Submission to Ministry of Environment and Climate Change Strategy

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Re: Clean Growth Intentions Papers Discussion 1 – Zero Emission Vehicles

The Province has invited responses to the Clean Growth Intentions Papers published in advance of the long-term clean growth strategy planned to be released in the fall.

This response has been submitted on behalf of Electron Communications, through which I chronicle the Canadian plug-in electric vehicle (EV) market and offer advisory services. The submission has been informed by my study of the Canadian EV market over the past six years, which includes, but it not limited to:

- an open-access spreadsheet tracking monthly Canadian electric vehicle sales; ¹
- an analysis of the impact of the loss (and return) of Clean Energy Vehicle rebates on plug-in electric vehicle sales in British Columbia in 2014-15; ii
- an analysis on the impact of the curtailment or loss of purchase incentives for luxury electric vehicles (the Tesla Model S and Model X) in British Columbia, Ontario and Quebec since 2016; iii
- research undertaken by Simon Fraser University’s Sustainable Transportation Action Research Team (START) and other organizations; iv
- membership in plug-in electric vehicle advocacy organizations such as the Vancouver Electric Vehicle Association and Electric Mobility Canada;
- media interviews, including fielding talk show radio calls from non-EV-driving British Columbians angry over electric car owners not paying a share of road and transit taxes;

- recent work assisting with the province’s Charging Solutions & Incentives program through Plug In BC, an initiative of the non-profit Fraser Basin Council. To avoid conflicts of interest, the submission will not discuss topics relating to the CSI program or Plug In BC’s activities.

The opinions advanced in this submission are solely those of Electron Communications; they are unlikely to represent the opinions of any other individuals or organizations, listed above or otherwise.

**Proposed Framework**

Electron Communications proposes that the Province encourage the use of clean light-duty vehicles (passenger vehicles) through the framework of policies that are:

1) informed by climate science
2) informed by demographics
3) cost-effective
4) intentional

Each line item will be discussed in turn, and for the purposes of discussion, zero emission vehicles (ZEVs) will be assumed to encompass plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs) and fuel cell vehicles (FCVs).

1. **Policy support informed by climate science**

The author will defer to the expertise of climate scientists on the levels of zero emission vehicle (ZEV) market share necessary for British Columbia to achieve science-based emissions targets. These will likely be more stringent than politically-negotiated aspirational targets, which are themselves likely to be more stringent than currently-politically feasible targets.

Where the policy proposals below are not in accordance with the emissions-reduction requirements established by climate science, the author would recommend that the proposals be adjusted accordingly.
One consequence for policy informed by climate science is that in the next five to ten years, a ZEV mandate (which will affect a small but growing fraction of an automaker's sales) may not reduce passenger vehicle emissions as much as significant improvements in internal combustion (if automakers deploy these widely across their product lines). The technologies behind the Nissan Note e-Power, Mazda's SkyActiv-X and Achates Power’s opposed-piston engine could reduce fleet emissions significantly if widely deployed; given trucks’ popularity, incremental improvements in their engine efficiency could do so as well. In the end, the climate doesn't care about ZEV market share so much as it cares about reduced transportation CO2 emissions.

So while the author is convinced of the need for a ZEV mandate to drive consumer adoption of zero-emission passenger transportation and radically reduce passenger transportation CO2 emissions in the long term, there may be merit to offering a temporary, shorter-term exemption for manufacturers who demonstrate significantly-improved average fleet efficiency – with appropriate penalties if they don’t. Again, the CO2 matters more than the ZEV market share.

2a. Policy support informed by demographics (vehicle types)

The Province has stated an intention to scale back EV rebates once ZEVs attain 5% market share. This could happen before the first plug-in pickup trucks become available for purchase. If the Province were to scale ZEV rebates back before plug-in pickup trucks are available on the market, it risks alienating the many, many British Columbians for whom these are the vehicles of choice.

It is recommended that provincial rebates for ZEVs not be scaled back until at least 12 months after the first plug-in pickup trucks are sold in the province, irrespective of ZEV market share.

2b. Policy support informed by demographics (housing)

Policy support must also be informed by the housing arrangements of the Province's residents. Approximately 45% of British Columbia's households live in multi-unit residential buildings, including nearly two-thirds of households in Metro Vancouver. Installation of charging stations in residential buildings can generally be done only after a ¾ majority of strata members approve a bylaw, and can be significantly more expensive than for single family homes as well.
No policy suggestions will be offered in this letter, however, to avoid potential conflicts of interest with the author’s activities through the Charging Solutions & Incentives program.

2c. Policy support informed by demographics (consumer preference)

Multiple academic studies have shown that while early adopters are enthusiastic about BEVs, mainstream car buyers overwhelmingly prefer PHEVs. Figure 1 presents data from the Canada Zero-Emissions Vehicle Survey (2017) showing that policy levers could significantly increase the proportion of car buyers who would purchase PHEVs (green bar) from roughly 18 to 32 percent.

None of the policy levers raised BEV purchase intention (blue bar) above about 9 percent, from a baseline of 6 percent. Curiously, cheap hydrogen fuel and widespread deployment of infrastructure were able to increase FCV purchase intention (yellow bar) from about 5 percent to 20 percent.

Quebec’s ZEV mandate\textsuperscript{vi} requires automakers to sell an ever-increasing proportion of ZEVs over time. It further requires that a growing portion of ZEV credits come from the sale of BEVs or FCVs. If relatively few car buyers (less than 10 percent) are inclined to purchase BEVs even under highly favourable policy scenarios, unintended market distortions could ensue.

It is therefore recommended that if BC introduces a ZEV mandate, it not include a Quebec-style requirement for BEVs or FCVs.
3. **Policy support that is cost-effective**

Cost-effective policies make the best use of limited public funds. They also reduce the intensity of backlash from voters who oppose the policies.

To make British Columbia’s purchase rebates as cost-effective as possible, it is suggested that:

a) rebates be limited to one per driver (or household)

   EV owners extolling the superior driving experience of electric propulsion often claim they will never go back to combustion. The author, a PHEV owner, concurs. Since an EV owner is highly unlikely to return to combustion vehicles or even conventional hybrids, they should not be eligible for additional rebates through the CEV for BC program, which offers rebates of up to $5000 for ZEVs. After all, they are highly likely to purchase ZEVs irrespective of the rebate. It would be more cost-effective for rebates to be reserved for drivers who are new to ZEVs.

Limiting rebates to one per driver also avoids the situation of luxury car collectors receiving multiple rebates for vehicles they will leave in showrooms.
b) standardizing on the same rebate for all ZEVs

Recent research suggests that PHEVs can electrify as many annual vehicle kilometres travelled as BEVs.\textsuperscript{vii} This will be particularly true in British Columbia, where annual vehicle kilometres travelled were last estimated at 13,000 km/year, or 35 km/day.\textsuperscript{viii}

Even allowing for PHEVs’ occasional use of gasoline, the GHG intensity of lithium ion battery production\textsuperscript{ix} means that lifecycle emissions for a PHEV with a 10 kWh battery could be below those of a BEV with a 60+ kWh battery.

In light of Vancouver’s role as the cradle of the modern fuel cell industry, an increased rebate for fuel cell vehicles could be considered. The Vancouver Economic Commission recently estimated it was responsible for $220 million of revenue in 2015.\textsuperscript{x} The province has also noted its expansion of hydrogen fuelling infrastructure in the Metro Vancouver region.

4. Policy support that is intentional

Policy support should be deliberate, with thought given to unintentional consequences that could result from policy decisions. To that end, it is recommended that:

a) ZEVs \textbf{not} be exempted from PST

It is understandable that the Province would seek to make ZEVs more attractive by exempting these from PST. This would have the effect of providing more benefit to buyers of more expensive ZEVs. Doing so is unlikely to be the Province’s intention.

Instead of exempting ZEVs from PST, it is recommended that the Province increase funding allotments to purchase rebates and other policy tools.

(The funds should not be used to increase the per-vehicle rebates – that would unintentionally reward British Columbians who were slower to purchase ZEVs – but to increase the number of British Columbians who could benefit from such programs.)

b) ZEV owners be levied an annual road tax

A common complaint of conventional vehicle owners is that ZEV owners do not pay their fair share of road (and where applicable, transit) taxes, as they do not purchase gasoline. It is unlikely that the province is providing ZEV owners this benefit intentionally.
It is fair for all drivers to contribute to the upkeep of roads (and where applicable, mass transit). To that end, it is recommended that the Province develop a method by which ZEV owners can pay road taxes; when they renew their auto insurance each year, for example.

Creating a mechanism by which ZEV advocates can pay their share of road taxes should generate goodwill among non-ZEV drivers, and reduce the likelihood of a voter backlash that causes future governments to cancel or upend the policies currently in place.

**Conclusion**

Electron Communications commends the Province for publishing its Clean Growth Intentions Papers and soliciting public feedback. It proposes that ZEV policy be formulated based on available climate science, demographics, cost-effectiveness and intention.

Much, much more could be asked from a ZEV advocacy perspective; Electron Communications is confident many individuals and organizations will do so, articulately and compellingly. So instead of attempting to move the Overton Window the goal of this submission has been to highlight policy options that would allow the Province to move towards its climate goals while shrinking the risk of an eventual backlash of the type which has happened in Ontario.

It is not enough for one side (here, ZEV advocates) to “win” if their more-numerous neighbours feel like they have “lost”, and the policy proposals above represent an attempt to maintain momentum for the ZEV transition while bringing as many British Columbians into the “win” column as possible. To draw from the African proverb, “if you want to go fast, go alone; if you want to go far, go together”.
i See: tinyurl.com/CanadaEVSales


iv Notable publications from SFU START include Electrifying Vehicles: Insights from the Canadian Plug-in Electric Vehicle Study (July 2015), Canada’s Electric Vehicle Policy Report Card (Nov 2016), and forthcoming papers from the Canada Zero-Emissions Vehicle Survey (2017), data from which were summarized in this GreenCarReports.com article. Still focusing on Canadian car buyers, McMaster University’s How open are Canadian households to electric vehicles? A national latent class choice analysis with willingness-to-pay and metropolitan characterization by Ferguson et al. merits consideration, as does Pollution Probe’s recent Decarbonizing Transportation in Canada report.

v Based on vehicle registration data, the author’s estimates for ZEV market share among new auto sales in British Columbia from January through June 2018 are 3.0%; ZEV market share in BC in June is estimated to have been 5.7% due to a one-time flood of Tesla Model 3s arriving to Canada.


vii https://www.nature.com/articles/s41598-017-16684-9

viii StatsCan, Canadian Vehicle Survey: Annual – 2009. Accessed at: https://www150.statcan.gc.ca/n1/pub/53-223-x/53-223-x2009000-eng.htm For vehicles under 4.5 tonnes in British Columbia in 2009, Table 4-1 has 33,310.1 million km travelled, and Table 3-1 enumerates 2,583,861 such vehicles. This makes for an average of 12,900 km/year per vehicle.

ix Estimated at 140 kg CO2/kWh by Kim et al, Cradle-to-Gate Emissions from a Commercial Electric Vehicle Li-Ion Battery: A Comparative Analysis, Environ. Sci. Technol. 2016, 50, 7715–7722. A 50 kWh difference between a PHEV and BEV would then represent the equivalent of an extra 7 tonnes CO2 during manufacturing. The difference would be reduced after accounting for the manufacture of the PHEV’s combustion system. Still, the PHEV could likely emit several tonnes of CO2 through combustion before its lifecycle emissions exceed those of the BEV – perhaps 10,000 km of combustion-based driving or more.