVs in a more carbon intensive supply mix based on the simple fact that EVs have no tailpipe emissions, and of course as the supply mix in these areas becomes cleaner the benefits of EVs will grow as well.

2. Electricity Distribution, Demand and Electric Vehicles

The ability of the electricity distribution system to respond to the power demand for EV charging will play a critical role in the overall adoption of EV technology. While increased public charging infrastructure is a key element to an overall effective EV strategy (see Section 3: Public Charging Infrastructure and Electric Vehicles), household charging is the main location for EV owners to 'refuel'. Research suggests that 80-90 per cent of charging happens at home as it is most convenient for drivers. This means that it is imperative that electricity distribution systems are equipped to handle increased demand resulting from EV charging.

Electricity distribution is the final step in the delivery of electricity to end-users. The distribution system takes the electricity carried along high-voltage transmission lines from a generating station and, through a series of step-down transformers, lowers the voltage to levels appropriate for use by individual households and businesses. The distribution system is owned and operated by local distribution companies (LDCs). The most important consideration related to EV charging is its impact on the neighbourhood-level distribution system, comprised of local transformers and the secondary cables responsible for running electrical power to individual households.

Research conducted as part of Pollution Probe's Electric Mobility Adoption and Prediction (EMAP) study showed that early users of EV technology will tend to concentrate in specific communities that can be characterized by a set of common values the residents share as consumers and as citizens. This 'clustering' of EV owners means that streets in certain neighbourhoods could have multiple vehicles charging simultaneously. While this additional demand is not expected to overload local transformers serving these streets in the near-term, as the technology begins to appeal to a broader market, there will be a greater need to recognize and proactively address the demand for power to charge EVs at the local level.

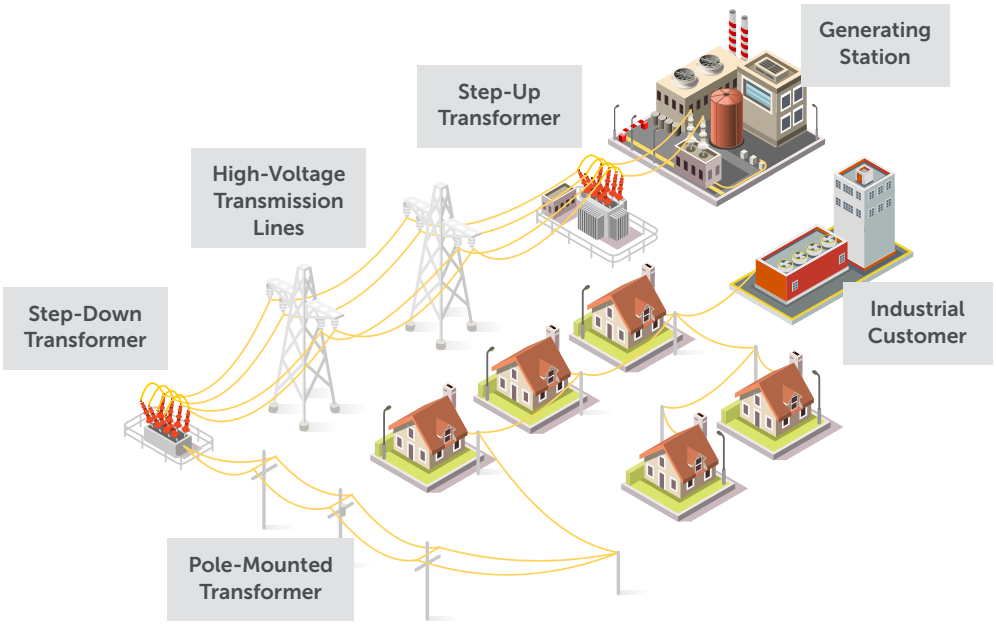


FIGURE 9
Electricity Generation, Transmission and Distribution



A number of key variables should be considered when analyzing the capacity of the local distribution system to accommodate EV charging including the demand profile for neighbourhood-level transformers and predicted EV charging patterns. Energy demand profiles are influenced by such things as weather and daily economic activity. Figure 10 shows a demand profile for a warm day for a single neighbourhood-level transformer. Usage typically starts to rise around 7 a.m., when people wake and begin their day and continues to rise until about 7 p.m., when people starting winding down. Each local distribution system is unique and will have varied EV uptake capacity as well as varied EV uptake interest based on the demographics of their area.

EV users tend to arrive home and start charging their vehicle, regardless of whether they need a full charge in a few hours or by morning (Figure 10). This means there is a potential for a number of EVs to be charging simultaneously during periods of peak demand. However, EV charging also presents an enormous opportunity to level the demand for power from existing distribution assets by encouraging EV charging overnight when the overall demand is lower. Figure 11 shows how EV charging has the ability to shift demand profile.

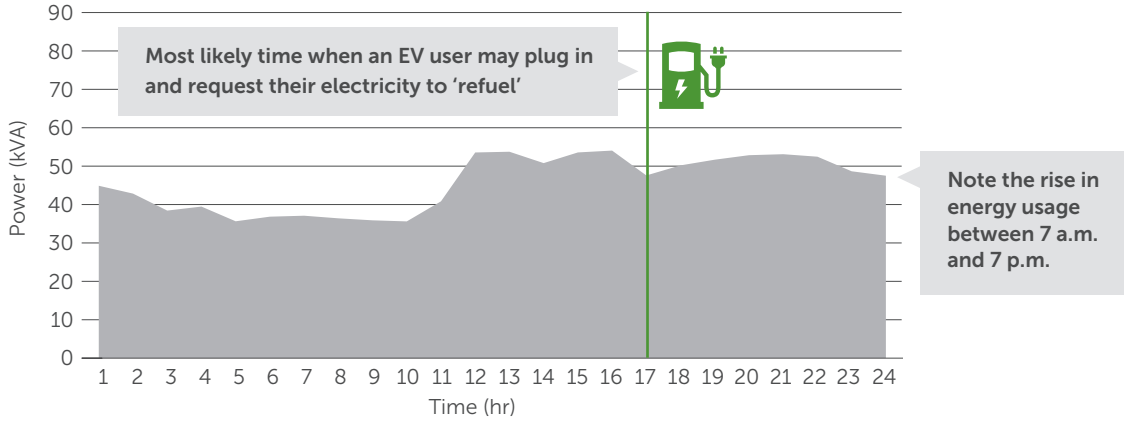


FIGURE 10
Energy Profile of a Transformer Within a Local Distribution Centre
(Source: Pollution Probe EMAP)

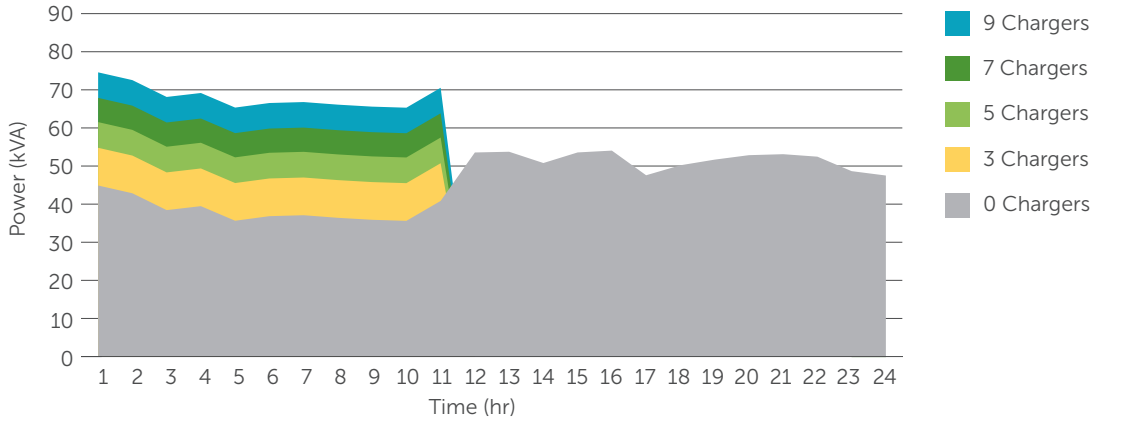


FIGURE 11
Electric Vehicle Charging Capacity to Shift Demand Profile
(Source: Pollution Probe EMAP)

This section focuses on the distribution capability within Canada and Ontario to supply residential charging, and does not focus on public infrastructure (See Section 3: Public Charging Infrastructure and Electric Vehicles).

CANADA'S ELECTRICITY DISTRIBUTION AND DEMAND

Canada has an array of electricity distribution systems and demand profiles. The distribution of electricity is managed by LDCs that are responsible for ensuring power is safely and reliably distributed to consumers. The local distribution system is designed to accommodate high impact but also low probability events, such as heat waves, cold snaps, equipment failures or planned work. LDCs can be publicly or privately owned and they collect a regulated fee for the delivery of electricity.

Demand also varies as Canada is a vast country that experiences four seasons and an array of electricity needs. In 2016, Canada furthered its commitment to EVs through the allotment of $46.1 million to The Energy Innovation Program (EIP) to support the demonstration of next-generation EV charging. The EIP supports innovation under the area of smart grid systems, meaning there is an opportunity for groups to obtain funding and help create solutions to potential future distribution challenges which include EVs. EIP should also consider funding innovation in other areas such as aging infrastructure, integration of intermittent and distribution of renewable generation.

As explained in Electricity Supply Mix and Electric Vehicles (page 13) a large portion of the electricity supply mix in Canada comes from clean, low carbon options such as hydroelectric and nuclear, creating an optimal scenario for EV technology adoption to reduce GHG emission from the transportation sector.

ONTARIO'S ELECTRICITY DISTRIBUTION AND DEMAND

Ontario has made great strides in understanding its electricity demand through a variety of avenues including the adoption of smart grid technology. Technologies such as sensors, monitoring, communications, automation and computers are used to improve the flexibility, reliability and efficiency of the electricity system. Smart grids place more information in the hands of consumers and utilities. Ontario has built its electricity system to ensure demand can be met at any time of day with clean energy sources, which means that overnight when demand decreases (Figure 10) there is a surplus of power. EV technology has the capability of leveling out demand (Figure 11), and making use of this clean low-carbon power for charging.

In Ontario, the majority of power available overnight comes from clean, low-carbon baseload sources such as nuclear, providing additional opportunities to maximize the emissions reductions potential of EV technology. As such, it is important to motivate owners to charge at times that are easier on the grid, lower life cycle emissions, as well as at lesser cost. Although EV penetration is still relatively low, it is critical that, as the number of EVs increase in Ontario, LDCs are able to proactively plan for and manage increased charging demand without increasing ratepayer costs. One potential option would be for LDCs to have the capability to control EV charging if granted permission by EV owner. This would mean that EV owners could plug in and their LDC could control when they receive their charge, allowing electricity to be provided when overall demand is lower. This capability has great potential but needs to be further researched and explored.

2. Electricity Distribution, Demand and Electric Vehicles

POLICY RECOMMENDATIONS

2.1 Further investigate options for Local Distribution Companies to have more control over EV charging times, allowing for greater EV uptake without infrastructure upgrades.

PROVINCIAL GOVERNMENT

Ontario has an excess of low-carbon power overnight which creates an optimal scenario to support EVs. If LDCs are able to have more control over charging times, they will be able to avoid premature infrastructure upgrades by shifting demand away from high-use times. They will also ensure charging occurs primarily at night when only low-carbon power options are running, obtaining optimal emissions reduction benefits from EVs. The Ontario government's suggested free nighttime electricity as outlined in Ontario's Climate Change Action Plan could be used to increase LDC involvement.

2.2 Investigate options for implementing programs that allow local distribution company customers to voluntarily share information about their intention to purchase an EV and the technology they choose to purchase (e.g., vehicle model and charging services).

With this information, LDCs can conduct predictive assessments of the infrastructure that will be affected and ensure that quality of service is maintained. The free overnight electricity initiative could be used to collect this information.

2.3 Promote and facilitate EV charging habits that reduce daily peaks in demand for power and that optimize use of the distribution system's existing assets.

In the absence of control to shift charging, ensuring EV owners are equipped with adequate information on the distribution system will be key to managing optimal charging. This will mean that prevailing design standards for neighbourhood-level infrastructure can be maintained while accommodating increased demand for EV charging.

2.4 Continue to support the Energy Innovation Program beyond 2017 and projects that allow for innovation in the area of electricity demand management.

FEDERAL GOVERNMENT

It is difficult to predict the rate of EV technology uptake across Canada, so additional support for innovation will allow for new solutions to be developed. Nationally grown solutions will allow Canada to be a global leader in EV technology as well as low-carbon transportation. Innovation also has the opportunity to grow our technology sector.

3. Public Charging Infrastructure and Electric Vehicles

Range anxiety is one of the number one hurdles for potential new EV adopters, even though studies show that 80 per cent of EV drivers charge at home and that 80 per cent of Canadians drive 50 km or less a day. There is a perception among non-EV drivers that the lack of available 'refueling' options in the public domain may leave them stranded. Therefore, enhanced public charging infrastructure availability plays a critical role in removing this psychological barrier and generating new EV drivers. Enhanced infrastructure may allow for more emissions reductions from existing EV owners as well, and PHEV drivers can also achieve more range powered by electricity. Thus, the EV is typically used for short distances, in urban and suburban locations, where infrastructure is more readily available. With enhanced infrastructure these existing owners will have the ability to use their EV for longer trips and realize further emissions reductions as they will be more apt to take their EV on longer trips as opposed to their gasoline-powered vehicle.

Canada has acknowledged the value in enhancing EV infrastructure; the following section discusses the initial successes and identifies opportunities that lie on the road ahead at the federal and provincial level with specific focus on Ontario. It is critical that infrastructure is well planned, sustainable for the long term, and realizes intended environmental benefits.

TYPES OF CHARGING

Before looking at the federal and provincial successes, it is important to understand that when we speak of public infrastructure in this section it relates to Level 2 and Level 3 chargers. Chargers vary by voltage, charging time, costs and permitting required.

LEVEL 1

TYPE
'Level 1' charging uses a standard electrical outlet, a 120 volt (V) alternating current (AC), and a standard 3-prong plug.

CHARGE TIME
8-30 hours to fully recharge a BEV.

INSTALLATION AND LABOUR COSTS
None.

PERMITTING
None.

CONSIDERATIONS
All EVs come standard with a cord set that plugs into a regular 120 V wall socket.

LEVEL 2

TYPE
'Level 2' (240 V AC) charging employs a permanently wired and fastened charging facility sited at a fixed location.

CHARGE TIME
4-10 hours to fully recharge a BEV, depending on battery size.

INSTALLATION AND LABOUR COSTS
These stations typically range from $1,000 to $5,000 but some of these costs can be recovered through the Government of Ontario's Electric Vehicle Charging Incentive Program.

CONSIDERATIONS
This is the most common charging station for home charging as well as public infrastructure and is easily installed in your garage, driveway, at storefronts and in parking lots.

LEVEL 3

TYPE
'Level 3' (480 V DC) are often called 'DC-Quick chargers' and use direct current (DC).

CHARGE TIME
25-30 minutes to charge BEV to 80%.

INSTALLATION AND LABOUR COSTS
$50,000-$100,000+.

CONSIDERATIONS
Well suited for highway driving applications based on the ability to recharge in a short time.

*For charging that is occurring at the household and may not require a quick charge or a significant amount of energy to 'top-up' the battery, **Level 1** and often **Level 2** chargers are used.*

*Charging that occurs outside of a residence and the stations that will make up public infrastructure are typically **Level 2** and **Level 3** based on the ability to top up a charge in a short period of time.*

CANADA'S ELECTRIC VEHICLE INFRASTRUCTURE

In the 2016 Federal Budget, the government committed significant financial support to the clean technology sector as part of its steps to ensuring Canada transitions to a low-carbon economy. As part of the budget it was recognized that decisions made now in the transportation sector will determine the mix of technologies on the road in 2030, and the related emissions levels. The budget committed $62.5 million over two years (2016-2017) to Natural Resources Canada to support deployment of infrastructure for alternative transportation fuels, including charging infrastructure for EVs. The government outlined its intent to work with provinces and territories as well as industry to achieve this goal. At this time, provinces and territories are moving forward with the implementation of transportation strategies for their jurisdictions; many are choosing some capacity of EV public infrastructure enhancements as part of their transportation plans, and are in various stages of development including British Columbia, Alberta, Québec and Ontario.

ONTARIO'S ELECTRIC VEHICLE INFRASTRUCTURE

Ontario has made great progress in enhancing EV infrastructure. In 2015, the Ontario government committed to the enhancement of EV infrastructure through the Electric Vehicle Chargers Ontario (EVCO) program. EVCO is allocating $20 million to expand new charging infrastructure across the province. In total, close to 500 charging stations will be installed across Ontario at over 250 locations, supporting efficiency, effectiveness and innovation. The initial infrastructure investment currently being funded by EVCO provides up to 100 per cent of cost coverage, for the next five years. It is necessary for a plan to be developed that looks at how the infrastructure will be sustained beyond the initial funding.

3. Public Charging Infrastructure and Electric Vehicles
POLICY RECOMMENDATIONS

3.1 Government should develop a plan to address the long-term sustainability of the EV public charging station network being built through Electric Vehicle Chargers Ontario (EVCO) program funding to ensure initial investment is maintained.

PROVINCIAL GOVERNMENT

A plan to sustain Ontario's EV infrastructure enhancements being delivered through EVCO funding needs to be given further clarity including development of a long-term cost recovery mechanism. Currently, guidelines from the Ontario Ministry of Transportation's recent EVCO funding states that fees charged should be associated with the convenience of utilizing the charger or parking spot and that capital and installation costs cannot be recovered through the fee.

3.2 Future EV infrastructure incentives should be reduced to partially government funded, to encourage partnerships with the private sector and sustained assets.

Partnerships will ensure the sustainment of assets and to free government from the continuous funding of infrastructure in order to ensure investments are not stranded in the future.

3.3 A joint task force comprised of all level of government, LDCs and industry should be formed to determine the correct fee structures for public charging infrastsructure.

This task force will allow for stakeholders to discuss the overall structures that exist, address ongoing issues and develop a standard that indicates appropriate charging fees. Currently, there are a variety of fee structures for public infrastructure capital cost recovery. The convening of a task force will allow stakeholders to collaboratively determine an appropriate fee structure.

3.4 Government should encourage and enable active participation of LDCs in the installation and management of public charging infrastructure, as governments move beyond their initial investment.

Ongoing efforts being funded provincially through EVCO will allow for the enhanced infrastructure required to begin enhanced adoption of EVs in the general public. Moving forward, as more mainstream uptake occurs, charging infrastructure could have an impact on electrical distribution assets. Involvement of LDCs would enhance the overall ease of EV uptake and lessen potential operational impacts, cost upgrades, and negative public perception.

3.5 Government funding that is provided for infrastructure enhancements should consider partial funding and partnerships with other stakeholders to enhance and improve effectiveness of the program.

FEDERAL GOVERNMENT

When allocating funds through Budget 2016 dedicated to the enhancement of charging infrastructure, partnership funding should be considered to ensure maintenance of infrastructure is not solely dependent on government.

4. Improving Government Co-ordination and Leveraging Existing Policy Efforts Related to Electric Vehicles

The successful deployment of EV technology depends on actions and decisions taken by a range of individuals and organizations and requires moving beyond traditional sectoral boundaries to develop supportive policies, regulations and bylaws. The nature of government ministries and departments with separate mandates, differing priorities and compartmentalized responsibilities, can make it challenging to take the systemic approach to supporting EVs that the technology requires. If not approached efficiently and proactively, co-ordination in the development of EV supportive policy can also cause delays at a critical point for the technology and may signal to the market that support does not exist. A new level of integration and co-ordination across a wide range of stakeholders, decision-makers and sectors including transportation, electricity, environment, infrastructure, natural resources and economic development, is required.

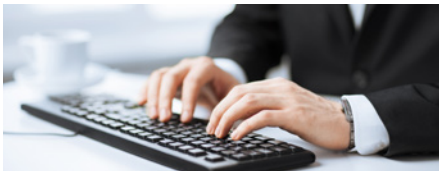
A well-co-ordinated approach to EV deployment across all levels of governments can help facilitate a timely, cost-effective and seamless transition to widespread EV use in Ontario. Capitalizing on opportunities to further support EVs within existing provincial and national regulatory frameworks and government programs can be an effective means of realizing important short-term gains, while a more comprehensive policy framework capable of addressing a broad range of national, regional and local barriers and opportunities is being developed.

GOVERNMENT CO-ORDINATION

The complexity of EV technology requires involvement from a number of government ministries to effectively facilitate deployment. The Ontario Ministry of Transportation (MTO), Ministry of Energy (MOE), Ministry of the Environment and Climate Change (MOECC) and Ministry of Economic Development Growth (MEDG), each play a key role in developing and implementing EV-related policies and programs. The number of ministries with EV-related responsibilities can create confusion among stakeholders. As such, leadership is needed to provide both stakeholders and the general public with clear guidance and information, to minimize the risk of unnecessary investments in infrastructure and technology, and to avoid competing standards that could limit market uptake.

Strong leadership around EV deployment should be complemented by voluntary collaboration among key stakeholders including utilities, automotive manufacturers, research institutions and civil society organizations, so that efforts are aligned and market needs are effectively addressed. A platform for communication and collaboration established across ministries would also reduce





the duplication of efforts, and help to coordinate the actions of relevant stakeholders. The Federal Ministry of Transport, Building and Urban Development in Germany established a similar platform, connecting key stakeholders in dialogue on advancing electric mobility, and successfully contributing to the growth of the country's EV market. Municipalities will also need to play a key role in leading and supporting the development of EV deployment strategies in their respective jurisdictions. A clear line of communication between the municipality and the province will be important for ensuring that a local perspective informs all EV-related policy development.

DATA AND INFORMATION SHARING

The alignment of policies and priorities and the sharing of information and best practices across jurisdictions can contribute to accelerating EV deployment. Ensuring that federal and provincial climate change mitigation and adaptation strategies related to EV technology are in alignment where appropriate, can also contribute to further supporting existing efforts to decarbonize transportation systems.

The development of a comprehensive EV strategy, as part of the Government of Canada's framework for Clean Growth and Climate Change, presents an important opportunity to develop a national vision for decarbonizing transportation, leveraging regional strengths and taking a holistic approach to implementing electric mobility strategies.

Collaboration between provinces and territories will also be important for successfully supporting the deployment of EV technology. For example, Québec and British Columbia both have strong policy frameworks with well-established financial incentive programs, public charging networks and non-financial incentives. Working closely with leading jurisdictions will allow Ontario to develop a strong policy framework based on best practices and lessons learned elsewhere. At the same time, the Government of Ontario could contribute to a strong national framework for EVs by sharing important knowledge and learnings with regions that currently lack proactive EV policy frameworks but are well-suited to EV deployment, such as Atlantic Canada and Manitoba.

LEVERAGING EXISTING REGULATORY FRAMEWORKS

Exploring opportunities to further support EVs within existing regulatory frameworks and government programs is another important means of achieving short-term goals related to EV deployment while more comprehensive policy frameworks are being developed. For example, the Government of Canada could consider incorporating more informative EV data into existing fuel consumption and environmental information within Natural Resource Canada's EnerGuide Label for Vehicles. The EnerGuide label currently provides consumers with model-specific information about fuel economy and consumption, CO_2 and smog emissions ratings and vehicle class range. Updating the EnerGuide

Label to incorporate more comprehensive information, including all vehicle-related GHG emissions (i.e., upstream and tailpipe emissions), would contribute to consumers making more informed purchasing decisions. In addition, providing information related to costs savings over a five-year timeframe would help consumers clearly understand the operational cost and fuel savings associated with EVs. While the upfront cost of the vehicle is typically greater for an EV when compared to their gasoline-powered counterparts, they provide significant maintenance and fuel savings over time.

Another potential option for supporting EVs within existing policy frameworks would be to investigate enhanced incentives for EVs under the Government of Canada's light-duty vehicle regulations. In order to incentivize the deployment of advanced technology vehicles, the amended Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations for model years 2017 to 2021, allows companies to multiply the total number of EVs, fuel cell vehicles, natural gas vehicles in fleets by a prescribed factor to meet emissions reductions standards. Increasing the volume multiplier used for EVs, would be an effective way to incent vehicle manufacturers.

Strengthening Canada's Green Levy by aligning it with more stringent thresholds found in other jurisdictions could also contribute to indirectly supporting EV adoption by discouraging the purchase of fuel-inefficient vehicles. In Canada, the Green Levy currently applies to vehicles that consume more than 13 litres of fuel per 100 kilometres while the U.S. Gas Guzzler tax applies to vehicles with a fuel efficiency rating of 10.5 litres per 100 kilometres. While the Canadian excise tax rate ranges from $1,000-$4,000, the U.S. tax range runs to a maximum of $7,700.

4. Improving Government Co-ordination and Leveraging Existing Policy Efforts Related to Electric Vehicles

POLICY RECOMMENDATIONS

4.1 Assign a lead ministry or agency within the provincial government with a mandate to implement Ontario's vision related to EV deployment. Provide a platform for communication and collaboration across different levels of government and among relevant stakeholders.

PROVINCIAL GOVERNMENT

A lead government body would have the ability to streamline and co-ordinate responses to potential issues as they arise and to delegate responsibilities to the appropriate ministry. The Government of Ontario could look to other jurisdictions whose successful leadership for EV deployment has contributed to accelerating EV use. For example, the United Kingdom recently established the Office for Low Emission Vehicles, a collaboration of three federal departments, in part to implement the government's EV related programming.

4.2 Continue data and information sharing across jurisdictions in order to strengthen regional EV deployment.

Data and information sharing across jurisdictions will contribute to establishing best practices and ensuring the alignment of supportive policy frameworks across the country. In addition, collaborative, national or provincial approaches will provide for effective inter-regional EV travel, an important consideration for many drivers. Provinces and territories could consider developing a regional memorandum of understanding, similar to that signed by eight U.S. states (i.e., California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont), to collectively participate in multi-state programming and collaboration related to zero emission vehicles.

4.3 Look for opportunities to further support EVs within existing regulatory frameworks and government programs

FEDERAL GOVERNMENT

Exploring opportunities to further support EVs within existing regulatory frameworks and government programs is an important means of achieving short-term goals related to EV deployment while more comprehensive policy frameworks are being developed. This could include consideration of incorporating more informative EV data into existing fuel consumption and environmental information within Natural Resource Canada's EnerGuide Label for Vehicles. Other options include investigating enhanced incentives for EVs under the Government of Canada's light-duty vehicle regulations and strengthening Canada's Green Levy by aligning it with more stringent thresholds found in other jurisdictions.

5. Electric Vehicle Retail Experience

Automotive dealerships play an important role in influencing purchasing decisions for EV customers. Dealership staff are the first point of contact for potential new EV adopters, which means they have the ability to influence the overall success of an EV strategy. Even if a customer does a great deal of online research beforehand, they still need to pass through an EV certified dealership in order to complete their purchase. A lack of available information and awareness of more sustainable options on the part of sales staff, coupled with a lack of product availability, are key barriers to the increased uptake of sustainable product options.

Various studies and consumer experiences support a need for focused improvement of the EV retail experience by addressing the following barriers:

- **Lack of availability of EVs at the dealership;**
- **Lack of EV-specific information and messaging; and,**
- **Minimal enthusiasm and information from salesperson.**

Improving the retail experience by addressing these barriers to deployment will provide an opportunity for many jurisdictions to boost sales of EVs and contribute to broader EV deployment strategies. There is limited information pertaining to individual provincial or territory EV retail experience strategies outside of Ontario. This section discusses the Canadian EV retail experience based on best available information with specific focus on Ontario.

CANADA'S EV RETAIL EXPERIENCE

Currently specific information for each province's or territory's retail experience is limited; it is expected that every jurisdiction in Canada will have slightly different strengths and challenges when it comes to enhancing their retail experience. However, common consumer experiences have been identified across the country. British Columbia, Ontario and Québec are currently leaders in the EV technology sector, with respect to policy and action and should be looked to by other provinces for lessons learned in their retail experience. Although each province and territory will have an individual transportation strategy, having a national understanding of the EV retail side would likely provide industry and government greater incentive to improve retail experience and decrease barriers listed above.



ONTARIO'S EV RETAIL EXPERIENCE

In Ontario, a potential EV adopter must go to a certified EV dealership to purchase a vehicle. Generally, automotive manufacturers require a dealership to become certified in order to sell and service their EV models. This certification involves salesperson training in EVs. It is important to note, however, that the average consumer would be unable to differentiate between a certified or non-certified dealership until they were at the dealership or called in advance. This poses a barrier to potential EV owners as they must first identify certified EV dealers if they wish to speak with a salesperson who has been trained to sell an EV.

In 2014, Plug'n Drive conducted a study to better understand the shopping experience for EVs for a typical consumer in Ontario to determine what aspects of the dealership sales model are conducive to or act as a barrier to purchasing an EV.

The study used 20 mystery shoppers who completed 95 shopping experiences at 24 EV-certified Ontario dealerships covering six major EV brands. Shoppers observed messaging, availability and placement of EVs, knowledge and confidence of salespeople, and the sales approach and attitude of salespeople towards EVs.

The study identified a number of opportunities to work with dealerships, including increasing the number of EVs available at certified dealerships, encouraging referral by sales staff to other dealerships with EVs in showroom, providing consistent and accurate information on government EV subsidies to salespersons, more detailed training in EV product knowledge and information on environmental benefits. Although barriers exist, overall dealerships were generally optimistic regarding the future growth of the EV sector, which indicates willingness from their end to collaborate and improve the overall EV retail experience.

STUDY:
Plug'n Drive's Secret Shopper Dealership Survey

5. Electric Vehicle Retail Experience

POLICY RECOMMENDATIONS

PROVINCIAL GOVERNMENT

5.1 Automotive manufacturers, dealerships, governments and non-governmental organizations should work together to explore options for increasing EV inventory at dealerships, and consider committing to a percentage of dealerships that will have cars at any time.

The 2014 study by Plug'n Drive identified lack of EV availability in showrooms. It is a normal process during a vehicle purchase to do a test drive to help in your decision making process. If EVs are not available to test drive, it has the potential to discourage a new EV customer. It is imperative that there is ease in the EV retail process to enhance purchase and avoid negative affiliation of technology. Although EVs currently do not make up a large percentage of vehicle sales, it will be important to give them greater attention given government commitments.

5.2 Under Ontario's Climate Change Action Plan, the province has committed $10 to 20 million to provide dealerships with support to increase engagement through sales training and awareness. The government should work together with automotive manufacturers, non-governmental organizations and other stakeholders through this program to enhance existing training program for salespersons working at EV certified dealerships.

Given that EV technology is still relatively new, when looking to purchase a vehicle potential owners will have a number of questions, requiring knowledgeable salespersons. Currently, Plug'n Drive has dealer training and is in the process of developing webinars. Working with them to build upon these existing efforts would provide continued support for dealerships to increase sales through improved general EV knowledge. Working together with other stakeholders will ensure a collaborative effort to find appropriate and effective solutions to the current challenges facing EV certified dealerships.

5.3 Government, automotive manufacturers and dealerships should consider further adoption of enhanced financial incentives and recognition for salespersons in an effort to increase EV sales.

Relatively substantial EV incentive programs exist for customers however, focus on increased recognition of salespersons as well as other potential incentives may contribute to an increase in EV sales. Plug'n Drive has established an EV dealership Award Program, that is moving into its third year. There is opportunity to work with this organization to further enhance awareness and grow this recognition program.

5.4 Government should enhance ability to provide potential EV adopters to have EV suitability assessments done on current driving profiles to aid in decision-making process of what EV is best for them.

Selection of the right EV is often difficult for a personal user or a fleet operator as data to support decision-making is not readily available. Real-world data from an owner's current vehicle driving profile through chip technology can be used to generate EV suitability assessment reports. These reports give the user a profile of their car's driving behaviour and can encourage the adoption of EVs by outlining the specific financial (payback period) and environmental benefits.

5.5 Government should consider support for a national study that evaluates the EV experience across Canada and identifies opportunities and barriers to EV deployment.

FEDERAL GOVERNMENT

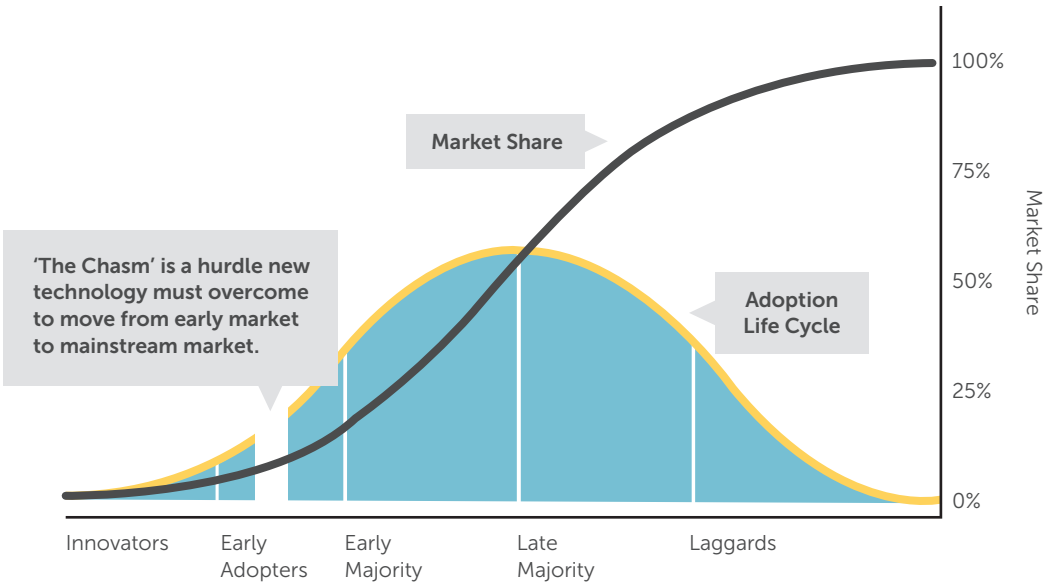
Currently, there is minimal knowledge across provinces and territories (aside from Ontario) that give a detailed understanding of the EV retail experience. A uniform study could show that barriers within Ontario are not provincially specific, but rather, they are indicative of the need to address similar challenges nationwide. This study would also highlight opportunities for provinces that have not yet developed a comprehensive EV strategy, to learn from the successes of others, resulting in a faster development of a positive retail experience.

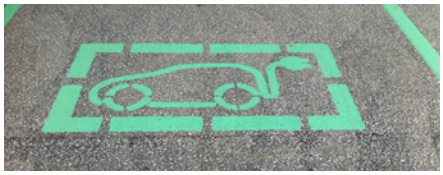
6. Public Awareness on Electric Vehicles

Increasing public awareness around EVs is another key element for the successful adoption of the technology. However, to understand the level of effort and type of awareness necessary it is important to understand that there are a variety of types of EV consumers (Figure 12) and each type has different motivation factors. At a very basic level, EV consumers can be divided into an early adopter group and the broader, mainstream or majority. In simple terms, what motivates an early adopter is different than what motivates the broader market. Market research conducted as part of Pollution Probe's EMAP initiative sought to better understand the behavioural and attitudinal characteristics and needs of the EV early adopter market, and found that if these early users of the technology are unable to experience and appreciate its full value, a broader market will not emerge. Early users will play a key role in expanding and developing the EV market and, for this reason, it is important to better understand exactly how to address their needs and incorporate the technology into their lives.

The factor that makes or breaks a new technology is its ability to move into the mainstream/majority market. This process is often coined 'crossing the chasm' (Figure 12). Addressing the mainstream market is key to an effective EV strategy, as this market contains the majority of the driving population, and therefore the largest portion of GHG contributions. The widespread uptake of EVs is dependent on a meaningful shift in social and technical understanding, and a sound public awareness strategy will be a key component to achieving this objective.

FIGURE 12
Various Types of Consumers in the EV Market
(Source: Pollution Probe EMAP)




In addition to the findings from Pollution Probe's EMAP research, Simon Fraser University's Plug-in Electric Vehicle Study, and a study from World Wildlife Fund and Plug'n Drive on EV Status in Canada, all had common elements for consideration during the development of a public awareness effort. These include the need for:

- Explanation of charging infrastructure as 92 per cent of Canadians believe there are very few places to charge EVs outside of the home
- Explanation of home charging, as this type of charging has a strong correlation with interest in EVs, and only 14 per cent of Canadians realize this is an option
- Focus on incentive programs, as one of the major drawbacks is initial purchase price, but rebate programs have been proven to have a major influence on point of sale
- A focus on PHEV Technology, as mainstream consumers tend to be confused about this EV option
- Extensive focus on EV features such as driving flexibility, fuel savings, and pollution reduction, as these tend to be motivation factors for purchase
- Clear information on the supply mix and range of environmental benefits, as one-third of Canadians think that the upstream emissions from electricity generation makes EVs no cleaner than a conventional vehicle
- Extensive focus on range, reliability and look of vehicles, as these factors have been identified as deterrent for new consumers, especially when discussing the option of BEVs

92%

of Canadians believe there are very few places to charge EVs outside the home.

86%

of Canadians don't realize charging an EV at home is an option.

Raising public awareness around EVs can help address misconceptions about the technology.

The following section discusses efforts that have been made in Canada and Ontario with respect to public awareness and moving EV technology from the early adopter to the broader mainstream market. It also identifies further opportunities to ensure maximum market uptake, and achieve related GHG emission reductions through an understanding of the needs of each consumer group.

CANADA'S PUBLIC AWARENESS EFFORTS

There are a variety of public awareness efforts underway across the country. The Federal Budget 2016 outlined support for some public awareness efforts through the commitment of $62.5 million over two years 2016-2017, to Natural Resources Canada. This funding is to support deployment of infrastructure for alternative transportation fuels, including electric vehicle charging stations. From a public awareness standpoint this will allow for increased visibility and awareness. The funding is also used to support technology demonstration projects that advance EV technology. Both infrastructure and technology demonstrations are important elements needed to enhance public awareness.

The federal government has offices and staff across the country, as well as a fleet of vehicles affiliated with operation. Discussion has taken place to add EVs to the fleet and they are evaluating which vehicles to switch to based on usage profiles of current vehicles. There is a large-scale public awareness opportunity from a technology visibility stand point if fleet conversion were to take place.

ONTARIO'S PUBLIC AWARENESS EFFORTS

Ontario should be commended for its leadership in EV public awareness efforts. Government, industry, utilities and non-governmental organizations continually create opportunities to enhance EV uptake in the mainstream market. The release of the Ontario Climate Change Action Plan indicates that the province will work with Plug'n Drive to establish and operate a facility to showcase EVs and related technology to Ontarians. This showcase will be a hub for EV information. The plan also indicates that it will continue to collaborate with local partners and jurisdictions such as California and Québec on education campaigns to promote awareness of the benefits of EVs with a focus on first-time car buyers and multi-car households. The government also indicated that it will keep its Green Licence Plate Program until at least 25 per cent of passenger vehicles have green plates, furthering awareness via visibility. The province has also committed to greening their fleet through EV adoption where possible and developing an awareness campaign for private fleets.

6. Public Awareness on Electric Vehicles

POLICY RECOMMENDATIONS

6.1 Government should ensure fulfillment of its commitment to create an EV Showcase and support for other public awareness strategies as outlined in the 2016 Ontario Climate Change Action Plan.

PROVINCIAL GOVERNMENT

The EV Showcase will provide a hub for information and will have the ability to easily communicate the benefits of EV technology to potential EV owners. This showcase will be one key element in ensuring Ontario achieves its climate change goals, through realized GHG emission reductions in the transportation sector. Additional public awareness campaigns and programs that contribute to increasing the visibility of EVs, such as the Green Licence Plate Program and greening of the government's fleet, will remain important to successful deployment of EVs in Ontario.

6.2 Government, industry, utilities and non-governmental organizations should play a role in enhancing public EV awareness, and work together where possible to create clear, concise and consistent educational resources.

The provision of relevant, reliable and easily accessible information is crucial to successful uptake of EVs and the corresponding emissions reduction potential and will require that all relevant stakeholders play a role in educating the public. In addition, educational resources should take into consideration the fact that the EV market is made up a variety of consumers. Strategies for engaging the early adopter community and the general public should acknowledge the potential differences between the demographic and psychographic profile and needs of each group.

6.3 Government should formally commit to and deliver on converting a portion of their operational fleet to EVs to demonstrate viability of EVs to Canadians.

FEDERAL GOVERNMENT

The federal government has offices across the country and a fleet of vehicles, which means government, has an operational GHG contribution. It also means that government has a win-win opportunity in the area of public awareness – fleet conversation would decrease operational GHG emissions in the transportation sector and increase visibility of EV technology among consumers. Fleet conversion would increase the number of EVs on Canadian roadways, and facilitate consumer driving experiences through employee vehicle use.

6.4 Government should create EV Showcases in all major cities across the country, with the help of Ontario.

The EV Showcase concept being created in Ontario could be adopted across the country in all major cities. Those involved in the Ontario showcase could be consulted to aid in the development.

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