

REALIZING THE POTENTIAL OF ELECTRIC VEHICLES IN MANITOBA

**RECOMMENDATIONS OF
THE ELECTRIC VEHICLE ADVISORY COMMITTEE**

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Background and Context

Electric vehicles (EVs) are here and Manitoba needs to ensure it is EV-ready. With global sales for electric vehicles predicted to increase markedly in the next three years and forecasts for rapid continuing advancement of the electric vehicle sector over the current decade, integrating highway-capable, “mass market” electric vehicles into Manitoba’s transport system and energy infrastructure is both a necessity and a significant opportunity.

The strategic drivers for this province are compelling. Promoting the transition to plug-in transportation will:

- help Manitoba achieve energy security and environmental goals;
- vitalize the economy by reducing economic leakage;
- position Manitoba to participate in the EV value chain; and
- demonstrate Manitoba’s leadership and innovation capacity.

Manitobans use about 1.5 billion litres of gasoline and one billion litres of diesel fuel annually, and our transportation sector generates more than one-third of Manitoba greenhouse gas emissions. Fossil fuel imports account for up to \$3 billion of outflow from Manitoba each year, and every 20 cent future hike at the gasoline pumps drains an extra \$500 million per year from our province’s economy. Given the magnitude of these impacts and the opportunity to advance strategic goals, EV policy leadership is critical. Manitoba’s low-cost electricity, virtually all produced by renewable hydropower, makes an even stronger case for electric transportation here.

The rate at which the electric vehicle market develops in Manitoba and elsewhere will depend on a number of factors, some that are difficult to predict and outside of our control – the price of oil, for example – and some that can be influenced to expand the electric vehicle market. Government has a crucial role to play in developing robust plans and engaging and partnering with stakeholders. The proposed actions identified in this report are intended to build on Manitoba’s Electric Vehicle Road Map (April 2011) and signal government’s willingness to partner with industry players, community groups, educational institutions and consumers to ensure Manitoba is at the forefront of – and reaps the benefits from – electrified transport.

Transitioning to electrified vehicles means dealing with initial costs and large-scale change. Overcoming these barriers will require cross-community collaboration and prioritized actions. A shared resolve among stakeholders is essential, a balanced private / public sector commitment is key, and timely action is critical given that multiple jurisdictions around the world are jockeying to secure a leadership position in the global market for electric transportation.

The proposed Manitoba EV action agenda presented below emphasizes the need for 1) a coordinated roll-out of EV-friendly policies and programs, and 2) a pragmatic approach that embraces this modal shift, yet responsibly manages resources and risk. These actions reflect substantial input gathered through a process of multi-stakeholder consultations.

Recommended Actions

Recommended actions for accelerating the uptake of electric vehicles in Manitoba and capturing opportunities associated with this evolution in the automotive-propulsion landscape are grouped under five core statements of purpose, as presented below:

Objective: To enhance Manitobans` awareness and knowledge relating to electric vehicles

Consumer attitude toward electric vehicles is the fundamental factor that will determine how successful the transition away from conventional vehicles is. Creating awareness and building knowledge are prerequisites to establishing consumer confidence and promoting buy-in. The provision of relevant, reliable and easily accessible information is crucial, especially at the outset of significant change. Although studies reveal that substantial consumer interest exists in procuring and driving electric cars, enthusiasm is tempered by significant anxiety arising from uncertainties. Reinforcing the need for accurate information tailored to Manitoba is the fact that different geographic areas have different features (climate attributes, typical drive lengths, infrastructure availability, energy costs, etc.) affecting EV practicality and use. The opportunity exists to consolidate and deliver EV-related information pertinent to Manitoba circumstances to reduce misconceptions and promote informed decision making. Joint action including co-branding with other stakeholders (particularly Canadian Automobile Association Manitoba, Manitoba Hydro, Manitoba Public Insurance, Red River College's Electric Vehicle Technology & Education Centre (EVTEC), and one or more environmental NGOs) may be practical. Key options include 1) launching a marketing campaign highlighting the benefits of "energy independence" and 2) establishing convenient single-window web access to a broad range of EV-related information tailored as appropriate to the Manitoba context.

ACTION #1 – Proactively engage in the provision of accurate and comprehensive information aimed at educating stakeholders and the general public concerning the acquisition and use of electric vehicles in Manitoba. Ensure that any lack of clear understanding of cost issues is addressed.

Objective: To increase consumer demand for electric vehicles in Manitoba

The challenge for automobile manufacturers continues to be bringing the cost of EVs in line with conventional vehicles; price remains an obstacle to achieving widespread consumer adoption. However, rebates are offered in many jurisdictions – including British Columbia, Ontario and Quebec – to overcome the hurdle of higher prices and stimulate EV procurement by early adopters. In conjunction with reduced maintenance and lower “fuel” costs, rebates that reduce initial purchase costs for new, highway-capable EVs offer a significantly improved payback proposition for consumers – potentially to the point of offering consumers approximate cost parity with conventional vehicles within what can be considered reasonable time frames. Comparatively low Manitoba hydroelectricity rates augment the saving opportunity for EV users and may allow rebate values to be lower relative to what several other jurisdictions are offering. Scaling of rebates, establishing eligibility criteria, and determining program timelines are core considerations to be addressed. Since other monetary levers such as waiving congestion charges or providing electricity discounts are not available in Manitoba to affect the EV value equation (total cost of ownership), reliance on upfront subsidies to help consumers cover the incremental expense for the technology is pronounced.

ACTION #2 – Reduce price differentials between electric and conventional vehicles so that higher procurement costs are less of a barrier to EV uptake, total-cost-of-ownership economics are more attractive in Manitoba, and consumers are reassured concerning affordability and value.

As increased visibility of electric vehicles occurs in Manitoba, public familiarity and acceptance of the technology will grow. The placement of EVs into routine operating circumstances has the potential to increase public awareness and interest, demonstrate vehicular ability, reduce consumer anxiety and expand consumer uptake. The gradual integration of electric vehicles and EV infrastructure into “normal” society is vital for shaping public opinion, building momentum and moving EV consumption beyond early adopters. Fleet operations – depending on the extent to which a suitable match exists between required vehicle functionality and EV capabilities – may be ideal platforms to help achieve the public profile desired.

ACTION #3 – Encourage major employers and prominent organizations in Manitoba to provide and designate electric vehicle charging stations, and commit the Manitoba Government to doing so.

ACTION #4 – Consider implementing a standard for Government of Manitoba and government agency fleets that mandates a specified proportion or quantity of electric vehicles within prescribed timelines – and encourage private sector fleet operators to do likewise – in order to increase the public profile and acceptance of electric vehicles throughout the province.

Objective: To ensure infrastructure in Manitoba meets EV-related requirements

On average, Manitobans drive approximately 43 km per day¹. This falls within the designed range of all battery-only EVs and most of the plug-in hybrids either currently on the market or recently announced for sale. This means that the average Manitoba driver should be able to complete their daily travel on a single charge under a wide range of weather and traffic conditions. A recent Electric Power Research Institute survey found that 95% of respondents said that they would prefer to charge their plug-in electric vehicle at their home.² Manitoba homes are well equipped for Level 1 AC home charging with convenient indoor/outdoor receptacles that allow for vehicle charging.

ACTION #5 – Actively promote home charging infrastructure as the principal means for “fueling” electric vehicles in Manitoba, and identify office charging infrastructure and community / convenience charging infrastructure as second and third priorities respectively.

Despite the prevalence of available Level 1 AC charging opportunities, many EV users may elect to install Level 2 AC charging at their residences to reduce the charging times for their vehicles – something being encouraged by certain vehicle manufacturers. Depending on the state of a residence’s electrical system, a licensed electrician may be required to upgrade the wiring and electrical panel to adequately service the Level 2 AC charging equipment. This is expected to be very common in natural gas serviced areas as many of the homes are only equipped with 60 or 100 amp electrical panels. Installation costs will vary widely across homes, but could exceed \$2,000, plus the cost of the charger, in many cases.

ACTION #6 – To encourage electrical code-compliant home installation of Level 2 charging infrastructure and to help offset this portion of the current EV price differential, consider offering Manitoba EV consumers a subsidy toward the licensed installation.

Notwithstanding the abilities of home and business-based charging equipment to satisfy the majority of charging needs of the average EV user, there may still be a need for public charging access. Manitoba’s cold temperatures increase the use of auxiliary loads such as vehicle heaters, headlights, windshield wipers and window defrosters which tap into battery energy that is normally reserved to propel the vehicle. Reduced vehicle range during cold Manitoba winters could encourage commuters to utilize some form of workplace charging out of true need or for the security of additional battery reserve, particularly during periods of extreme cold. Manitoba’s existing network of block heater receptacles capable of powering Level 1 AC charging systems could be an excellent compliment to home charging to

¹ “Manitoba’s Electric Vehicle Road Map – April 2011”. *Manitoba.ca* September 1, 2011
http://www.manitoba.ca/iem/energy/transportation/images/elec_vehicle_road_map.pdf

² Electric Power Research Institute. “Power Delivery and Utilization – Top Deliverables 2010”, February 2011. p 3.

help keep EV batteries topped up and ready for use. In extreme temperatures, they could be a necessity to keep the EVs' built-in battery heaters from depleting the batteries' charge level.³

Below are some common parking scenarios that will limit charging access for some EV owners and may impede sales of electric vehicles in Manitoba:

- A. Street Parking – Curb-side electrical access is limited and will affect those EV owners who regularly park on the street instead of a driveway or parking lot where electric receptacles are more commonly located.
- B. Heated Underground Parking – Due to the climate controlled nature of these parking lots, electrical infrastructure to power block heaters is not typically installed.
- C. Multi-family Dwellings – Residents of multi-family dwellings such as apartment and condominium complexes could face difficulty charging their electric vehicles if the building management is not in favour of them doing so. Individual parking stalls at these facilities are often not individually metered, leading to resistance from other building residents to the idea of them partially funding the transportation costs of their neighbours.
- D. Some Existing Block Heater Infrastructure Is Not Adequate For EVs -- Many Manitoba residential, workplace and commercial parking lots have systems in place to provide power for vehicle block heaters during the winter months. These systems have the potential of being used to charge EVs, however there are some potential limitations to using these existing systems in their current state, including:
 - Power Smart initiatives have been effective in encouraging parking lot owners to install technologies that cycle power to outlets based on the ambient outdoor temperature in an effort to save energy. These technologies could inhibit, and in some cases completely prevent vehicle owners from using the outlets as a power source for their EV. However, some of these technologies do have the possibility of being reprogrammed to send power to designated stalls on a 100% basis which would mitigate those problems.
 - In an effort to trim costs, some parking lot receptacles were built specifically to handle the load of a single block heater and could become overloaded if used to supply a larger EV load. The individual circuits in most parking lots are now rated for 15 amps, which should be sufficient for most Level 1 charging scenarios, however, under the Canadian Electrical code, outlets specifically designated as EV Level 1 AC charging points must be supplied by a minimum of 20 amps. Parking lots will have to be reviewed on a case-by-case basis by their owners to ensure they can support EV charging systems.
 - Existing infrastructure can only support Level 1 AC chargers at most. If the market demands faster Level 2 AC charging, new infrastructure will need to be installed.

Resources should be initially focused on preparing for residential and, as appropriate, commercial/fleet EV loads. Communicating with commercial entities to identify potential fleet and parking lot loads will allow for an assessment of how much of the charging demand can be met at the residential and

³ “2011 Nissan Leaf Owner’s Manual” pEV-4 <http://www.nissan-techinfo.com/refgh0v/og/Leaf/2011-Nissan-Leaf.pdf>

commercial level and will help optimize planning and deployment of public charging assets that may be needed to fill gaps in the charging network. A quick response to address the limits of the existing block heater infrastructure and to educate EV owners on these limits is recommended. A clear legal framework to allow lot owners to recover these additional infrastructure costs through parking fees will be required (see Action #11).

ACTION #7 – Encourage parking lot owners to consider addressing the limits of existing block heater infrastructure in designated EV charging stalls. Owners of EVs will need to be educated as to these existing limits.

ACTION #8 – Continue to evaluate the need for public charging infrastructure as the deployment of electric vehicles in Manitoba increases.

Research has been conducted by Manitoba Hydro to predict the impact EVs will have on the electricity distribution system. Based on early market predictions regarding EV sales, there does not appear to be any reason for concern regarding their impact on the electrical grid. Nevertheless, adoption of EVs may accelerate the need for certain areas of the electric distribution system to be upgraded earlier than originally planned. Further investigation into the potential benefits of encouraging off peak charging as well as proactively increasing the size of certain types of distribution system equipment during planned work including primary conductors, distribution transformers, and secondary conductors should be undertaken. Although physical assets such as distribution transformers may eventually have to be replaced or upgraded to handle increased loads, there are currently no plans for pre-emptive upgrades at the distribution level. Manitoba Hydro will continue to monitor EV distributions / concentrations in the province and upgrade infrastructure on an as-required basis within the confines of existing processes.

ACTION #9 – Further investigate the potential benefits of encouraging off peak charging and explore cost-effective means to achieve these benefits.

ACTION #10 – Gauge commercial electrical customers' interest in installing EV charging equipment at their businesses, and encourage all plug-in owners to inform Manitoba Hydro of their location, and where they usually plug in, to help Manitoba Hydro closely monitor those zones and ensure effective load management.

The Manitoba Hydro Act will play an important role in shaping the future development of public charging infrastructure ownership and billing. Section 15.2 of *The Act* specifies that Manitoba Hydro is the only entity allowed to engage in the “retail supply of power” within the province. Section 14 of Regulation 186/90 is even more explicit and restrictive, not permitting a parking lot owner to purchase electricity from Manitoba Hydro and then allow it to be “used by or for the benefit of any other.” This restriction on even the pass-through of electricity to a parking stall user will need to be addressed prior

to any efforts to encourage parking lot owners to develop EV charging-friendly facilities. Three approaches were identified that could address the current restrictions under the Regulation and Act:

- A. Implement a new regulation under *The Manitoba Hydro Act* to clarify circumstances and conditions under which a Manitoba Hydro customer can provide electricity generated by Manitoba Hydro to another user. This pro-active step would be the simplest to implement and the most practical to administer, and is recommended.
- B. Modify *The Manitoba Hydro Act*. This would also require the above change in regulation, but also has the potential to open up debate on Manitoba Hydro's retail monopoly in general.
- C. Maintain status quo and allow individual proponents to seek "written permission" from Manitoba Hydro under Section 14 of Regulation 186/90. Given the number of potential requests, this would be difficult to track and enforce. Due to the expected administrative burden this would create, this option is not recommended.

ACTION #11 – Implement a new regulation under The Manitoba Hydro Act to clarify circumstances and conditions under which a Manitoba Hydro customer can provide electricity generated by Manitoba Hydro to another user.

By pre-building the capability to readily install EV chargers into new homes or parking facilities as a part of their construction, the complexities and costs of future installations will be greatly reduced. The next revision of the National Building Code is scheduled for 2015. The National Research Council (NRC) is currently in the process of reviewing the building code in terms of its compatibility with the needs of current and future EV owners. Changes will be made at the national level and will filter down to the Manitoba Office of the Fire Commissioner. Although it would be possible to amend existing provincial building codes before 2015, it is not common practice to make amendments prior to the scheduled date, especially if related modifications are being planned at the national level. The best approach to modifying the code is to influence the NRC to institute changes at the national level. By ensuring that a solid charging network exists at the residential and commercial/fleet level, there is an opportunity to reduce the need for expensive public charging stations.

ACTION #12 – Work with the NRC to influence building code changes that will promote the development of a comprehensive EV charging infrastructure, and ensure that building codes pertaining to new construction and reconstruction / renovation are updated as appropriate to support widespread adoption of electric vehicles in Manitoba.

Objective: To capture economic opportunities in Manitoba relating to electric transportation

Thompson is an established centre of excellence for cold and winter weather testing meeting the needs of a variety of industrial clients in the automotive, diesel, aviation, heavy equipment, and recreation vehicles sectors. World class, state-of-the-art cold weather testing and research facilities have recently been established for aerospace engine testing, and several top-tier automotive manufacturers currently undertake extensive cold weather testing operations in Thompson. As automakers embrace electric transportation, and the interest in evaluating cold weather impacts relative to EV functionality expands, a significant opportunity exists to further attract EV supply chain manufacturers and researchers to northern Manitoba.

ACTION #13 – Collaborate with Thompson Unlimited (Thompson’s development corporation) to identify opportunities for promoting and supporting cold weather testing operations with a view to drawing more EV-related industry to northern Manitoba.

Initiatives recently launched under Manitoba’s Electric Vehicle Road Map include the creation of an Electric Vehicle Technology & Education Centre (EVTEC) at Red River College as well as the collaborative development of an all-electric transit bus and charging system. EVTEC is intended to enhance Manitoba’s training programs to better prepare students for the future of the automotive industry and establish Red River College as a Canadian leader in electric-vehicle testing and research. Leveraging New Flyer’s experience in building hybrid and hydrogen fuel-cell buses, Mitsubishi’s leading-edge lithium-ion battery technologies, Manitoba Hydro’s grid-management knowledge and Red River College’s instructors and students who can assist in solving the technological challenges coming from the project, the electric bus is an initiative aimed at developing and demonstrating a prototype all-electric transit bus by mid-2012 and proving that this technology is viable in the heavy-duty transit market.

ACTION #14 – Build on the electric transportation assets and experience already established in Manitoba to realize commercial opportunities focusing on manufacturing, assembly, research and intellectual property.

Agreements established with Mitsubishi Motor Sales of Canada, Toyota Canada, Nissan Canada, and General Motors Canada (pending) form the basis for mutually advantageous “plug-in partnerships” with leading automakers. Underlying purposes are to demonstrate real-world EV operation, raise public awareness of electrified transport, and promote Manitoba’s advantages as a location for business development, including opportunities in the development, testing, and, potentially, manufacturing of electric vehicle technologies.

ACTION #15 – Continue to partner with electric vehicle manufacturers through agreements to deploy electric vehicles and gather vehicle and battery performance data in the Manitoba environment and enhance the profile of electrified transport.

Objective: To facilitate skills and knowledge upgrading in Manitoba relating to EV technologies

The development and introduction of new technology requires broad transfers of new knowledge and skills. Education and training programs centred around EV technologies are particularly essential for skills upgrading throughout Manitoba's automotive-related workforce and first responder communities. An opportunity exists to collaborate with key stakeholders such as the Manitoba Motor Dealers' Association, Canadian Automobile Association (CAA Manitoba), National Fire Protection Association Canada, and Manitoba trade / technical / community colleges in support of educational programming intended to ensure an adequately trained workforce throughout the province.

ACTION #16 – Assess the opportunity to invest in technical information and worker transition assistance needed to rapidly train plug-in service technicians and encourage plug-in curricula in trade / technical / community colleges.

ACTION #17 – In collaboration with the Office of the Fire Commissioner and fire and paramedic services throughout Manitoba, ensure that first responder safety training for fire, police and paramedic personnel incorporates up-to-date curricula and training specifically in relation to hybrid and electric vehicle powertrains.

Manitoba universities and colleges also have a role to play in understanding a broad range of implications arising from the anticipated modal shift to electric transportation and in developing approaches, tools and intellectual property designed to facilitate this transition.

ACTION #18 – Promote participation by Manitoba universities and colleges in EV-related technology development, charging technology development, and modeling electrical grid and transportation impacts in order to stimulate the creation of high-value intellectual property.

MANITOBA POLICY FRAMEWORK for ELECTRIC VEHICLES

GUIDING PRINCIPLES

1. A near-term focus on policy development will help mitigate substantial uncertainty concerning the evolution of electric transportation.
2. Technology neutrality will be maintained.
3. A shared and balanced private / public sector commitment will support optimal implementation of policies.
4. Convergence of several individual policies and programs will promote overall policy success.
5. Stakeholder interests must be balanced within a portfolio of policies and programs.
6. Policies will be designed to be as cost effective as possible.
7. The ability to measure and assess impact will be considered an important aspect of policy and program design.
8. Inter-jurisdictional and inter-agency alignment of policies and programs wherever practical will be pursued.
9. Federal government program opportunities will be leveraged where available and beneficial.
10. Policies and programs must not promote vehicle ownership to the detriment of alternative sustainable transportation means, including public transportation, walking and cycling.
11. Timely action by Manitoba will be critical given that multiple jurisdictions around the world are jockeying to secure a leadership position in the global market for electric transportation.