

An Electric Vehicle Roadmap for New Brunswick

A Discussion Document for Public and Stakeholder Engagement



Report on the Findings of the New
Brunswick Electric Vehicle Advisory Group
2016ⁱ

ⁱData used in this roadmap is based on 2015 data.

Electric Vehicle Advisory Group

About the Electric Vehicle Advisory Group and this Roadmap

In 2014, as part of implementing the [NB Climate Change Action Plan](#) 2014-2020, the Department of Environment and Local Government partnered with NB Power to engage a group of experts and stakeholders to examine options and opportunities for advancing electric vehicles in New Brunswick. Under the guidance of this group, known as the Electric Vehicle Advisory Group (EVAG), salient issues were examined and favourable options were explored. This is a report of their findings in the form of a potential EV “Roadmap” for New Brunswick.

The Electric Vehicle Advisory Group is made up of members from NB Power, the New Brunswick Lung Association, the City of Fredericton, the City of Saint John, the City of Moncton, the City of Bathurst, Lounsbury Limited, Siemens Canada Limited, the Department of Environment and Local Government, the Department of Transportation and Infrastructure, and the Department of Energy and Mines.

The contents, conclusions and recommendations are the perspective of the EVAG and are not necessarily endorsed by participating organizations or the Government of New Brunswick. This report is meant to inform future discussions on the advancement of electric vehicles in the province of New Brunswick.

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Glossary of Terms and Abbreviations

Electric Vehicle (EV)

For the purposes of this paper, Electric Vehicles (EVs) will refer to any light-duty passenger vehicle which is at least somewhat powered by an electric motor and *must* be plugged into an electrical supply.

Battery Electric Vehicle (BEV)

Battery Electric Vehicles (BEVs) refer to EVs which are powered *solely* by an electric motor, i.e. they do not contain any internal combustion engine system. BEVs must be plugged into an electrical supply.

Plug-in Electric Vehicle (PHEV)

Plug-in Electric Vehicles (PHEVs) refer to EVs which are powered by and contain *both* an electric motor and an internal combustion engine. PHEVs must be plugged into an electrical supply.

Hybrid Electric Vehicle (HEV)

Hybrid Electric Vehicles (HEVs) will not be considered EVs in this paper as they are not plugged into an electrical supply. HEVs refer to vehicles which contain both an electric motor and an internal combustion engine, however, the electric motors in HEVs are not plugged into an electrical supply, rather, they are charged by the vehicle's kinetic energy which only slightly improves fuel economy compared to BEVs and PHEVs.

Smart Grid Technology

Smart Grid Technology refers to an electrical grid which gathers and acts on information – such as information about the behaviours of suppliers and consumers – in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

Range Anxiety

Range Anxiety refers to the worry of a person driving an EV that the battery charge will run out before they reach their destination or a suitable charging point. Range anxiety is often cited as the most important reason why consumers are reluctant to buy electric cars.

Internal Combustion Engine (ICE)

Internal Combustion Engines (ICEs) refer to engines that generate motive power through the combustion of gasoline, oil, or other combustible fuel.

Greenhouse Gases (GHG)

Greenhouse Gases (GHGs) refer to gases which enter the atmosphere, absorb thermal radiation, trap heat in the atmosphere, and ultimately contribute to the greenhouse effect or global warming. One of the primary GHGs is carbon dioxide (CO₂).

Fossil Fuels

Fossil Fuels refer to fuels formed by natural processes over millions of years. These typically contain high concentrations of carbon, which is then released as CO₂ when burned.

NEG-ECP

The 11 member jurisdictions of NEG/ECP are: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, and Québec. Since 1973, the six New England states and the five Eastern Canadian provinces have worked cooperatively to address their shared interests across the border. Among the topics recently addressed by the NEG-ECP are transportation and air quality; and climate change action plans and greenhouse gas emission reduction strategies.

Reduce and Shift Demand (RASD)

Reduce and Shift Demand (RASD) is an electric vehicle program developed by NB Power as part of their Smart Grid program which is geared towards encouraging the public to reduce electricity consumption and shift their electricity consumption to times of day when there is less overall demand.

Climate Change Action Plan (CCAP)

The *New Brunswick Climate Change Action Plan 2014-2020* establishes 2020 and 2050 provincial GHG emissions reduction targets of 10 per cent below 1990 levels by 2020 and 75 to 85 per cent below 2001 levels by 2050. The actions put forward in this plan will help New Brunswick become a province that is prepared for and resilient to the impacts of climate change and has reduced its greenhouse gas emissions while sustaining economic growth.

Term

Measures have been classified as immediate, short term, medium term, and ongoing to help guide their implementation. Immediate will be defined as relatively easily addressed measures which will be implemented within the next year with minimal budgetary implications. Short term will be defined as needing slightly more time to prepare for, and execute (1-3 years) with minimal to modest budgetary implications. Medium term will be defined as measures which do not need immediate attention and/or may take more time to prepare for, and implement. Medium term measures typically will not have large budgetary impacts, but they will typically involve creating new or amending old policies. Ongoing are measures which will be implemented throughout the next 5 years but will not require continuous or excessive effort to achieve.

1. Executive Summary

One of the main pillars of addressing climate change in New Brunswick is mitigation of greenhouse gas emissions. With the advent of electric vehicle technology, the New Brunswick Electric Vehicle Advisory Group has guided the development of a potential strategy in order to take advantage of a pragmatic market solution which will help New Brunswick reduce GHG emissions, improve air quality, and support NB Power's future smart grid applications. This report outlines how New Brunswick is well-positioned to begin taking action towards the mainstream adoption of electric vehicles. The report, comprised of four key action areas, clearly states what initial actions could be taken by utilities, municipal and provincial government, enterprise partners and other motivated stakeholders in order to make meaningful progress in the deployment of electric vehicles and related infrastructure.

The first key action area is Increasing Public Adoption of Electric Vehicles. This action area focuses on increasing electric vehicle purchases by the public. Three priority actions and respective measures have been identified for potential implementation over the next 5 years as listed below:

Increasing Public Adoption of Electric Vehicles		
Priority Action	Measure	Term
Establish An Electric Vehicle Baseline In New Brunswick	Determine current electric vehicle owner profile through various means such as social media, an electric vehicle owners club, registration data, surveys, or by adopting surrogate survey data.	Immediate 0-1 year
	Develop an efficient and effective means of capturing electric vehicle registrations in New Brunswick by working with the Department of Public Safety.	Immediate 0-1 year
	Develop a method of capturing all electric vehicle purchases in New Brunswick by working with auto dealerships.	Immediate 0-1 year
Work In Partnership With New Brunswick Auto Dealers	Educate dealers on the benefits of electric vehicles. Consider holding a dealership conference with an aim to educate and empower auto dealers.	Immediate 0-1 year
	Encourage an adequate supply of electric vehicles in New Brunswick by working with dealerships and manufacturers.	Short Term 1-3 years
	Recognize and award auto dealers/dealerships who get electric vehicles on the road.	Ongoing
Reduce Price Differentials Between Electric Vehicles And Conventional Vehicles	Determine best financial incentive options for NB and consider other enabling policies. Examine fiscal incentives, namely a limited term point-of-sale financial incentive.	Short Term 1-3 years

The second key action area is Increasing Fleet Adoption of Electric Vehicles. This action area focuses on increasing electric vehicle sales for fleets. Three priority actions and respective measures have been identified for potential implementation over the next 5 years as listed below:

Increasing Fleet Adoption of Electric Vehicles		
Priority Action	Measure	Term
Determine An Electric Vehicle Fleet Baseline	Obtain up-to-date fleet information for all provincial, municipal and private fleets, and determine a method of continually reporting this information such as through motor vehicle registration data.	Short Term 1-3 years
Analyze Fleets' Electric Potential	Identify fleet owners/managers, establish relationships, and encourage and facilitate the use of FleetCarma ¹ by fleet owners to assess their maximum electric capacity.	Short Term 1-3 years
Incorporate More Electric Vehicles In Private, Provincial And Municipal Fleets	Determine best financial incentive options for fleets purchasing electric vehicles in NB and consider other enabling policies/incentives.	Short Term 1-3 years
	Consider a standard for government agency fleets to procure a specified proportion or quantity of electric vehicles in a set time period.	Short Term 1-3 years

The third key action area is Addressing Marketing & Outreach Needs. This action area focuses on promoting and educating New Brunswickers on the benefits of electric vehicles. Two priority actions and respective measures have been identified for potential implementation over the next 5 years as listed below:

Addressing Marketing & Outreach Needs		
Priority Action	Measure	Term
Enhance Awareness And Knowledge Relating To Electric Vehicles And Increase Consumer Demand	Create a New Brunswick electric vehicle program brand, webpage (information hub), marketing campaign, and utilize social media to create awareness and improve knowledge surrounding electric vehicles.	Short Term 1-3 years
	Identify opportunities to participate in, or hold, electric vehicle advocacy events which may include demonstrations, presentations, and/or test-drives, etc.	Ongoing
	Identify and recruit electric vehicle owners to create and champion an electric vehicle owner's association for New Brunswick.	Short Term 1-3 years
	Assess the possibility of partnering with academia to conduct electric vehicle-related studies and analyses.	Medium Term 3-5 years
Facilitate Skills And Knowledge Upgrading Relating	Assess opportunities to train electricians and repairmen in electric vehicle technologies and encourage electric vehicle curricula in community college/trade schools.	Short Term 1-3 years

¹ Fleetcarma is an organization that analyses fleets and determines whether electric vehicles would be financially beneficial to the business. For more information visit: <http://www.fleetcarma.com/>.

To Electric Vehicle Technologies	Ensure that first responder safety training for fire, paramedic and police personnel incorporates up-to-date curricula and training specifically in relation to electric vehicle and electric vehicle supply equipment (EVSE).	Medium Term 3-5 years
	Promote participation by universities and colleges in electric vehicle-related technology development and EVSE technology development.	Medium Term 3-5 years

The fourth key action area is Addressing Charging Infrastructure Needs which focuses on increasing the amount of charging infrastructure so that electric vehicles are adequately supported in New Brunswick. Four priority actions and respective measures have been identified for potential implementation over the next 5 years as listed below:

Addressing Charging Infrastructure Needs		
Priority Action	Measure	Term
Increase Home Charging Infrastructure And Promote Home Charging As A Principal Means Of Fueling electric vehicles	Promote home charging by providing information to New Brunswickers about how to choose, purchase, and install home chargers.	Short Term 1-3 years
	Ensure electrical code compliant installation of home charging infrastructure.	Short Term 1-3 years
	Assess the adoption of building codes that would require new multi-unit family homes to include chargers or be capable of supporting future charger installations.	Medium Term 3-5 years
	Require all electric vehicle owners to inform utilities of their charging location and monitor those zones for effective load management by utilities.	Short Term 1-3 years
Encourage Night-Time Charging To Keep GHG Emissions Minimized	Assess whether a “time-of-use rate” to incent night-time (non-peak) charging, is necessary.	Medium Term 3-5 years
	Assess the need to increase the Renewable Portfolio Standard to ensure that, as the number of electric vehicles grows, the increasing amount of electricity used to fuel the vehicles is non-emitting.	Medium Term 3-5 years
Increase Workplace Charging Infrastructure	Engage with and encourage workplaces to consider investments in charging infrastructure and provide information about best practices.	Medium Term 3-5 years
	Identify, assess and implement workplace charging for government buildings.	Short Term 1-3 years
Increase Public Charging Infrastructure And Create Electric Vehicle Charging Corridors	Identify charging infrastructure gaps and priority areas with focus on the creation of charging corridors.	Medium Term 3-5 years
	Assess the adoption of municipal by-laws that would require new commercial construction to include chargers or be capable of supporting future charger installations.	Medium Term 3-5 years
	Assess and implement policy and other incentive options which would increase charging infrastructure deployment.	Medium Term 3-5 years

This proposed approach would be implemented under the continued oversight of the EVAG. Other provinces that have been successful in deploying electric vehicles over short periods of

time, have also done so through collaborative partnerships between provincial government, utilities, non-profits, municipalities, and auto dealerships.

2. Introduction

The New Brunswick Electric Vehicle Advisory Group (EVAG) has steered the development of this report on a potential Electric Vehicle Roadmap for New Brunswick, to provide future direction and guidance for New Brunswick electric vehicle stakeholders in the pursuit of advancing electrified transportation in the province. This report identifies four key action areas with respective priority actions that both encourage and accommodate electric vehicle use in New Brunswick.

By investing in and encouraging early adoption of this technology, New Brunswick would be positioning itself for future success on many fronts. Benefits of adopting electric vehicles include, but are not limited to; optimizing smart grid investments and future energy sustainability; improving air quality; lowering fuel costs; and reducing our dependency on fossil fuels and their resultant GHG emissions.

Electric vehicles are critical to reducing greenhouse gas (GHG) emissions. New Brunswick has the third highest per capita GHG emissions in Canada, which is also above the national average.² New Brunswick's transportation sector is responsible for approximately 30 per cent of these emissions.³ Replacing a conventional vehicle with an electric vehicle in New Brunswick can reduce vehicle-related GHGs by up to 75% while also reducing air pollutants such as NO₂, SO₂, particulate matter and VOCs.⁴ These reductions in air pollutants are measurable and are necessary to improve respiratory health. Electric vehicles will also play an important role in the future of sustainable electricity and could serve as a vital component of NB Powers' Reduce and Shift Demand (RASD) Smart Grid program, as well as other utilities' load management.

Electric vehicle technology is currently New Brunswick's best option for reducing NB's transportation-related GHG emissions. The benefits – for both the climate and New Brunswickers – are clear. A strategy is needed to promote and educate the public on these benefits as well as develop policies and incentives which will help the transition from vehicles with internal combustion engines (ICEs) to electric vehicles.

This Roadmap is divided into two parts. The first, 'The Context', gives background information on electric vehicles and other relevant topics. The second, 'The Strategic Framework', outlines and rationalizes the specific actions and measures the EVAG has identified to meet the objectives.

² Government of Canada, 2014. *Canada's Emission Trends 2014*. Retrieved from: <http://ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1&offset=5&toc=show#toc56>.

³ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

⁴ US Department of Transportation, 2010. *Transportation's Role in Reducing U.S. Greenhouse Gas Emissions: Volume 1*. Washington, DC, USA. Retrieved from: http://ntl.bts.gov/lib/32000/32700/32779/DOT_Climate_Change_Report_-_April_2010_-_Volume_1_and_2.pdf.

The Context

3. Background

Greenhouse gas (GHG) emissions have been drastically increasing as a result of human activities. The burning of fossil fuels releases GHGs including carbon dioxide, methane, and nitrous oxides. These GHGs are accumulating beyond reasonable levels, creating a powerful “blanket” of heat-trapping gases in our atmosphere. This in turn affects the global climate resulting in melting glaciers, rising sea levels, more extreme temperatures, and increased the likelihood of more intense storms.⁵ Reducing GHG emissions in response to climate change across Canada is currently a major challenge. In Canada approximately 24% of total GHG emissions come from cars. Currently, there are 21.8 million cars, utilizing 40 billion litres of gasoline per year, and emitting 94 million tonnes of carbon dioxide annually.⁶ New Brunswick has the third highest per capita GHG emissions in Canada, with thirty per cent of those emissions being attributable to the transportation sector.^{7,8} The Canadian Medical Association estimated that the impact of air pollution on the health of New Brunswickers in 2015 would be (in number of people): Acute Premature Deaths – 65; Hospital Admissions – 371; Emergency Room Visits – 5,031; Doctor’s Office Visits – 27,107; and Minor Illnesses – 377,424. Total estimated cost of air pollution in NB in 2015 (lost productivity, health care costs, quality of life reduction, loss of life) is approximately \$185,878,000.⁹ To address these issues, New Brunswick has committed to reducing emissions from transportation in its *New Brunswick Climate Change Action Plan 2014-2020*.

Encouraging and facilitating the adoption of electric vehicles in the province is extremely important for many reasons. It is strongly linked to the province’s commitment to reduce greenhouse gas (GHG) emissions in the *New Brunswick Climate Change Action Plan 2014-2020* by “working with industry and other stakeholders to support low emission vehicles, low-carbon and alternative fuels and enhanced transportation system efficiencies”.¹⁰ It directly supports NEG-ECP’s electric vehicle adoption target established after NEG-ECP’s Resolutions 37-2 and 38-2, which specifically address alternative fuel vehicle adoption. It also plays a vital role in the future of NB Power’s Reduce and Shift Demand (RASD) Smart Grid Program as they will contribute to grid benefits and efficiencies (e.g. increased renewables).

The market for alternative fuel vehicles, particularly electric vehicles, is growing rapidly across Canada. These vehicles offer the environmental benefits of producing lower GHG emissions

⁵ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

⁶ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

⁷ Government of Canada, 2014. *Canada’s Emission Trends 2014*. Retrieved from: <http://ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1&offset=5&toc=show#toc56>.

⁸ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

⁹ Canadian Medical Association (CMA), 2008. *No Breathing Room: National Illness Costs of Air Pollution*. Canadian Medical Association, Ontario, Canada.

¹⁰ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

and air pollution as well as economic benefits such as lower fuel costs and independence from fluctuating gasoline prices. Given that the majority of the province's electricity comes from low emission or non-emitting sources (75 per cent non-emitting or renewable sources by 2020¹¹), the environmental benefits of switching to electricity-fuelled vehicles in New Brunswick are significant.¹² In light of the growing and anticipated need for electric vehicles in the province, the New Brunswick Electric Vehicle Advisory Group (EVAG) was formed in early 2015 to ensure that New Brunswick, with most of its electricity generated from non-emitting energy, makes meaningful steps forward in adopting this electric vehicle technology.

New Brunswick Climate Change Action Plan 2014-2020 Target

A variety of initiatives taken in New Brunswick saw GHG emission levels decline by 17 per cent between 2005 and 2010 (while the economy simultaneously grew by 19 per cent). Further reductions must include efficiencies in the transportation sector; where currently about 30% of New Brunswick's GHG emissions are attributable to gasoline, diesel, and other fossil fuel combustion.¹³

The *New Brunswick's Climate Change Action Plan 2014-2020* includes a goal of reducing GHG emissions to **10% below 1990 levels by the year 2020**. In support of this goal, New Brunswick is committed to working with key stakeholders to promote low-emissions vehicles through the development of strategic partnerships. Pursuing low-emissions vehicle adoption has the potential to significantly reduce GHG emissions from the transportation sector, and in turn, NB's overall GHG emissions.¹⁴

NEG-ECP Target

The New England Governors and Eastern Canadian Premiers committed their states and provinces in 2013 to reducing harmful air pollutants, including GHGs, and to exploring emerging transportation technologies such as vehicle electrification. The states and provinces further recognize that reduction of transportation-related emissions requires actions to enhance vehicle technologies and efficiencies and provide lower-emitting vehicle fuels. Two resolutions were adopted which support alternative fuel vehicles: Resolution 38-2 (Sustainable Transportation Systems and Use of Alternative Fuel Vehicles: Continuing Commitment to Regional Initiatives)¹⁵ and Resolution 37-2 (Resolution Concerning Regional Initiatives to Encourage Greater Use of Alternative Fuel Vehicles).¹⁶ More specifically, it was resolved, in Resolution 38-2, that the region would work toward achieving, , a **five per cent fleet market share penetration of**

¹¹ Government of New Brunswick (GNB), 2016. *Renewable Portfolio Standard*. Retrieved from:

http://www2.gnb.ca/content/gnb/en/departments/energy/energy_blueprint/content/renewable_portfolio.html

¹² Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

¹³ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

¹⁴ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

¹⁵ New England Governors and Eastern Canadian Premiers (NEG-ECP), 2014. *Resolution 38-2: Sustainable Transportation Systems and Use of Alternative Fuel Vehicles: Continuing Commitment to Regional Initiatives*. NEG-ECP, New Hampshire, USA: <http://www.cap-cpma.ca/images/Newsroom/Photo%20Gallery/NEG/Res38-2Transportation-AFV.pdf>

¹⁶ New England Governors and Eastern Canadian Premiers (NEG-ECP), 2013. *Resolution 37-2: Resolution Concerning Regional Initiatives to Encourage Greater Use of Alternative Fuel Vehicles*. NEG-ECP, Québec, Canada: <http://www.cap-cpma.ca/images/ECP%20Documents/NEG-ECP%20Resolution%2037-2%20Alternative%20Fuel%20EN.pdf>

alternative fuel vehicles by 2020 and facilitating the availability of refueling stations to support those vehicles will continue.¹⁷

“Actions by governments in the NEG-ECP region can increase the rate of adoption of these cleaner, more efficient vehicles and thus achieve maximum benefits.” –Transportation and Air Quality Action Plan¹⁸

NB Power Smart Grid

Electric vehicles have become an integral part of NB Power’s Smart Grid future, by not only providing opportunities for new off-peak electrical loads, but by also serving as an entirely new resource: mobile energy storage. Electric vehicles will serve as a mobile energy storage by storing energy acquired during periods of high electricity generation from renewable sources (during low demand periods), and feeding electricity back onto the grid in times of high demand or emergencies, thanks to enabling Smart Grid technology.¹⁹

NB Power and Siemens Canada Limited are evolving a 10-year grid modernization plan in which electric vehicles play an important role in the future of sustainable electricity. NB Power has also initiated an electric vehicle program as part of their Reduce and Shift Demand (RASD) Smart Grid program which is geared towards enabling New Brunswickers to have more control over their electricity consumption through new programs, technologies, and behaviours (i.e. the ‘smart habits’ campaign).²⁰

Industrial and commercial load growth is diminishing and upgrading or replacing aging generating facilities could potentially cost billions of dollars; increased development of renewable energy sources will require grid integration and storage technologies; and voltage fluctuations on the grid must be maintained at a minimum. The concept of electric vehicle charging is therefore happening at an attractive time. Utilities across Canada are promoting the use of electric vehicles. An electric vehicle is not considered to be “just a car”; rather, it can become a technology, a mobile energy resource, and part of the Virtual Power Plant that enhances grid capacity by providing flexible load for balancing energy storage.²¹

The New Brunswick Electric Vehicle Advisory Group

In 2014, in keeping with the commitments pursuant to the *New Brunswick Climate Change Action Plan 2014 – 2020*, the New Brunswick Electric Vehicle Advisory Group (EVAG) was established to encourage the adoption of electric vehicles in New Brunswick. The EVAG is comprised of twelve senior level officials from NB Power, NB Lung Association, provincial government, municipal government, Siemens Canada Limited, and an automotive dealership.

¹⁷ New England Governors and Eastern Canadian Premiers (NEG-ECP), 2014. *Resolution 38-2: Sustainable Transportation Systems and Use of Alternative Fuel Vehicles: Continuing Commitment to Regional Initiatives*. NEG-ECP, New Hampshire, USA: <http://www.cap-cpma.ca/images/Newsroom/Photo%20Gallery/NEG/Res38-2Transportation-AFV.pdf>

¹⁸ New England Governors and Eastern Canadian Premiers (NEG-ECP), 2013. *The Transportation and Air Quality Action Plan 2013-2020*. NEG-ECP, Québec, Canada.

¹⁹ NB Power, 2014. *Electric Vehicle Program: Mission, Vision and Guiding Principles Internal Discussion Document*. NB Power, New Brunswick, Canada.

²⁰ NB Power, 2014. *Electric Vehicle Program: Mission, Vision and Guiding Principles Internal Discussion Document*. NB Power, New Brunswick, Canada.

²¹ NB Power, 2014. *Electric Vehicle Program: Mission, Vision and Guiding Principles Internal Discussion Document*. NB Power, New Brunswick, Canada.

The main objectives of the EVAG are to:

- *Position electric vehicles as a viable option for New Brunswickers by identifying opportunities and removing barriers;*
- *Build knowledge and educate New Brunswickers on the positive attributes of electric vehicles; and*
- *Build strategic partnerships around electric vehicles with municipalities, government and other fleet organizations, as a means for critical testing, evaluation, and early adoption regarding electric vehicle applicability and experience in New Brunswick.²²*

In pursuit of these objectives, an Electric Vehicle Workshop was held in March 2015 where members of the EVAG and key stakeholders in New Brunswick met to discuss the future of electric vehicles in New Brunswick and the most effective ways to get there. At the workshop it was determined that initial efforts should focus on four key action areas: increasing public adoption of electric vehicles, increasing fleet adoption of electric vehicles, addressing marketing and outreach needs, and addressing charging infrastructure needs. Four working groups were structured and commenced addressing each of the key action areas, in keeping with this Roadmap, starting in the fall 2015.

Electric Vehicles

Any vehicle that uses electricity for propulsion is considered an electric vehicle. This can include automobiles, electric Zambonis, electric golf carts, and electrified buses. In order to gain early action, only passenger light-duty vehicles will be considered in this strategy. Below are the main types of passenger light-duty electric vehicles.

Hybrid Electric Vehicles (HEVs)

HEVs use both electricity and gasoline, but *do not plug into an electrical source*. Their energy comes entirely from gasoline and the kinetic energy of braking which is captured and converted to electricity to power the vehicle's electric traction motor.

Plug-In Electric Hybrids (PHEVs)

PHEVs can be plugged into an electricity source and can operate completely on a rechargeable lithium-ion battery. The vehicle also has a gasoline combustion engine which comes into use when the vehicle's battery charge has been emptied. The battery range is limited because of the relatively smaller battery size. While running on the battery the vehicle produces zero tail pipe emissions.

Battery Electric Vehicles (BEVs)

BEVs are charged by being plugged into an electrical source and operate completely on electricity usually

²² NB Electric Vehicle Advisory Group (EVAG), 2015. *NB EVAG Terms of Reference Draft*. NB EVAG, New Brunswick, Canada.

provided from a rechargeable lithium or lithium-ion battery. These vehicles produce zero tailpipe emissions and have considerably longer range capabilities than PHEVs.

This report will focus on PHEVs and BEVs which will provide the greatest opportunity to reduce GHG emissions and shift electricity demand. For a list of the most common BEVs and PHEVs available in Canada, refer to Appendix A.

Brief History of Electric Vehicles

Although electric vehicles seem like a new concept, electric vehicle technology has actually been around since the mid-1800s, and was, for a time, more popular than gasoline vehicles. In 1900, 28 percent of passenger cars sold in the United States were electric. Advancements in internal combustion engines (ICEs) and a supply of affordable gasoline, however, eventually led to the decline of electric vehicle development as well as a growing dependency on the use of fossil fuels. In the 1970s and 1990s interest in electric vehicles resurfaced; however, it wasn't until the past few years that advances in batteries and other technologies, coupled with a growing concern surrounding GHG emissions and fuel economy, allowed electric vehicle technology to flourish as a viable vehicle option.²³

Electric Vehicle Advantages and Barriers

As previously stated, the two main classifications of electric vehicles applicable to this report are battery electric vehicles and plug-in hybrid electric vehicles, or BEVs and PHEVs, respectively. BEVs run exclusively on electric batteries that are charged by plugging into an outlet or charging station. PHEVs, on the other hand, will have both an ICE and battery, giving the driver the option to “plug-in” or “fill-up”. Depending on the model, PHEVs can travel for a certain distance on electricity before the ICE will kick in.

The most notable advantages and barriers surrounding electric vehicles are summarized below.

Driving Range

The biggest difference between a BEV and PHEV is driving range. A BEV's driving range is limited by the energy storage capacity of its battery, and charger accessibility. PHEVs, equipped with an ICE, have a virtually limitless range due to their ability to refuel at any conventional gas station. These two technologies are therefore better suited to different driving patterns and customer preference. In terms of day-to-day car use, BEVs will suit the majority of drivers. Plug-in BC states that 95% of all urban car trips are 30km or less, well within most electric vehicle ranges.²⁴ The Nissan LEAF, a popular BEV model in Canada, can cover those distances easily with a stated average range of 135 km.²⁵ Outlier trips, however, requiring more than 100-150 km of travel, give PHEVs an advantage – especially for frequent long-distance travelers.

²³ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

²⁴ Plug-in BC, 2015. *Public Charging*. Retrieved from: <http://pluginbc.ca/charging-stations/public-charging/>.

²⁵ Nissan, 2015. *Nissan Leaf*. Retrieved from: <http://www.nissanusa.com/electric-cars/leaf/charging-range/range/>.

Misconceptions concerning the range of electric vehicles have been identified as a major purchasing barrier. Range anxiety refers to the concern for running out of charge and being stranded. Data collected from those who considered an electric vehicle but did not buy one reveal inaccurate perceptions about range. It is therefore a lack of product education and familiarity with electric vehicles and their electricity consumption/range that poses as a specific barrier, rather than the range itself.²⁶

Advantages

- Lower GHG emissions*
- Lower operating costs*
- Reduced fuel costs*
- Reduced interior noise*
- Better low-speed acceleration*
- At-home fueling*
- Improved air quality*
- Storage potential for Smart Grid applications*

Barriers

- Limited driving range*
- Higher upfront costs*
- Long battery-charging time*
- Concerns about battery life*
- Concerns about battery safety*
- Limited model selection*
- Concerns about choosing, purchasing, and installing home chargers*

Costs

The reason electric vehicles are incrementally more costly than comparable ICEs is largely due to the cost of the battery. PHEVs, which are equipped with a smaller battery, will have lower upfront costs than a BEV. For example, the PHEV Toyota Prius comes with a 5.2-kWh battery and starts at approximately \$26,000, whereas the Nissan LEAF has a 24-kWh battery and starts at roughly \$32,000.^{27, 28}

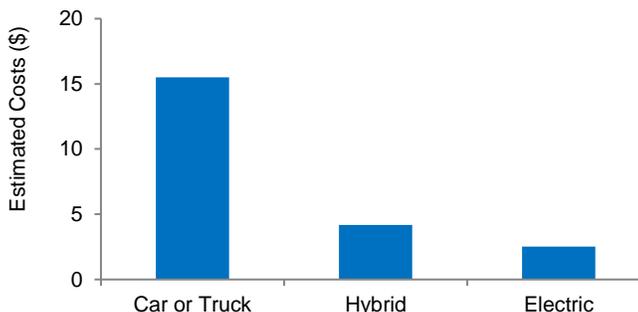


Figure 1. Estimated costs to drive in New Brunswick per 100km.

*Car or truck is the average of an estimated cost range \$12.91 - \$18.10.

In terms of operating costs, a mile driven electrically is cheaper than a mile driven on gasoline. ICEs incur higher operating costs as they have more moving parts and thus require more maintenance. In terms of fuel costs, gasoline is significantly more expensive than electricity in New Brunswick (Figure 1). The data indicates that electric vehicles are 67-90% cheaper to drive than a gas vehicle

in terms of fuel. The fact that electricity is locally-made is also a common advantage promoted for electric vehicles.²⁹

²⁶ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

²⁷ Toyota, 2015. *Prius 2015*. Retrieved from: http://www.toyota.com/prius/?srchid=sem|bing|Prius|Model_Prius|Prius_General_E|Copy+Refresh+7.24.15|Prius_MLP#!#features/technology

²⁸ Nissan, 2015. *Nissan Leaf*. Retrieved from: <http://www.nissanusa.com/electric-cars/leaf/charging-range/range/>.

²⁹ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator's Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

CO₂ Emissions

Data indicates a significant difference in carbon dioxide emissions to drive 100 km in New Brunswick between a BEV and an ICE. The data indicate that electric vehicles emit 57-96.5% less CO₂ than a gas vehicle.³⁰

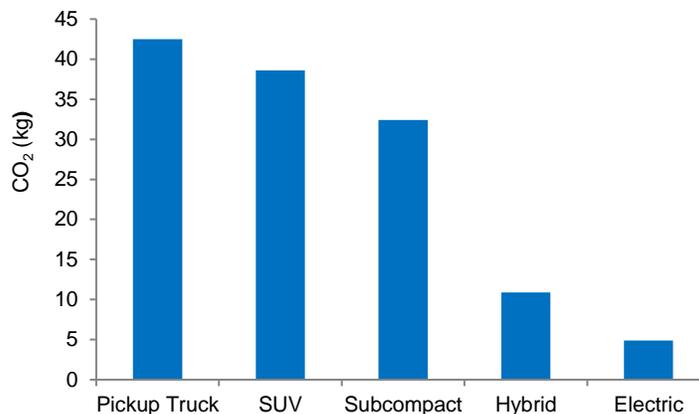


Figure 2. Carbon dioxide emissions to drive 100km in New Brunswick.

Electric Vehicle Supply Equipment (EVSE)

Electric vehicle supply equipment, or EVSE, includes any equipment used to charge plug-in electric vehicles. There are 3 different classifications of EVSE: Level 1, Level 2, and Level 3 chargers.

Level 1 Chargers (AC 125V)

All electric cars come with a cord set in the trunk that can plug into a standard wall socket. The industry calls this a “trickle charge” because it takes 12 to 16 hours to fully charge a pure electric car from empty. Level 1 is a great option for PHEVs that have smaller battery packs as they can fully charge in less time.

Level 2 Chargers (AC 240V)

The most common charging station is a Level 2. It is typically found in parking lots or at the side of the road. Easily installed in a garage or driveway, Level 2 stations are cost-effective to purchase and can fully charge a pure electric car from empty to full in 4 to 6 hours. Level 2 is perfect for charging at home overnight, at the mall while shopping or at work. Installation typically requires an electrical upgrade (same type of outlet used for ovens).

Level 3 Chargers (DC 120kW)

Also known as a DC Fast Charge (DCFC), the Level 3 uses a DC (direct current) instead of AC (alternative current) like the other chargers use. It can charge a fully electric car from empty to 80% in 20 to 30 minutes. The Level 3 chargers are perfect for centralized public-charging applications or along highway corridors where drivers need to quickly recharge. The Level 3 is not yet widely used as it consumes the most electricity and is more costly – however, this would be the electric vehicle equivalent to a gas station.

³⁰ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator's Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

Current EV & EVSE Numbers in Canada & New Brunswick

The electric vehicle market has exhibited rapid growth and transformation throughout North America in recent years. According to Ontario's Plug n' Drive, there were over 12,000 electric vehicles in Canada as of August 2015.³¹ Although they still represent a comparatively small percentage of the total Canadian vehicle market (759,000 light-duty passenger vehicles were sold in 2014), electric vehicle growth rates per year are high, partially due to purchasing incentives, growing charging infrastructure, and marketing strategies.³² In New Brunswick there are approximately 50 electric vehicle sales to date, making electric vehicles just over 0.01 per cent of the total 327,000 light duty passenger vehicles registered in the province.³³ Preliminary data from the NEG-ECP 2015 Transportation and Air Quality Committee (TAQC) Report shows that the Eastern Canadian Provinces (NB, NB, PEI, NL, and QC) have a total of 6,457 electric vehicles (with Québec having 6,166 of those). Electric vehicle record keeping in vehicle registration databases is still being refined by most provinces; therefore, this number will likely become more accurate over time. Many new and improved electric vehicle models are expected to be introduced in Canada in 2015 and on, which will increase electric vehicle options and in turn sales. A list of the most common electric vehicles on roads in Canada is listed in Appendix A.

In addition to electric vehicles, The TAQC data has also reported on the number of EVSE in the region. The Eastern Canadian Provinces have an estimated total of 541 level 2 and 35 level 3 chargers. New Brunswick has 33 level 2 and no level 3 chargers, while Québec has the majority again with 419 level 2 and 33 level 3 chargers.

³¹ Plug'n Drive Ontario, 2015. *Electric Vehicles in Canada*. Retrieved from: <http://plugndriveontario.ca/>.

³² Carlos Gomes, 2015. *Global Auto Report*. Retrieved from: http://www.gbm.scotiabank.com/English/bns_econ/bns_auto.pdf

³³ Personal Communication with NB Power's Diane Robichaud and Department of Public Safety's Heather Gorman.

A Strategic Framework

4. Options for a Strategic Electric Vehicle Roadmap

This section outlines four key action areas with associated actions which were identified at the New Brunswick Electric Vehicle Workshop held in March 2015 and hosted by the EVAG. These actions and their respective measures are strong options for advancing electric vehicles in any jurisdiction, including New Brunswick.

Vision

New Brunswick is a leader in electric vehicle deployment and embraces clean energy technological innovation associated with electric vehicles and related smart grid opportunities.

Mission

To significantly lower greenhouse gas emissions within New Brunswick by advancing electric vehicles through strategically addressing four key action areas which include; increasing public adoption of electric vehicles; increasing fleet adoption of electric vehicles; addressing marketing and outreach needs; and addressing charging infrastructure needs.

Goal

To reach a target of 5 per cent market penetration of alternative fuel vehicles by 2020 in accordance with the NEG-ECP Resolution 38-2 and Resolution 37-2 which also supports *New Brunswick's Climate Change Action Plan 2014-2020* target to reduce GHGs by 10% below 1990 levels by 2020.

4.1. Increasing Public Adoption of Electric Vehicles

To encourage and enable New Brunswick consumers to purchase electric vehicles and become early adopters of this technology, paving the way for others to follow.

One of the action areas identified by the EVAG is the increased public adoption of electric vehicles, as this is an essential component of furthering electric vehicle technology and its implied benefits. In New Brunswick, there are currently roughly 50 known electric vehicles.³⁴ In order to accurately measure and report on our electric vehicle baseline and future progress, methods for correctly capturing electric vehicle data in the province must be developed. Ensuring that the supply of electric vehicles is adequately meeting demand is also key to supporting the uptake of electric vehicles. Finally, financially incentivizing electric vehicle purchases is likely the most effective method for electric vehicle deployment as price differential is a major purchasing barrier.

PRIORITY ACTION 1: ESTABLISH AN ELECTRIC VEHICLE BASELINE IN NEW BRUNSWICK

Knowing how many electric vehicles there are in the province as well as the demographic that is choosing to drive electric is fundamental to advancing electric vehicles. Accurate measurement and reporting of electric vehicle registration and sales would allow analysis of the effectiveness of electric vehicle initiatives and/or the need for them. Establishing an accurate baseline will enable progress towards goals and targets, such as the Climate Change Action Plan and NEG-ECP, to be measured and reported on. To accomplish this, an efficient and effective means of capturing registrations could be developed by working with the Department of Public Safety and Service New Brunswick. Dealerships may also be engaged to try and establish a method for communicating how many electric vehicles are being sold in New Brunswick.

Capturing potential demographic information will also support the Marketing & Outreach action area as well. Information from social media, surveys, owners clubs, networks, and pooled registration data will form the basis of an understanding of New Brunswick's "electric vehicle demographic" which will, in turn, guide targeted marketing and outreach efforts.

³⁴ Personal Communication with NB Power's Diane Robichaud.

	Measure	Term
1.1.	Determine current electric vehicle owner profile through various means such as social media, an electric vehicle owners club, registration data, surveys, or by adopting surrogate survey data.	Immediate 0-1 year
1.2.	Develop an efficient and effective means of capturing electric vehicle registrations in New Brunswick by working with the Department of Public Safety.	Immediate 0-1 year
1.3.	Develop a method of capturing all electric vehicle purchases in New Brunswick by working with auto dealerships.	Immediate 0-1 year

PRIORITY ACTION 2: WORK IN PARTNERSHIP WITH NB AUTO DEALERS

Auto dealers could be a major asset to successful electric vehicle uptake. In general, knowledge of electric vehicles at dealerships is inconsistent and sometimes insufficient to address many consumer questions and concerns about electric vehicles.³⁵ For example, a study was conducted at 24 electric vehicle certified dealerships in 2014 across Canada, to assess negative and positive electric vehicle shopping experiences. Results were overall encouraging; however, the biggest issues were: lack of vehicles; not enough information available to possible buyers; and, significant misinformation regarding availability of electric vehicles in Canada, their costs and benefits, and details regarding incentives. On the other hand, salespeople were generally positive about electric vehicles (incentive programs, lower operating costs, fuel economy) rather than discouraging (limited battery capacity, limited access to charging, higher upfront cost, and battery capacity in cold climates).³⁶ Partnering with dealerships to fill this knowledge gap would be a key step toward mainstreaming electric vehicle adoption.

	Measure	Term
2.1.	Educate dealers on the benefits of electric vehicles. Consider holding a dealership conference with an aim to educate and empower auto dealers.	Immediate 0-1 year
2.2.	Encourage an adequate supply of electric vehicles in New Brunswick by working with dealerships and manufacturers.	Short Term 1-3 years
2.3.	Recognize and award auto dealers/dealerships who get electric vehicles on the road.	Ongoing

³⁵ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

³⁶ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator's Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

PRIORITY ACTION 3: REDUCE PRICE DIFFERENTIALS BETWEEN ELECTRIC VEHICLES AND CONVENTIONAL VEHICLES

As with any new technology, early electric vehicle adopters typically require incentives to help overcome barriers such as additional costs and potential risks associated with investing in a new technology.

“In the meantime, financial intervention by governments may be imperative to support the early stages of the [electric vehicle] industry’s development.” – Canada Electric Vehicle Roadmap³⁷

Fiscal policy can offer a powerful mechanism to reduce the overall cost of ownership and entice consumers to consider and purchase electric vehicles. For New Brunswick, a purchasing incentive would likely only need to be in place for a short-term (approx. 5 years) in order to incent early adopters and remove market barriers. However, it should be noted that when British Columbia removed their incentive program, EV vehicle purchases dropped so significantly that the government reintroduced the incentive starting April 2015 until March 2018 or until funds expire. A sufficient purchasing incentive in these early electric vehicle adoption stages is crucial to penetrate the ‘early adopter market’. It is anticipated that technological advances in batteries will gradually reduce the price point of electric vehicles to competitive market levels in that amount of time.

Table 1 below shows what BC, Ontario and Québec are doing to incentivize electric vehicles and EVSE compared to NB and the federal government:

³⁷ Natural Resources Canada, 2010. *Electric Vehicle Technology Roadmap for Canada*. Retrieved from: <http://www.publications.gc.ca/site/eng/357226/publication.html>.

Table 1: Electric vehicle purchase incentives by province.

Jurisdiction	GHG Target (2020)	EV Target (2020) ³⁸	Purchase Incentive (up to) ³⁹	Home Charger Incentive (up to) ⁴⁰
British Columbia	- 33% ⁴¹	>50% of Vehicle Sales (2050)	\$5,000	\$500
Ontario	- 15% ⁴²	1 in 20	\$8,500	\$1,000
Québec	- 20% ⁴³	25% of New Vehicle Sales	\$8,000	\$1,000
New Brunswick	- 10% ⁴⁴	5% Alternative Fuel Vehicle Stock (NEG-ECP)	None	None
Federal Govt.	- 17% ⁴⁵	None	None	None

A full list of potential incentives is provided in Appendix B.

	Measure	Term
3.1.	Determine best financial incentive options for New Brunswick and consider other enabling policies. Seriously examine fiscal incentives, namely a limited term point-of-sale financial incentive to help move electric vehicles forward whilst battery technologies continue to develop and reduce in price differential.	Short Term 1-3 years

³⁸ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects - Draft*. Department of Environment and Local Government, New Brunswick, Canada.

³⁹ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects - Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁴⁰ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects - Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁴¹ Government of British Columbia, 2007. *British Columbia's Climate Action Plan*. Province of BC, BC, Canada. Retrieved from: http://www.gov.bc.ca/premier/attachments/climate_action_plan.pdf.

⁴² Government of Ontario, 2007. *Go Green: Ontario's Action Plan on Climate Change*. Province of Ontario, Ontario, Canada. Retrieved from:

<http://www.climateontario.ca/doc/workshop/2011LakeSimcoe/Ontarios%20Go%20Green%20Action%20Plan%20on%20Climate%20Change.pdf>.

⁴³ Government of Québec, 2013. *2013-2020 Climate Change Action Plan*. Province of Québec, Québec, Canada. Retrieved from: http://www.mddelcc.gouv.qc.ca/changements/plan_action/pacc2020-en.pdf.

⁴⁴ Government of New Brunswick (GNB), 2014. *New Brunswick Climate Change Action Plan 2014-2020*. Province of New Brunswick, New Brunswick, Canada.

⁴⁵ Environment Canada, 2015. *Target 1.1: Climate Change Mitigation – Relative to 2005 emission levels, reduce Canada's total greenhouse gas emissions 17% by 2020*. Retrieved from: <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=AD1B22FD-1>.

4.2. Increasing Fleet Adoption of Electric Vehicles

To boost electric vehicle uptake in fleets for maximum sales opportunities, to increase electric vehicle visibility and to establish a precedent for all other fleets.

Incorporating numerous electric vehicles into rental, commercial and government fleets is a more efficient means of propagating electric vehicles when compared to single-vehicle purchases by private owners. Fleet owners and managers inherently take a pragmatic approach to vehicle purchases and are therefore typically drawn to electric vehicles' financial benefits. In general however, a limited choice of electric vehicle models, charging infrastructure, and higher initial prices pose barriers to adoption by fleets. As well, fleet operators may not have the resources or motivation to independently assess their own fleets for electric vehicle compatibility. Luckily, there are organizations such as FleetCarma who are equipped to assess fleets and demonstrate comprehensive business cases for electric vehicles. They can recommend whether electric vehicles would benefit a fleet, which drivers would be appropriate for electric vehicles, and which electric vehicle models would best fit the company. Fleets whose vehicles leave and return to the same base and have predictable daily routines are important to target as they will see the most economic returns with electric vehicles. Identifying fleet owners and managers, bringing electric vehicles to their attention, and providing them with access to fleet-specific resources such as FleetCarma will be relatively simple measures which could drastically increase the number of electric vehicles in New Brunswick. Not to mention the downstream effects of increasing the public's awareness just through increasing the frequency of electric vehicles on the road.⁴⁶ This section will focus on current knowledge of electric vehicle uptake in fleets and how to encourage New Brunswick fleets to consider and purchase electric vehicles.

Commercial Fleets

In order to effectively address the barriers and accentuate the pros associated with electric vehicles for fleets, the advantages and disadvantages must be understood. Table 2 below summarizes advantages and disadvantages/concerns of switching to electric vehicles identified by commercial fleet owners in a 2008 online survey. When working with fleet owners it will be important to keep note of the pros and cons below (Table 2).

Financially incenting fleets is a strong option for addressing the barrier of high upfront costs for fleet owners. Other provinces have already taken steps to incent fleets. Ontario, for example, has extended their electric vehicle incentive to commercial vehicle fleets and is encouraging the purchasing of electric vehicles for business fleets. They are offering a rebate on up to 25 fleet electric vehicles per year as well as on a charging station for each fleet electric vehicle purchased. Similarly, Québec's Drive Electric

⁴⁶ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

program offers a rebate to businesses, municipalities, and non-profit organizations that want to purchase or lease eligible vehicles.⁴⁷

Table 2. A 2008 online survey of 23 fleet owners summarized the following as their main advantages or disadvantages/concerns about switching to EVs in their fleets.⁴⁸

Advantages	Disadvantages/Concerns
<ul style="list-style-type: none"> • Excellent PR which leads to a “positive public image” • Existing electrical infrastructure • Low noise • Reduced lifetime costs of vehicle operations and lower operating costs • No more “budget surprises” because of fuel commodity price fluctuations • General environmental benefits including reduced dependency on fossil fuels • Desire to meet provincial/territorial regulatory targets⁴⁹ 	<ul style="list-style-type: none"> • Economics: Initial cost, pay-back period, prices of parts and service • Occupational health and safety • Reliability • Recharge time • Recycling and disposal • Weight and efficiency issues • Repair costs and access/availability of in-field technicians for repairs

Government Fleets

Governments across Canada and elsewhere recognize the importance of leading by example with electric vehicles. One of the goals in *New Brunswick’s Climate Change Action Plan 2014-2020* is dedicated to demonstrated leadership by the provincial government. Government of New Brunswick assets, including fleet vehicles, produce around 400 kT of GHG emissions annually.⁵⁰ Although advancements have occurred in other areas, there still exists opportunity to establish government targets and policy in this area, including the adoption of electric/hybrid vehicles and charging infrastructure where suitable.⁵¹ This would support the government’s alternative vehicle goals and enhance the visibility of electric vehicles in general.⁵²

Amongst the three provincial electric vehicle leaders in Canada, British Columbia has most fully embraced the notion of government leadership. Since 2006, the BC government has worked to ensure that new vehicles purchased or leased by government use hybrid/electric vehicle technology, as part of the province’s carbon-neutral policy. BC has more than 600 PHEVs in its fleet – one of the largest such fleets

⁴⁷ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁴⁸ Natural Resources Canada, 2010. *Electric Vehicle Technology Roadmap for Canada*. Retrieved from: <http://www.publications.gc.ca/site/eng/357226/publication.html>.

⁴⁹ Natural Resources Canada, 2010. *Electric Vehicle Technology Roadmap for Canada*. Retrieved from: <http://www.publications.gc.ca/site/eng/357226/publication.html>.

⁵⁰ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁵¹ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁵² The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

in North America.⁵³ They also have a number of other related initiatives in place to minimize fuel use by government vehicles including:

- A PHEV pilot program in a few ministries including the Ministry of Energy and Mines;
- An on-line “DriveSmart” training program available to staff to help reduce emissions; and
- Improved information sharing between fleet managers to strengthen day-to-day practices and yield better fleet fuel economy (e.g. fuel efficiency data from individual light vehicles, intelligence on alternative fuels).⁵⁴

Public policies can play a role in supporting fleet adoption. Targeting suitable commercial and government fleet vehicles is one of the best means to accelerate vehicle penetration rates and overall market transformation. Fleet vehicles are highly visible, as they spend much of their day on the road, which creates a positive feedback of enhanced awareness and increased sales. Organizations such as FleetCarma can help kick-start electric vehicle fleet penetration by demonstrating electric vehicle suitability in fleets and estimating the payback period for fleet owners. Policies that mitigate initial costs will shorten the payback period and contribute positively to a business case that supports electric vehicle procurement in fleets.⁵⁵

PRIORITY ACTION 4: DETERMINE AN ELECTRIC VEHICLE FLEET BASELINE

As with individually-owned electric vehicles, accurate measurement and reporting of electric vehicles in fleets is important. Establishing an accurate baseline allows numbers to be tracked, effectiveness of various initiatives to be assessed, and progress on commitments such as the NEG-ECP to be monitored.

	Measure	Term
4.1.	Obtain up-to-date fleet information for all provincial, municipal and private fleets, and determine a method of continually reporting this information such as through motor vehicle registration data.	Short Term 1-3 years

PRIORITY ACTION 5: ANALYZE FLEETS’ ELECTRIC POTENTIAL

FleetCarma is a division of CrossChasm Technologies Inc. FleetCarma’s purpose is to expand on CrossChasm’s expertise in vehicle design and provide value-added technology to fleet managers to reduce the cost of operating their fleet. To do this, FleetCarma provides modeling and simulation technology that enables managers to identify the best fit vehicle for each duty

⁵³ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁵⁴ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁵⁵ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

cycle in their fleet portfolio. This process has been proven to identify cost-saving opportunities for fleet operators to right-size the type of vehicle, and the size of the fleet, to their ever changing operational needs.

	Measure	Term
5.1.	Identify fleet owners/managers and encourage them to use FleetCarma to assess their maximum electric capacity.	Short Term 1-3 years

PRIORITY ACTION 6: INCORPORATE MORE ELECTRIC VEHICLES IN PRIVATE AND GOVERNMENT FLEETS

Converting suitable commercial and government fleets to electric is a cost-effective means of accelerating electric vehicle penetration rates and overall market transformation. Electrifying fleet vehicles can significantly impact sales as well as drastically increase awareness and interest by creating more electric vehicle visibility across the province. Policies that mitigate the price differential for fleet owners would shorten the payback period and positively influence electric vehicle procurement in fleets.⁵⁶

	Measure	Term
6.1.	Consider financial incentive options for electric vehicles in fleets and other enabling policies.	Short Term 1-3 years
6.2.	Consider a standard for government agency fleets to procure a proportion or quantity of electric vehicles in a set period of time.	Short Term 1-3 years

⁵⁶ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

4.3. Addressing Marketing & Outreach Needs

To increase consumer demand of electric vehicles and related infrastructure by developing and executing an NB-specific marketing and outreach plan as it is imperative to our early and long-term success with electric vehicle adoption.

According to a 2009 survey of over 2,000 Canadians, six in ten Canadians are at least somewhat interested in purchasing a PHEV. Interest is highest in urban areas and increases with education and *familiarity with electric vehicle technology*. In general, it seems that an improved perception of electric vehicles is correlated with improved knowledge of them. Unfortunately, there are a lot of misconceptions surrounding the advantages and disadvantages of electric vehicles and very few advocates working to correct them. This is why marketing strategies that are informative and increase electric vehicle visibility and familiarity are key. Under conditions of uncertainty and perceived risk, consumers will tend to gravitate to the known and familiar – ICEs.⁵⁷ Educating the public on the many pros and cons of electric vehicles will help steer consumers to an educated decision. Reduced environmental impact, reduced dependence on gasoline, and savings on operating costs are important reasons to consider a PHEV – it is these benefits that need to be clarified and promoted, specifically.

Review of Marketing Strategies

Throughout Canada there are a wide variety of marketing and outreach strategies and collaborations that focus on the adoption of electric vehicles. Jurisdictional examples of organizations working (either independently or in partnership with government) to tackle the specifics of marketing electric vehicles to Canadians are listed below:

⁵⁷ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

Table 3. Examples of organizations/campaigns with various marketing and outreach-related initiatives across Canada.

Jurisdiction	Name	Mandate	Initiatives
Ontario/ Nation-wide	Plug'n Drive	Plug'n Drive is a non-profit organization committed to accelerating the adoption of electric cars.	Online EV resources; Charging station consultation; Fleet assessments; Dealership awards; EV owners club; EV roadshows; Surveys and studies; and more.
Ontario/ Nation-wide	FleetCarma	FleetCarma is a division of CrossChasm Technologies. FleetCarma's purpose is to provide value-added technology to fleet managers to reduce the cost of operating their fleet.	Online EV resources; Modelling and simulation technology that identifies best EV vehicles for fleet portfolios and vehicle monitoring to improve fleet performance.
British Columbia	Plug-in BC	Plug In BC is an initiative co-chaired by the BC Ministry of Energy and Mines and BC Hydro to lay the groundwork for plug-in electric vehicles and related electric charging infrastructure in British Columbia.	Online EV resources; Emotive: Plug-in BC's campaign to raise public awareness about EVs; and more.
British Columbia	BC Hydro	BC Hydro partnered with the government of BC to promote EV adoption.	Online EV resources.
Québec	Québec's Electric Circuit (Hydro Québec)	Canada's first public charging station network for plug-in vehicles, the Electric Circuit, offers level 2 and 3 charging to its members for a flat rate of \$2.50 per charge.	Provincial public charging station network (376 chargers – based on geographical distribution, driver needs, and partnerships with businesses (Rona, St. Hubert, etc.))
Canada	Electric Mobility Canada (EMC)	National membership-based not-for-profit organization dedicated exclusively to the promotion of electric mobility.	Online EV resources; Annual EV Conference and Trade Show (considered Canada's premier event on electric vehicles); A PEV (plug-in electric vehicle) Working Group – an initiative by utilities and municipalities, developing a comprehensive operating guide to integrate electric vehicles into Canadian communities; Symposium held every 18 months – the largest world symposium on electric transportation; and more.

Leading stakeholders in advancing electric vehicle marketing and outreach are non-profits such as Plug'n Drive and EMC; utilities such as BC Hydro and Hydro Québec; and governments such as the government of BC. It is recommended that a joint effort be established (NGOs, utilities,

and government) in New Brunswick to emulate what successful provinces and partnerships have accomplished in advancing electric vehicles. Below are actions and measures which could be carried out as part of an electric vehicle marketing and outreach plan.

PRIORITY ACTION 7: ENHANCE AWARENESS AND KNOWLEDGE RELATING TO ELECTRIC VEHICLES AND INCREASE CONSUMER DEMAND

There is a plethora of electric vehicle information already available on the internet. It will be important to find an appropriate means of developing an electric vehicle online resource tailored to New Brunswick. Supportive stakeholders such as NGOs, utilities, and the provincial government could link to this and other resources in order to ensure New Brunswick consumers are receiving accurate information and making informed decisions.⁵⁸

Electric vehicle demonstrations, presentations, and test-drives are also important as they allow customers to breach the barrier of unfamiliarity and assess electric vehicles more closely. More opportunities should be explored for a collaborative effort to provide test-drives and/or show-and-tell events and presentations.⁵⁹

	Measure	Term
7.1.	Create an NB electric vehicle program brand, webpage (information hub), marketing campaign, and utilize social media to create awareness and improve knowledge surrounding electric vehicles.	Short Term 1-3 years
7.2.	Identify opportunities to participate in, or hold, electric vehicle advocacy events which may include demonstrations, presentations, and/or test-drives, etc.	Ongoing
7.3.	Identify and recruit electric vehicle owners to create and champion an electric vehicle owner's association for New Brunswick.	Short Term 1-3 years
7.4.	Assess the possibility of partnering with academia to conduct electric vehicle-related studies and analyses.	Medium Term 3-5 years

PRIORITY ACTION 8: FACILITATE SKILLS AND KNOWLEDGE UPGRADING RELATING TO ELECTRIC VEHICLE TECHNOLOGIES

As electric vehicle technologies begin to become mainstream, so will the demand for trained tradesmen and women who are able to repair related mechanical issues.

⁵⁸ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

⁵⁹ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

Update: The New Brunswick Community College (NBCC) secured funding in 2016 for two electric vehicles and seven charging stations to facilitate the incorporation of electric vehicle training into their programming. The EVAG was able to collaborate with and support NBCC during its funding application and plans to continue helping them with future electric vehicle-related projects.

Similarly to mechanical/repair skills, it is extremely important to proactively incorporate safety training on electric vehicles for our first responders in case of emergency. Police, firefighters, and emergency medical services (EMS) personnel responding to road crashes that involve electric vehicles must be aware of the hazards associated with electric vehicles that differ from the hazards associated with gasoline-powered vehicles, and they must be trained in procedures for mitigating these hazards. An electric vehicle safety training program could be adopted or created to address this need.⁶⁰

Lastly, there are numerous opportunities for technology development and other electric vehicle-related academic applications. There is currently a need for electric vehicle battery and charging infrastructure advancements and New Brunswick could be taking part in this innovative new technology development.

	Measure	Term
8.1.	Assess opportunities to train electricians and repairmen in electric vehicle technologies and encourage electric vehicle curricula in community college/trade schools.	Short Term 1-3 years
8.2.	Ensure that first responder safety training for fire, paramedic and police personnel incorporates up-to-date curricula and training specifically in relation to electric vehicle and EVSE.	Medium Term 3-5 years
8.3.	Promote participation by Universities and colleges in electric vehicle-related technology development and EVSE technology development.	Medium Term 3-5 years

⁶⁰ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

4.4. Addressing Charging Infrastructure Needs

To stimulate charging infrastructure deployment within the province in order to alleviate range anxiety and give electric vehicle owners freedom to roam.

Home Charging

The vast majority (~90 per cent) of electric vehicle charging happens at home where electric vehicles are usually parked for the longest period of time. Equipping homes with adequate charging infrastructure (level2 chargers) and helping consumers navigate the complexities of choosing, purchasing, and installing EVSE is very important.

The three leading provinces in electric vehicles have all offered incentives to purchase (and install) home charging stations. Incentives range from \$500 in BC, to \$1,000 in Ontario and Québec for residents who own or lease an eligible BEV or PHEV. Ontario's incentive program, for example, helps support the purchase of level 2 charging stations with a rebate that covers 50 per cent of the purchase cost (up to \$500) plus 50 per cent of the installation cost (up to \$500) for a maximum value of \$1,000. Québec's Drive Electric Program is very similar, offering financial assistance corresponding to the lesser of 50 per cent of eligible expenses or \$1,000.⁶¹

Aside from single-family homes, meeting charging infrastructure needs for multi-unit residential homes is also important. In British Columbia, as part of the Clean Energy Vehicle program, the BC Building Owners and Managers Association (BOMA) partnered with the Province of BC to offer a charging station incentive for multi-unit residential buildings which supported 125 stations. In addition, they developed an Electric Vehicle Charging Station (EVCS) information package to support an overall market transformation to clean energy vehicles. The province of BC also worked with the Condominium Homeowners' Association (CHOA) to look at barriers to electric vehicle charging and together developed a guideline for condominium and strata owners titled *Installation of Electric Vehicle Charging Stations on Strata Properties in British Columbia*.⁶²

In addition to financial incentives and developing guidelines, the city of Vancouver has gone one step further by introducing a Building By-law – requiring that 20 per cent of parking spaces be equipped with vehicle charging infrastructure for all new multi-unit family dwellings. New Brunswick could enable a similar requirement initially as guidelines which in time could lead to legislative requirements through the Community Planning Act and related regulations. Ultimately, building codes and related regulations could be amended to require that at least the rough-in for outlets for charging infrastructure be included in all new buildings.

⁶¹ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁶² Plug-in BC, 2015. *Home & Work Charging*. Retrieved from: <http://pluginbc.ca/charging-stations/charging-at-home/>.

Homes are and will likely remain the most important location for personal vehicle charging. Lack of access to charging infrastructure for residents of multi-family dwellings is a barrier that will need to be overcome to promote electric vehicle deployment for all residents.⁶³

Workplace Charging

Workplace charging (level 2 chargers) also offers an important opportunity to increase driving range for New Brunswickers. Electric vehicles are parked at workplaces for typically 8 hours a day – ample time to charge up and extend a driver’s range for the day. Large workplaces could be identified and educated on the benefits and logistics of offering their employees charging stations. In Québec, the “Branché au travail” program allows businesses to receive a rebate for the purchase and installation of level 2 charging stations. Afterwards, the employer must offer free charging to its employees for the three years following the installation of the station.⁶⁴ Workplace charging could be an alternative to home charging for those who do not have access to charging infrastructure at home. Charging at workplaces provides an important opportunity to encourage electric vehicle adoption and increase the fraction of miles that are fueled by electricity. There are possible financial benefits for workplaces as they can potentially charge employees/customers for using the chargers. Other reasons for workplaces to install charging infrastructure can include fostering an environmentally friendly image and providing the perk to retain and recruit employees. Local governments could engage with and encourage workplaces to consider investments in charging infrastructure and provide information about best practices.⁶⁵

Public Charging

A lack of public charging infrastructure is consistently identified as one of the main barriers to purchasing electric vehicles. Public charging infrastructure (level 2 and 3 chargers), although potentially not the main method for daily charging, is equally important to electric vehicle owners as

Factors to consider when planning for large-scale infrastructure deployment

- Interest and visibility
- Codes and standards
- Population density
- Future growth areas
- Ownership models
- Availability to drivers
- Reserved parking
- Level 1, 2, or 3 chargers
- Proximity to destinations
- Signage
- Revenue/cost recovery
- Grid impact
- Employment density
- Security/vandalism risk
- Retail density
- Traffic corridors
- Disability requirements
- Even distribution

⁶³ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

⁶⁴ Climate Change Secretariat, 2015. *Advancing Electric Vehicles in New Brunswick: An Overview of Current Status Prospects Draft*. Department of Environment and Local Government, New Brunswick, Canada.

⁶⁵ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

these are key to providing range confidence.⁶⁶ The analogy “the chicken and the egg” could be used to describe the circular argument of whether electric vehicles should come first, or their charging infrastructure. Public charging stations are not viable if there are not enough electric vehicles on the road; conversely, the lack of public charging stations has been shown to be a strong barrier to more electric vehicles being purchased. The challenge is to offer the public enough charging infrastructure so that they feel secure when travelling long distances while simultaneously increasing electric vehicle sales to adequately utilize the charging infrastructure. New Brunswick, with approximately 33 public charging stations, is trailing far behind some of the leading electric vehicle provinces.⁶⁷ British Columbia currently has the highest number of EVSE locations with over 550 public charging stations⁶⁸. Québec follows closely behind with over 450 public charging stations to date.⁶⁹

British Columbia, with their Clean Energy Vehicle program, invested \$2.7 million towards supporting deployment of public level 2 charging infrastructure. The results were over 450 stations installed over the span of less than one year. The goal was to support charging stations serving members of the public or fleets, with participation of municipalities, regional governments, First Nations communities, businesses and other organizations.

Policies could be used to promote the advancement of charging infrastructure in New Brunswick. By-laws such as building codes could be amended to require charging stations (or the ability to install charging stations in the future) in new buildings (such as parking garages or malls). Financial incentives could be used to encourage businesses and other organizations to install chargers; and guidelines could provide individuals, businesses, and building owners the tools and knowledge they need to take their own first steps towards charger installation.⁷⁰

Québec’s Electric Circuit

Québec is the only province in Canada to have developed a public charging station network for electric vehicles, providing 368 level 2 and 8 level 3 chargers to users. The Electric Circuit, developed by Hydro-Québec, charges electric vehicles with almost all electricity coming from clean, renewable resources. Since its launch in 2012, the Electric Circuit has rapidly expanded to several Québec regions, with continued expansion into new urban areas. The Electric Circuit charging stations are rolled-out based on the geographical distribution of electric vehicle sales, drivers’ needs, and partners’ business strategies. The network has charging stations in parking lots of its partners (Rona, St. Hubert, etc.) and members pay a flat rate of \$2.50 a charge, no matter how long they are plugged-in. As of January 2015, over 100 partners have joined

⁶⁶ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

⁶⁷ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

⁶⁸ Plug-in BC, 2015. *Public Charging*. Retrieved from: <http://pluginbc.ca/charging-stations/public-charging/>.

⁶⁹ Government of Québec, 2015. *Electric Vehicles*. Retrieved from: <http://vehiculeselectriques.gouv.qc.ca/english/>.

⁷⁰ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

the Circuit, and are already committed to commissioning 117 new charging stations in the coming year.⁷¹

The lack of charging infrastructure in New Brunswick could be rectified through a similar program as Québec’s Electric Circuit. Regardless of the method of charging infrastructure uptake, creating a user friendly and consistent province-wide network of chargers should be a priority. Private enterprises could benefit from having charging stations as it fosters a positive environmentally friendly perception of the business, it may increase the duration of time spent at the location, and charging revenue may be an option (though charging revenue is generally insufficient to cover the investment).⁷² Public charging infrastructure in general has the potential to provide range confidence, extend travel distance for limited-range electric vehicle models, and allow long-distance electric travel. Ongoing research should be conducted to determine how much public infrastructure is needed and where it should be sited, and the extent to which its availability affects electric vehicle adoption.⁷³ Many provinces and organizations have unique approaches, and New Brunswick stakeholders have an opportunity to learn from one or many of these programs.

PRIORITY ACTION 9: INCREASE HOME CHARGING INFRASTRUCTURE AND PROMOTE HOME CHARGING AS A PRINCIPAL MEANS OF FUELING ELECTRIC VEHICLES

As mentioned above, home charging is the principal means of fueling electric vehicles for most electric vehicle owners. It is important to empower consumers with knowledge so that choosing, purchasing, and installing home charging infrastructure is no longer a barrier. Building codes could be used to ensure New Brunswick residential buildings move toward being more “EV-ready”, and monitoring the electricity load in relation to charger locations is also an important measure for utilities.

	Measure	Term
9.1.	Promote home charging by providing New Brunswickers with information on how to choose, purchase, and install home chargers.	Short Term 1-3 years
9.2.	Promote electrical code compliant installation of home charging infrastructure.	Short Term 1-3 years
9.3.	Assess the adoption of building codes that would require new multi-unit family homes to include chargers or be capable of supporting future charger installations.	Medium Term 3-5 years
9.4.	Consider methods for having electric vehicle owners inform utilities of their charging location for effective load management.	Short Term 1-3 years

⁷¹ Hydro-Québec, 2015. *The Electric Circuit*. Retrieved from: <http://www.lecircuitelectrique.com/index.en.html>.

⁷² Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

⁷³ The National Academies, 2015. *Overcoming Barriers to Deployment of Plug-in Electric Vehicles*. The National Academies Press, Washington, DC, USA.

PRIORITY ACTION 10: ENCOURAGE NIGHT-TIME CHARGING TO KEEP GHG EMISSIONS MINIMIZED

Encouraging non-peak charging is an important component of reducing GHG emissions. During peak electricity consumption, fossil fuels typically have to be used to meet demand; however, during non-peak hours (night-time) electricity generation typically uses only clean renewable sources. Trends indicate that most electric vehicle owners charge overnight so that their battery is refueled and ready in the morning. This consumer habit is ideal and could be further encouraged by educating customers and possibly financially incenting them with a “time-of-use rate”. Some utilities in other provinces have instituted electric vehicle rates to encourage off-peak charging. Many provinces have a surplus of electricity at night, so charging at night could be encouraged through incentives. There is an opportunity for low-cost night-time pricing, which a fully integrated utility (such as NB Power) could potentially make a viable business case for.⁷⁴

	Measure	Term
10.1.	Assess a “time-of-use rate” to incent night-time (non-peak) charging.	Medium Term 3-5 years
10.2.	Assess the need to increase the Renewable Portfolio Standard to ensure that, as the number of electric vehicles grows, the increasing amount of electricity we use to fuel the vehicles is non-emitting.	Medium Term 3-5 years

PRIORITY ACTION 11: INCREASE WORKPLACE CHARGING INFRASTRUCTURE

As mentioned above, workplaces are another key area to increase charging infrastructure. Being the second longest place where vehicles are parked, workplace chargers have the potential to boost driving range significantly and improve charger distribution.

	Measure	Term
11.1.	Engage with and encourage workplaces to consider investments in charging infrastructure and provide information about best practices.	Medium Term 3-5 years
11.2.	Assess the potential for workplace charging at government buildings.	Short Term 1-3 years

⁷⁴ Amec Foster Wheeler Americas Limited, 2015. *New Brunswick Electric Vehicle Workshop Facilitator’s Synthesis Report*. Department of Environment & Local Government, New Brunswick, Canada.

PRIORITY ACTION 12: INCREASE PUBLIC CHARGING INFRASTRUCTURE AND CREATE ELECTRIC VEHICLE CHARGING CORRIDORS

A lack of charging infrastructure or even the perception of a lack of infrastructure to support electric vehicles can be detrimental to their deployment. Increasing the number of charging stations while simultaneously strategically siting them is one of the most important components of advancing electric vehicles. Financial incentives, partnerships, and funding opportunities are just some effective means of deploying EVSE.

	Measure	Term
12.1.	Identify charging infrastructure gaps and priority areas with focus on the creation of charging corridors.	Medium Term 3-5 years
12.2.	Assess the adoption of municipal by-laws that would require new commercial construction to include chargers or be capable of supporting future charger installations.	Medium Term 3-5 years
12.3.	Assess policy and other incentive options which would increase charging infrastructure deployment.	Medium Term 3-5 years

Roadmap Implementation

This Roadmap outlines many actionable options which could be beneficial to New Brunswick. The information herein and the action areas and measures prescribed are solely intended to inform and guide interested parties, stakeholders and decision makers in New Brunswick.

The direction and objectives of this Roadmap could transform New Brunswick into one of Canada's leading electric vehicle provinces. Many provinces have shown that rapid market transformation can happen when governments, utilities, and other interested groups support and enable electric vehicle adoption. Providing New Brunswickers with access to information, support, and appropriate infrastructure is fundamental. Electric vehicles are innovative, environmentally responsible, and could greatly diversify and increase skill sets and jobs needed in New Brunswick.

Appendix A

List of electric vehicles commonly found in Canada separated by type and listed in rough order of popularity.

Type	Model	Avg Range on Electric
BEV	Nissan LEAF	121km
	Tesla Model S	335km (60kWh)/ 426km (85kWh)
	Smart Fortwo Electric Drive	109km
	Mitsubishi i-MiEV	100km
	BMW i3*	160km
	Ford Focus Electric	122km
	Kia Soul EV	149km
	Chevrolet Spark Electric	
PHEV	Chevrolet Volt	61km
	Ford C-MAX Energi	34km
	Toyota Prius Plug-In	18km
	Ford Fusion Energi	34km
	BMW i3*	160km
	Cadillac ELR	59km
	BMW i8	35km
	Porsche 918 Spyder	26km

*The BMW i3 can be purchased with a range-extending gasoline engine.

Appendix B

List of potential financial and non-financial incentives for electric vehicles.

Financial Incentives

Purchase Incentives

- Tax credits or deductions (realized on filing tax return)
- Tax exemptions or rebates (realized at point of sale)

Ownership Incentives

- Exemption from or reduction in registration or ownership taxes or fees
- Exemption from or reduction in weight surcharges (collected annually at time of registration or renewal)
- Exemption from environmental taxes
- Exemption from vehicle inspection

Use Incentives

- Exemption from motor fuel taxes
- Reduced roadway taxes or tolls
- Discounted or free EV charging
- Discounted or free EV parking

Infrastructure Incentives

- Tax credit or rebate for installing EV charging stations
- EV charging infrastructure deployment subsidies

Non-financial Incentives

Use Incentives

- Access to restricted lanes (bus-only, high-occupancy-vehicle, etc.)
- Reserved parking for EVs