SFU

Electrifying Vehicles

Insights from the Canadian Plug-in Electric Vehicle Study

Executive Summary

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Simon Fraser University

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ELECTRIFYING VEHICLES

The Canadian Plug-in Electric Vehicle Study

Electric-mobility may be a key component in a successful transition toward deep greenhouse reductions. However, widespread uptake and use of plug-in electric vehicles will involve meaningful shifts in social and technical systems. This report considers the potential market for plug-in electric vehicles in Canada's passenger vehicle sector and investi-gates how consumer interests may guide such shifts.

About Us

The Energy and Materials Research Group (EMRG) is a research group directed by Dr. Jonn Axsen and Dr. Mark Jaccard in the School of Resource and Environmental Management (REM) at Simon Fraser University (SFU). EMRG is comprised of faculty, adjunct professors, full-time research associates and graduate students; it collaborates closely with external researchers and consultants. EMRG focuses on the analysis of technologies, strategies, behaviour and policies that lead to a more sustainable flow of energy and materials in society.

Dr. Jonn Axsen leads the EMRG Sustainable Transportation Research Team, which focuses on the transition to lower impact transportation systems. The Team takes a unique interdisciplinary research approach, combining elements of economics, engineering, marketing, policy and psychology into the analysis of sustainable transportation solutions. The Team actively engages stakeholders in the debate around sustainable shifts in our transportation system and provides robust analyses to support sound, evidence-based business and policy decisions.

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Abstract

Electric-mobility may be a key component in a successful transition toward deep greenhouse-gas (GHG) reductions. This report considers the potential market for plug-in electric vehicles (PEVs) in Canada's passenger (light-duty) vehicle sector.

We consider two broad categories of PEVs: plug-in hybrid electric vehicles (PHEVs) that can be powered by grid electricity or gasoline, and pure battery electric vehicles (BEVs) that are powered solely by electricity. To investigate how consumer interest in PEVs may guide shifts in technology and behaviour, we engage a sample of Canadian new vehicle buyers and British Columbian PEV owners in a mixed-mode survey and interview process. Data collected for this study comes from two distinct surveys: the 2015 Plug-in Electric Vehicle Owners Survey (PEVOS, n = 94) and the 2013 New Vehicle Owners Survey (NVOS, n = 1754).

For both, a multi-method survey and interview process collected in-depth information from each respondent, including: background information such as vehicle ownership, electricity use, familiarity with PEV technology, and personal values and lifestyle; vehicle travel behaviour; access to vehicle charging at home and elsewhere; interest in purchasing a PEV under different conditions; interest in green electricity; and openness to enrolling in a utility controlled charging (UCC) program to increase the uptake of intermittent renewable energy sources.

Through this survey data, we identify three groups of PEV buyers: PEV Pioneers (current PEV owners), the potential Early Mainstream buyers (next PEV buyers) and Later Mainstream buyers (not PEV buyers).

This report summarizes several key results for the potential PEV market in Canada, including:

- PEV Pioneers tend to be of higher income and education and are more engaged in environment- and/or technology-oriented lifestyles, relative to Mainstream respondents.
- Most Mainstream respondents have little familiarity with PEVs, and are particularly confused about the concept of a PHEV.
- Two-thirds of Mainstream respondents already have Level 1 recharge access at home.
- Only 20—33% of Mainstream respondents are aware of public chargers, but awareness does not seem to influence PEV interest.
- About one-third of potential Mainstream respondents want a PEV—the vast majority want a plug-in hybrid (PHEV) rather than a pure electric vehicle (BEV).
- Different PEV models are associated with different symbols; all are associated with being pro-environmental, while the Tesla is more associated with images of style and success.
- Mainstream and Pioneer respondents differ considerably in terms of motivations for PEV interest, e.g. exploring new technology, seeking environmental benefits, or realizing savings.

Abstract (cont'd)

- Potential Mainstream usage of PEVs could vary widely by province, where electricity demand could range from 6.8 to 8.7 kWh/day per vehicle. In all provinces, however, uncontrolled demand will peak around 5PM to 6PM.
- With today's electricity grids, usage of PEVs can cut greenhouse gas emissions by 80—98% in British Columbia, around 45% in Alberta, and 58—70% in Ontario.
- With the current supply of PEVs in Canada (7 models), future PEV new market share is not likely to exceed 4—5% by 2030; increasing supply (to 56 models) could increase market share to over 20% by 2030.
- Mainstream and Pioneer PEV respondents are generally open to the idea of enrolling in a "utility controlled charging" program, though some are concerned about privacy and the potential for battery degradation.

Executive Summary
Study Overview

Electric-mobility may be a key component in a successful transition toward deep greenhouse-gas (GHG) reductions (Williams et al., 2012). This report considers the potential market for plug-in electric vehicles (PEVs) in Canada's passenger (light-duty) vehicle sector.

We consider two broad categories of PEVs: plug-in hybrid electric vehicles (PHEVs) that can be powered by grid electricity for an initial distance, say 60 km, but are otherwise powered by gasoline until the battery is recharged (e.g. the Chevrolet Volt) and electric vehicles (BEVs) that are powered solely by electricity for a range of 100 to 300 km (e.g. the Nissan LEAF).

Widespread uptake and use of passenger PEVs will involve meaningful shifts in social and technical systems (Sovacool and Hirsh, 2009). To investigate how consumer interest in PEVs may guide such shifts, we engage a sample of Canadian new vehicle buyers and British Columbian PEV owners in a mixed-method survey and interview process.

Data collected for this study comes from two distinct study designs: the **2015 Plug-in Electric Vehicle Owners Survey (PEVOS)** and the **2013 New Vehicle Owners Survey (NVOS)**.

This research report addresses several objectives, including:

- Identifying current and potential PEV buyers and assessing their preferences, motivations, behaviour and lifestyles. (Section 5)
- Assessing consumer awareness and understanding of PEV technology (Section 6).
- Assessing awareness of public charging and access to home charging (Section 7).
- Quantifying consumer demand for different PEV designs (Section 8).
- Assessing if charger awareness influences PEV demand (Section 9).
- Identifying different segments of current and potential PEV buyers according to preferences and motivations (Section 8 and Section 10).
- Characterizing driving and charging patterns among current PEV owners, and potential future buyers (Section 11 and Section 12).
- Modeling the potential GHG impacts of PEV usage in different Canadian regions (Section 13).
- Forecasting PEV new vehicle market share under different market and policy conditions (Section 14).
- Assessing consumer acceptance of utility-controlled charging programs that attempt to use PEVs to support renewable energy (Section 15).

Global Policy Context

Canada and British Columbia are not alone in efforts to stimulate PEV development. The issues of global climate change, local air pollution, oil dependence, and energy security have all been drivers of a renewed political push for PEV deployment in many parts of the world. Several national governments have set ambitious targets for PEV deployment, such as the US (Revkin, 2008), China (Wan et al. 2015) and Canada (Natural Resources Canada, 2010).

PEV success requires policy support, and countries and regions will vary in their use of demand-focused policies (e.g. financial and non-financial incentives, and charging infrastructure deployment) and supply-focused policies (e.g. a zero-emissions vehicle standard or low-carbon fuel standard).

Norway represents a particularly strong example, where PEVs represented over 20% of new vehicle market share in early 2015, thanks in large part to aggressive demand-focused policies such as vehicle tax exemptions, as well as other financial incentives. Many other regions (including 3 Canadian provinces: British Columbia, Ontario and Quebec) have also implemented demand-focused policies; however, most are much less stringent than Norway's policies.

On the other hand, some regions have pioneered supply-focused policies such as a low carbon fuel standard (California and British Columbia) or a zero emissions vehicle mandate (California), which put the onus on vehicle or fuel suppliers to develop the market for PEVs and other low- or zero-carbon vehicles. These supply-focused policies may hold particular potential to boost PEV market shares in North American regions, where very strong demand-focused policy (e.g. large taxes on conventional vehicles) are not likely to be politically acceptable.

Our analyses in this paper (particularly Objective #9 and Section 14) suggest that a combination of demand-focused and supply-focused policies is likely required to induce adoption of PEVs significant enough to achieve deep greenhouse reduction targets, as well as other environmental and energy goals.

Study Design

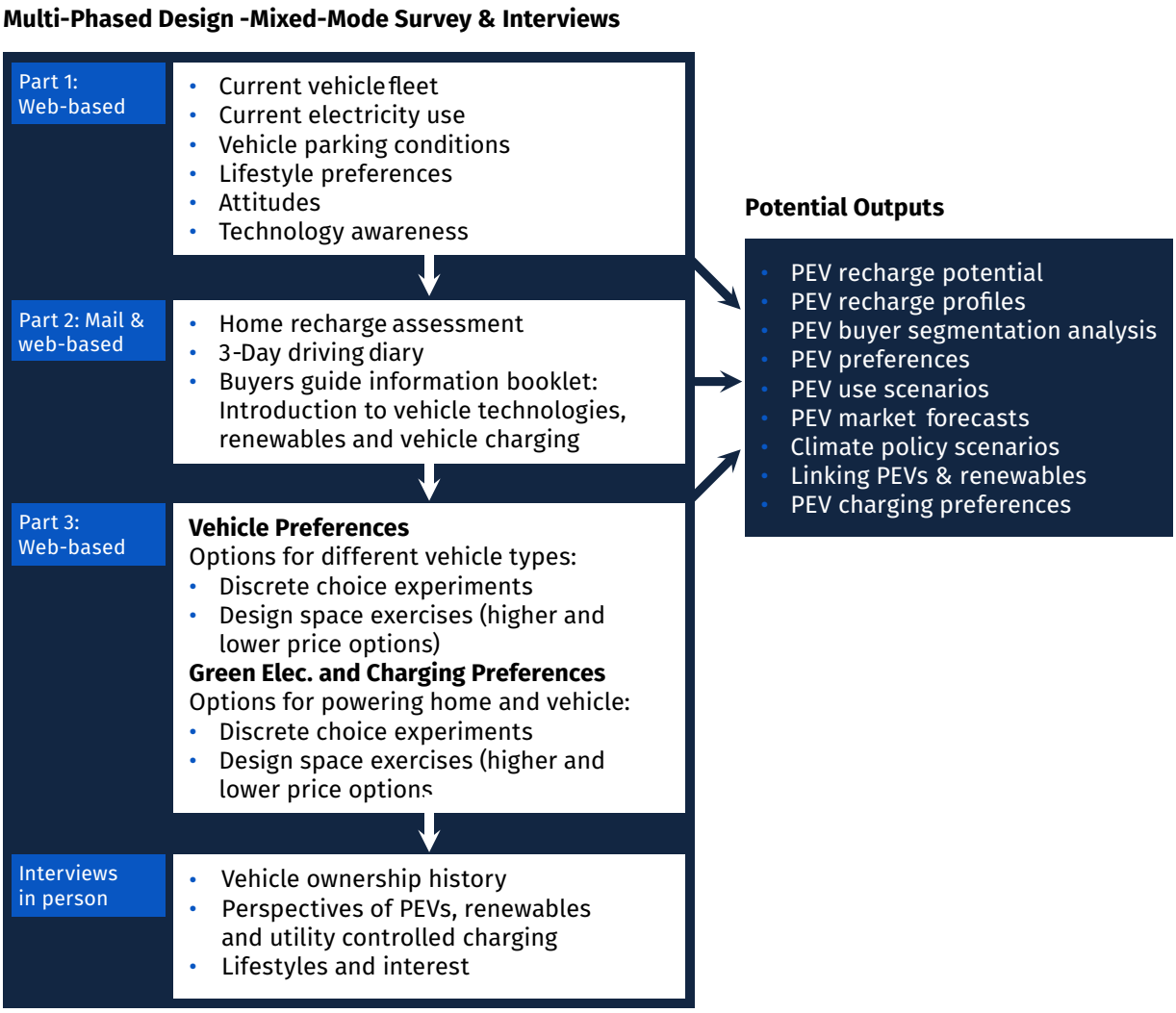
Previous PEV market research can be categorized into three approaches: constraints analyses, rational-actor choice models, and the reflexive lifestyle approach.

The Canadian Plug-in Electric Vehicle Study (CPEVS) follows the reflexive lifestyle approach, which assumes that consumers construct their interests and preferences as they learn about PEV technology, and that these interests may or may not be constrained by present driving patterns and home recharge access—depending on the motivations of the consumer.

We consider three groups of consumers: PEV Pioneers (current owners of PEVs), the Early Mainstream PEV buyers (the segment most likely to buy PEVs in the next 10—15 years), and the Late Mainstream (the segment not likely to buy PEVs in the next 10—15 years). PEVOS collected data from PEV owners, while NVOS collected data from Mainstream vehicle owners.

The study design for both samples started with a three-part survey that included a driving diary, home recharge assessment, discrete choice experiment and design exercises, and for a subsample of respondents was followed with household interviews (Figure E-1).

Figure E-1: Overview of multi-method survey and interview process



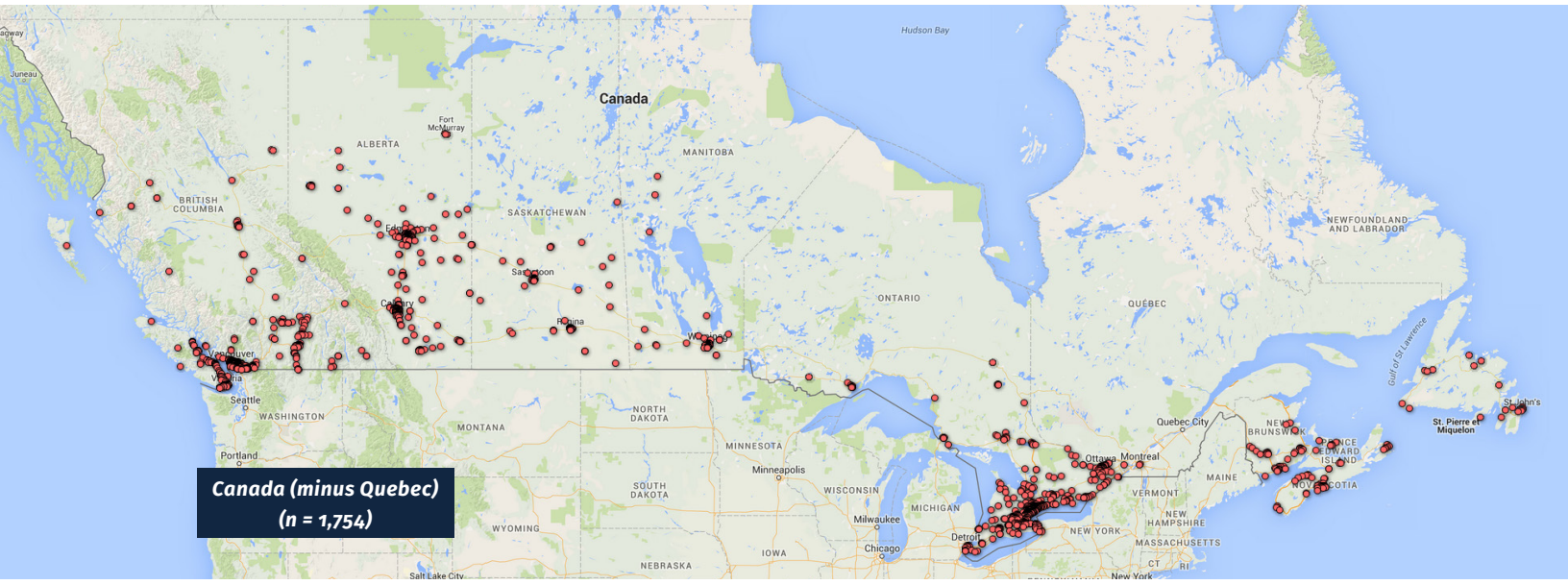
Data Collection

The sample of Mainstream vehicle buyers (NVOS respondents) was recruited by Sentis Market Research in 2013. In total, 1754 respondents completed all three parts of the survey, with 538 respondents from BC (Figure E-2). The full Canadian sample includes all provinces except for Quebec. A diverse subsample of 22 of these households was recruited for semi-structured interviews.

The sample of 94 PEV Pioneer (PEVOS) respondents was recruited from the British Columbia Government's Clean Energy Vehicle Program, the Vancouver Electric Vehicle Association (VEVA) and Emotive BC.

Survey data were collected between June 2014 and February 2015. A diverse subsample of 12 of these households was recruited for semi-structured interviews.

Figure E-2: Geographical representation of the Canadian NVOS sample by postal code (n = 1754)



Results

This report summarizes the key findings from the 10 primary research objectives listed in the Study Overview, drawing from analysis of Mainstream (NVOS) and PEV Pioneer (PEVOS) respondent data. This executive summary provides key highlights for each objective.

Objective #1: Compare PEV Pioneers and Mainstream Buyers

PEV Pioneers (PEVOS respondents) tend to have higher engagement in technology- or environment-oriented lifestyles, and express higher levels of environmental concern than Mainstream buyers (NVOS respondents). PEV Pioneers also have higher education and income; they are more likely to have a graduate degree (30% vs. 11%) and an annual household income greater than $90,000 (67% vs. 33%). Moreover, PEV Pioneers are more likely to be male and to own their own home compared to both Mainstream new vehicle owners and the Canadian Census.

Most of our PEV Pioneer respondents own either the Nissan Leaf (46%), Chevrolet Volt (24%), or Tesla Model S (10%). Tesla owners, in particular, report the highest income and education levels.

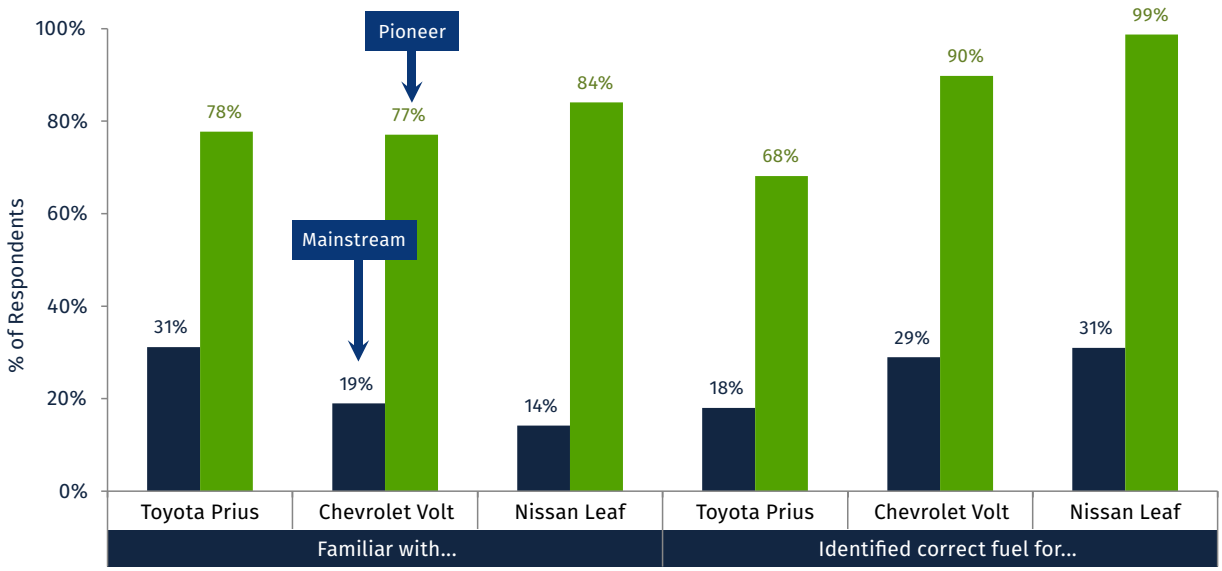
Objective #2: Assess Awareness and Understanding of PEV Technologies

According to the reflexive theory, consumers develop preferences as they learn about new products and technologies. We thus assess the initial awareness of Mainstream and PEV Pioneer respondents to compare each sample's understanding of (or confusion with) PEV technologies.

Through this comparison, we see significant differences in the level of technological awareness between the two samples (Figure E-3). While PEV Pioneers demonstrate considerably high familiarity with major PEV models (77—84%), only a minority of Mainstream respondents were familiar with PEVs (14—31%) and were able to correctly identify how to fuel the Toyota Prius (18%), the Chevrolet Volt (29%), and the Nissan Leaf (31%). Mainstream respondents demonstrated a particular confusion about the idea of PHEVs.

For example, in an interview, Mrs. Park (pseudonym) expressed some confusion with PHEVs, saying "so just to clarify… let's say I didn't have time to charge it and I still had to drive it, it would still drive because it would just default to gas?"

Figure E-3: Comparison of PEV familiarity and refueling between Mainstream (NVOS, n = 538, blue bars) and PEV Pioneer respondents (PEVOS, n = 157, green bars) in British Columbia



Objective #3: Identify Home Charging Awareness and Public Charging Access

PEV charging infrastructure is an important aspect of PEV deployment; however, it is unclear what kind of charging infrastructure is needed to best support PEVs. As a first step, we explore potential access and use of home charging and public charging among the Mainstream and PEV Pioneer samples, highlighting key differences in charging availability.

Among Mainstream (NVOS) respondents, two-thirds presently have Level 1 charging access at home, and 35% have the potential to install Level 2 charging (Figure E-4). One-third of Mainstream respondents in British Columbia have seen at least one public (non-home) charger, compared to only 18% in the rest of Canada (Figure E-5). Higher awareness in British Columbia is likely due to recent efforts to install several hundred public chargers and charger signage.

In contrast, nearly all PEV Pioneers (PEVOS) have access to home charging, with 75% having installed a Level 2 charger. PEV Pioneers were also more likely to be aware of at least one public charger when they purchased their vehicle (86%), though their reported usage of any specific public charger tended to be infrequent (once per month or year).

In interviews, several PEV Pioneers explain that after a brief learning period they discovered that they have little need to use public charging infrastructure.

Figure E-4: Mainstream respondents' residential Level 1 and 2 access by housing type and parking space (British Columbia only, n = 528)

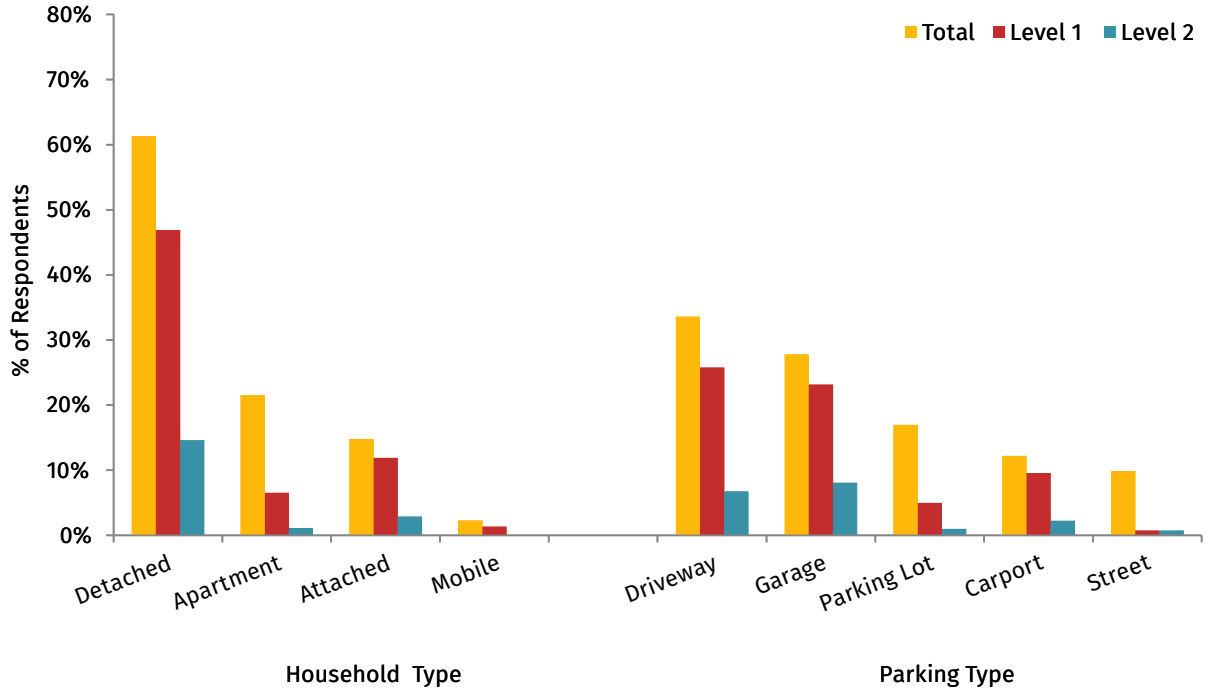
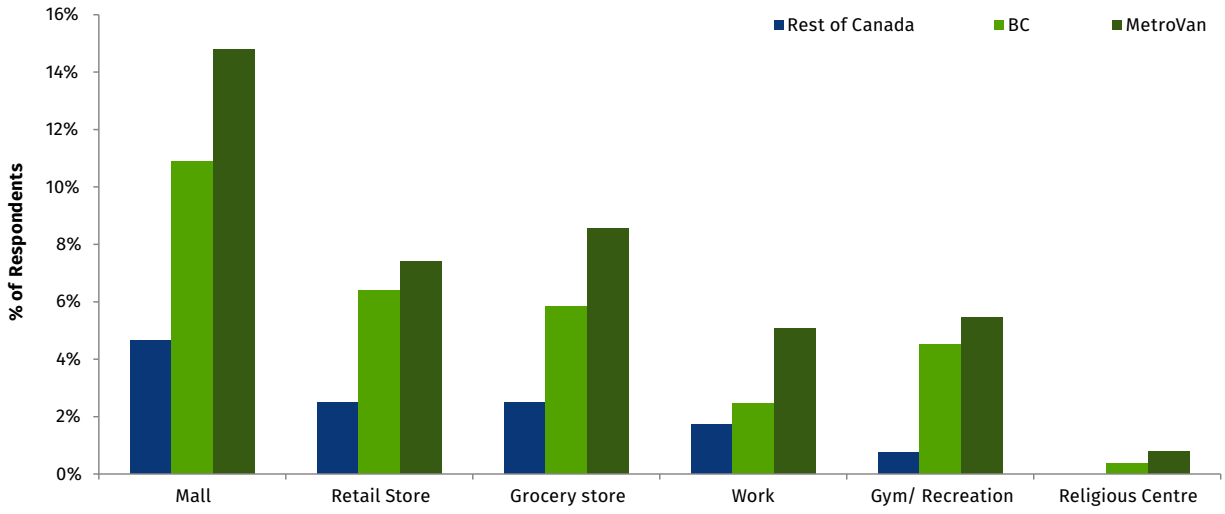


Figure E-5: Mainstream respondents' public charger awareness by location categories; rest of Canada (n = 1207); British Columbia (n = 536) and Metro Vancouver (n = 257); Source: Bailey et al., 2015.



Objective #4: Identify PEV Demand and Dssess Dttribute Valuation

Interest in PEVs and valuation of PEV attributes may help us understand the motivations of PEV pioneers and potentially identify the next likely segment of PEV buyers, the Early Mainstream. We find interesting differences between these two samples in terms of PEV interest, valuations and motivations.

About one-third of Mainstream respondents expressed interest in buying some form of PEV (Figure E-6), and most selected a PHEV over a BEV design (89—93%); we define this sub-sample as the "Early Mainstream." Motivations for PEV interest included driving flexibility (for PHEVs), fuel savings, and pollution reduction. Resistance to PEVs included range limitations (especially for BEVs), reliability concerns, and aesthetic concerns (i.e. PEVs look "strange").

Among PEV Pioneer respondents, almost all would buy another PEV (96—100%). Most (50—70%) selected a BEV over a PHEV design. PEV Pioneers expressed very high valuation of PHEVs and BEVs, as well as PEV attributes including fuel savings, driving range, and Level 2 charging at home. About half of the PEV Pioneer sample reported that their vehicle purchase was strongly influenced by the BC Government's CEVforBC™ rebate.

Motivations for BEV interest (over interest in PHEVs) included improved driving experience, environmental benefits, independence from oil companies, and technological superiority. The number and type of symbols and images that PEV Pioneer respondents associated with their vehicles varied significantly between owners of different PEV models; all models are associated with environmental symbols, but the Tesla Model S is much more likely to represent sportiness or being successful, powerful or exotic (Figure E-7).

Figure E-6: PEV designs selected by Mainstream respondents
(NVOS, British Columbia only, n = 442, higher and lower price scenarios)

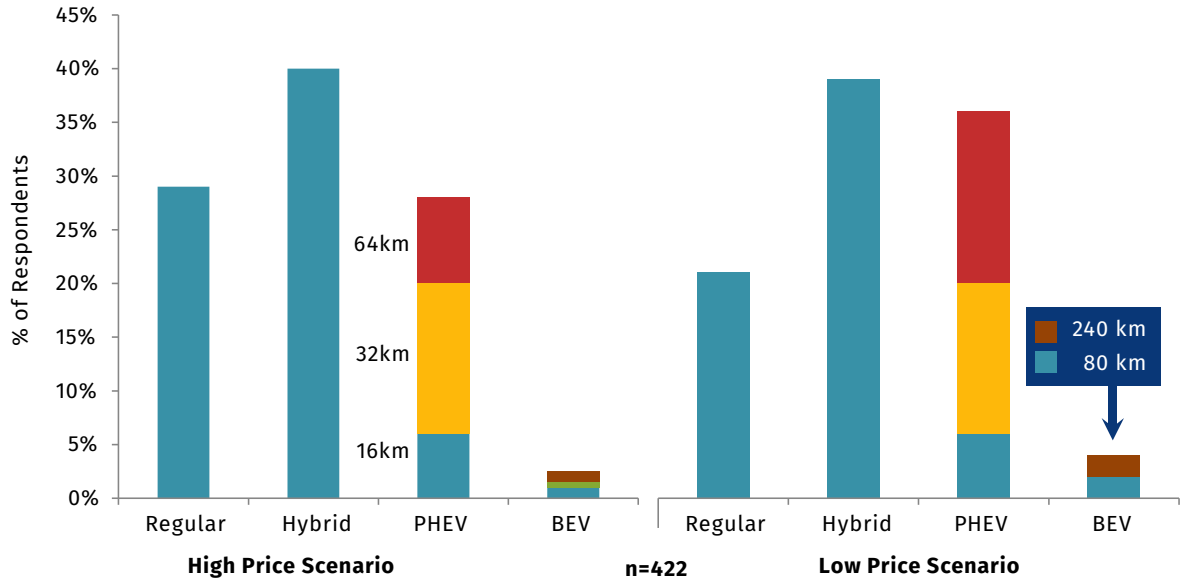
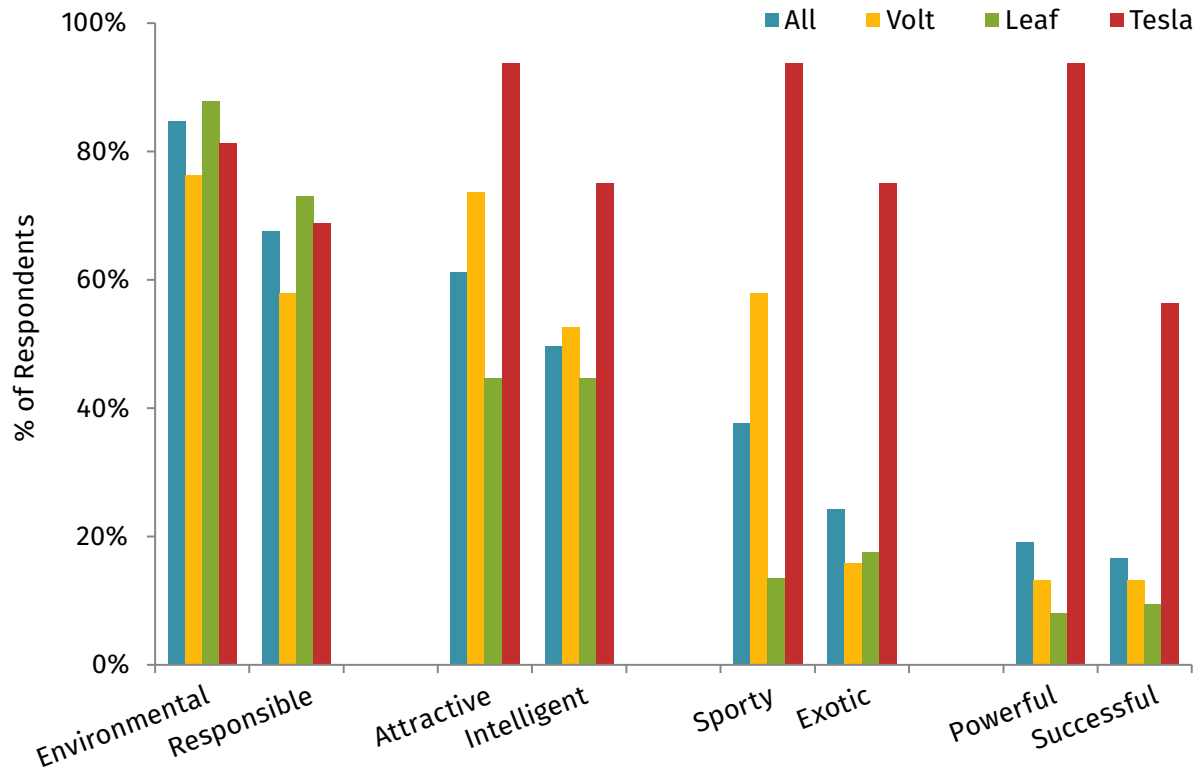


Figure E-7: Reported PEV Pioneer image associations, by PEV owner group (n = 157)



Objective #5: Assess if Charger Awareness Influences PEV Demand

Although there is evidence that the uptake of PEVs may depend on the availability of home charging infrastructure, it is not clear if the visibility of public charging stations actually has an impact on PEV demand. Using Mainstream respondent data from NVOS, we statistically test the associations between public charging visibility and stated PEV interest while controlling for other factors such as socio-demographic variables.

We find that awareness of public charging infrastructure has a weak or non-existent relationship with PEV interest. Instead, the results indicate that having PEV charger access at home is a stronger and more consistent predictor of PEV interest, suggesting that PEV policy ought to prioritize home charging access over public charging deployment.

Objective #6: Characterize Heterogeneity in Preferences and Motives

There is substantial heterogeneity with respect to PEV preferences and motivations among groups of Mainstream new vehicles buyers and PEV Pioneers. We use latent-class analysis to identify five preference-based segments among Mainstream (NVOS) respondents:

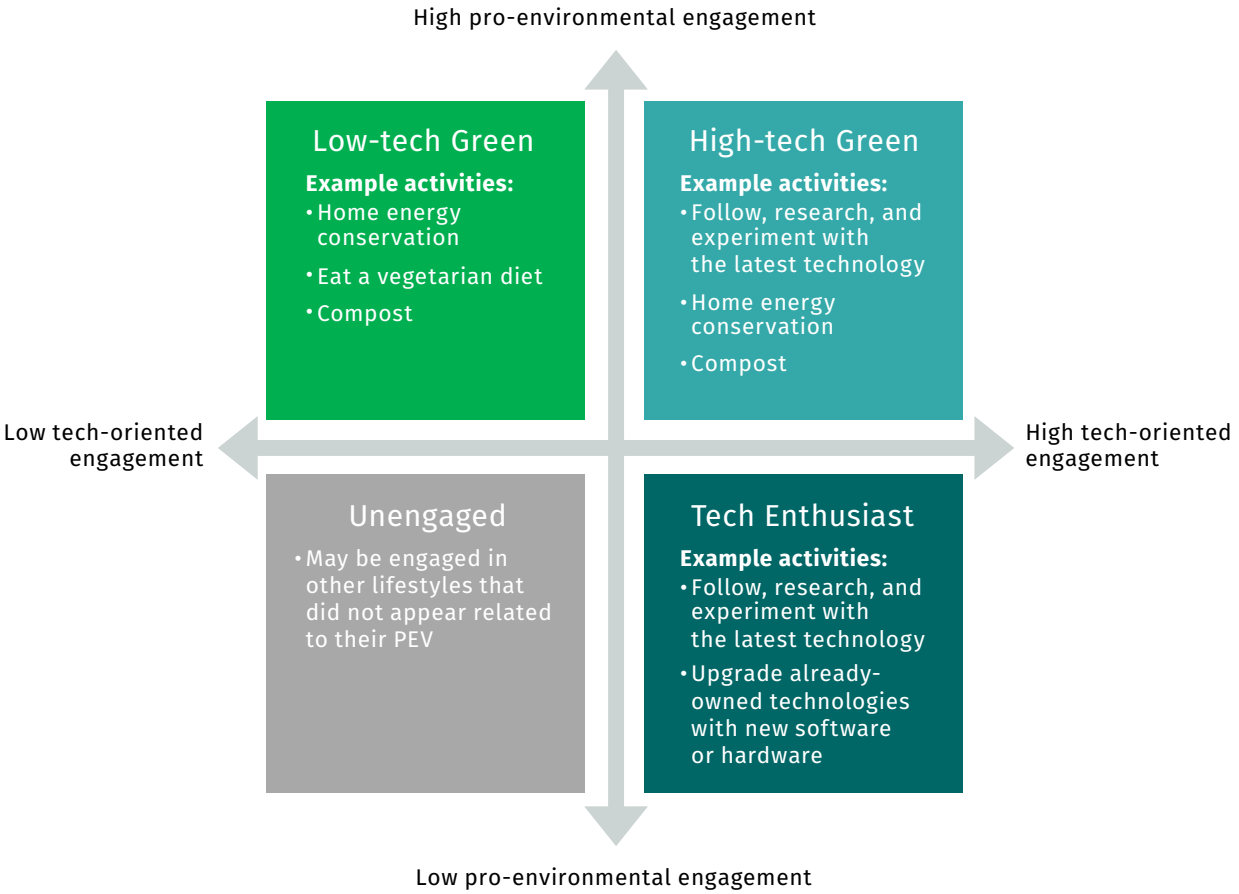
1. The "PEV-enthusiast" class (representing 8% of the sample) place very high value on hybrid, PHEV and BEV designs relative to a conventional gasoline vehicle. This group has high interest in PHEVs and BEVs, but places no significant value on fuel savings.
2. The "PHEV-oriented" class (25% of the sample) has positive and significant valuation of hybrid and PHEV designs, and a negative and significant valuation of BEV designs. This group has high interest in PHEVs and is very conscious of fuel savings.
3. The "Hybrid-oriented" class (16% of sample) prefers hybrid vehicles to other vehicle types, having a mildly positive valuation of PHEVs and a negative valuation of BEVs.
4. The "Hybrid-leaning" class (27%) only has a positive valuation for hybrids, which is smaller than the "Hybrid-oriented class."
5. The "Conventional-oriented" class (23%) has negative valuation for hybrids, PHEVs and BEVs, These respondents have no interest in any vehicle other than a conventional gasoline vehicle.

We also perform a cluster analysis to identify six different segments of Early Mainstream (NVOS) respondents based on their lifestyles. Each segment varies significantly in terms of values and lifestyles, including engagement in environment- and technology- oriented lifestyles.

Interestingly, PEV preferences (i.e. preference for PHEVs) are largely similar across these six Early Mainstream segments, indicating that different consumers may have very different motivations for wanting the same PEV.

There is also substantial variation in PEV interest motivations among PEV Pioneer respondents, including environment- and technology-oriented motives. Using interview data, we constructed lifestyle segments by grouping participants with similar engagement (or disengagement) in environment- and technology-oriented lifestyles (Figure E-8).

Figure E-8: Overview of PEV Pioneer interview lifestyle segments and example lifestyle activities



Objective #7: Characterize PEV Pioneer and Early Mainstream Driving Patterns

Understanding the potential usage of PEVs among current and future PEV buyers can help utilities and governments to anticipate electricity demand. Among Mainstream (NVOS) respondents, the median driving distance for one "driving day" was 36km (mean of 54km). We merged respondents' driving data, recharge access and PEV interest to model potential electricity demand from PEVs (Figure E-9). We constructed three scenarios:

- **Scenario 1:** with current charging access, modeled average daily electricity demand for PEVs is highest for Alberta respondents (8.7 kWh/day per vehicle), followed by respondents in Ontario (8.0 kWh/day) and British Columbia (6.8 kWh/day). Modeled PEV electricity demand is expected to peak around 5—6PM in all three provinces.
- **Scenario 2:** universal workplace Level 2 charging access could increase the proportion of PHEV kilometers that are powered by electricity (by 21% in British Columbia, 14% in Ontario and 5% in Alberta).
- **Scenario 3:** with the adoption of larger battery BEVs (with 240km of range) and universal Level 2 charging access at home and work, daily electricity demand could be substantially higher per vehicle (77% higher in British Columbia, 57% in Alberta, and 79% in Ontario).

Among PEV Pioneer respondents, the median driving distance for one "driving day" was 45 km (mean of 59km). Median "driving days" varied across owners of the Nissan Leaf (37km), the Chevrolet Volt (45km) and the Tesla (39km).

Interview participants indicated that they tend to increase the number of trips they make since purchasing a PEV due to three main reasons: reduced operating costs, interest in further using the technology, and "feeling better" (or less hypocritical) about driving a PEV relative to a conventional gasoline vehicle. Analysis of survey data indicates that about two-thirds of PEVOS respondent charging events occur at home (Figure E-10).

Figure E-9: Electricity demand profiles under three scenarios in British Columbia (n = 201; 603 diary days)

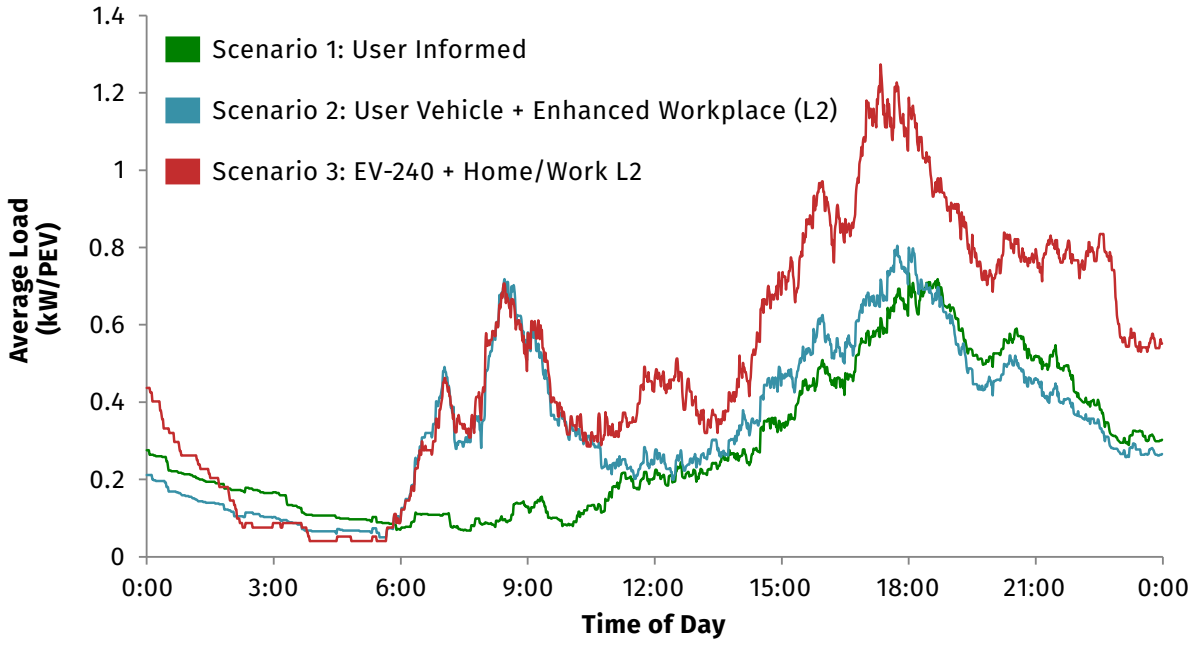
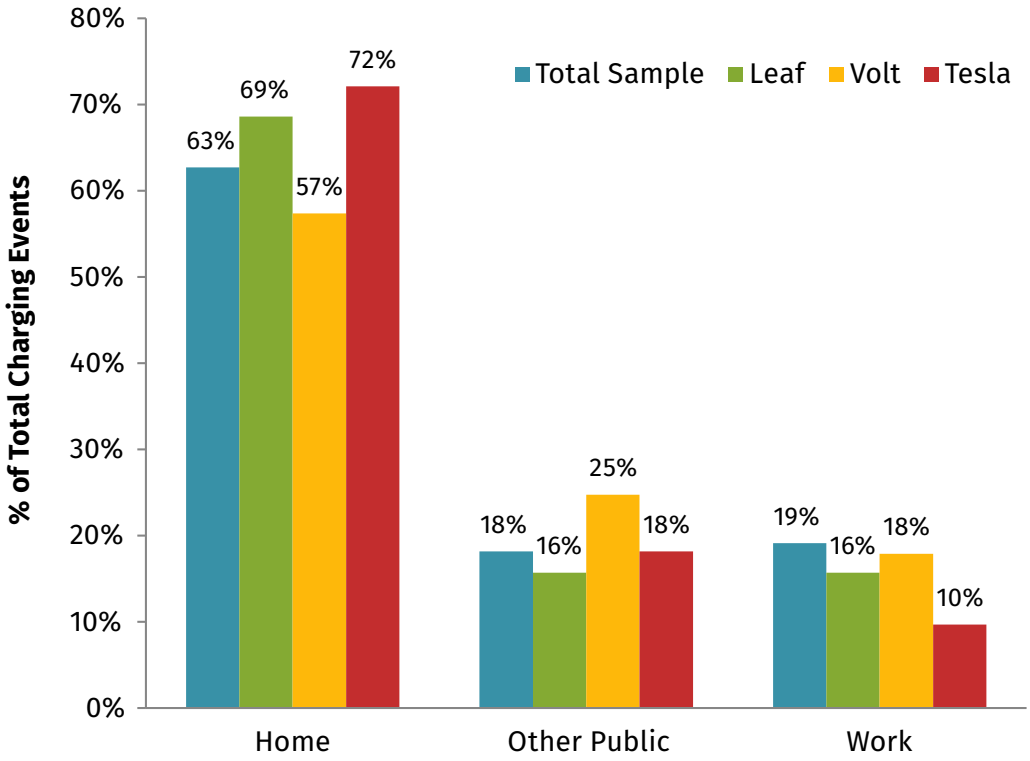


Figure E-10: % Total PEV Pioneer respondent charge events by location (Leaf, n = 312; Volt n = 190; Tesla, n = 165)



Objective #8: Model the Potential GHG Impacts of PEV Usage in Canada

One important benefit associated with PEVs is the ability to reduce GHG emissions relative to conventional gasoline vehicles. However, electricity grids in most regions include some amount of GHG emissions, depending on the sources of electricity.

We use Early Mainstream respondent data to build consumer-informed models that represent potential well-to-wheels GHG impacts among PEV buyers in British Columbia (a hydro-based grid), Alberta (a fossil-fuel based grid), and Ontario (a mixed grid).

Our findings show that (Figure E-11, using a "marginal" approach to GHG emissions attribution):

- **Scenario 1:** with respondent-selected PEV designs (mainly PHEVs) and existing charging access (the "User-informed" scenario), PEVs can cut well-to-wheels GHG emissions by 79% in BC, 44% in Alberta, and 58% in Ontario, relative to conventional gasoline vehicles.
- **Scenario 2:** with enhanced access to workplace charging (leading to more daytime charging), GHG emissions reductions are about the same as in Scenario 1.
- **Scenario 3:** with enhanced charger access and universal BEV-240 adoption, emission reductions are even more substantial in British Columbia (98%) and Ontario (70%), but not much different in Alberta (relative to Scenario 1).

Objective #9: Forecast PEV Market Share

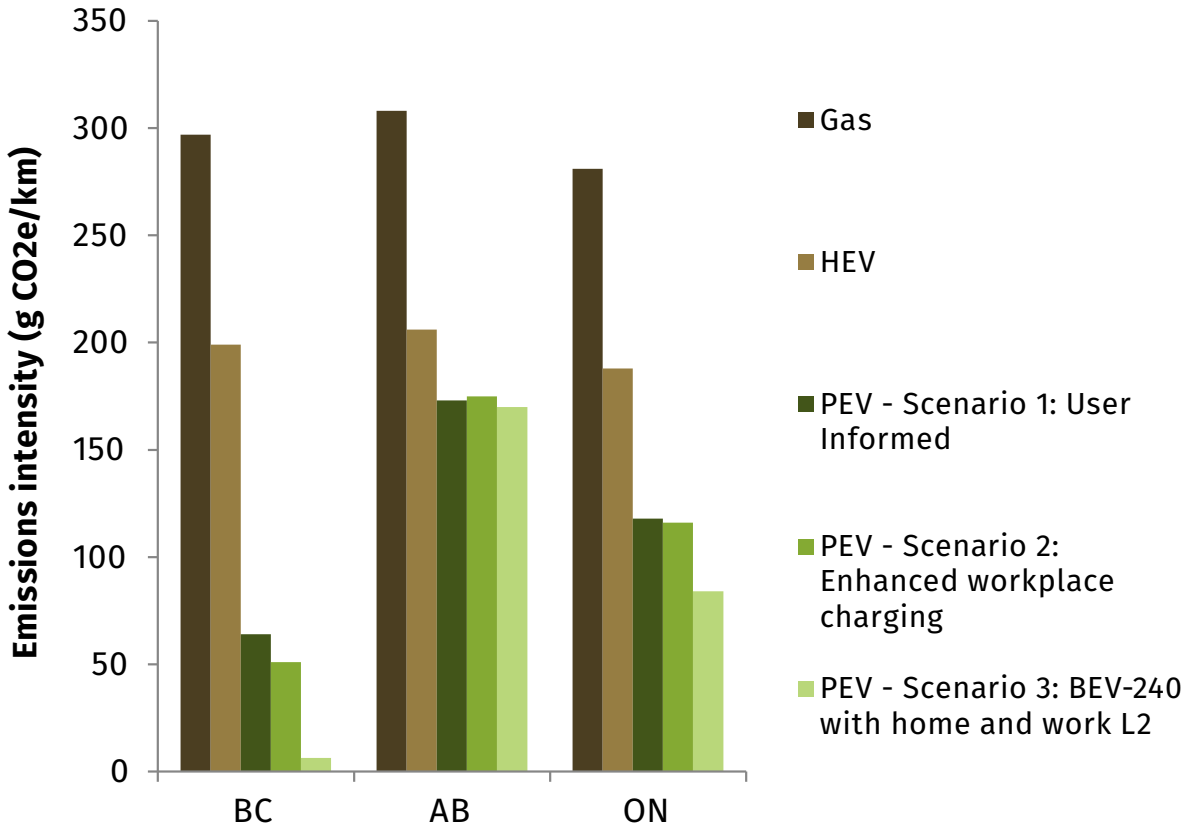
Forecasts of PEV sales (in terms of new passenger vehicle market share) can vary widely—e.g. from 1% to 28% in 2020, and from 1% to 70% in 2030. Here we use the data and analyses (including the analyses presented above) from the NVOS survey to construct a PEV market share forecast model for British Columbia.

Specifically, we build a "constrained choice model" that simulates consumer preferences as well as real-world constraints such as PEV model variety and availability, and lack of consumer awareness. Our findings show that in British Columbia, unconstrained demand (or "latent demand") for PEVs translates to a 32% new market share by 2020 (as described in Objective #4 above); however, various constraints bring this forecast down to 1% (Figure E-12).

With the current supply of PEVs in Canada (7 models), 2030 new market share is not likely to exceed 4—5%; while increasing supply (to 56 models) could increase that share to over 20% (Figure E-13).

This analysis makes the case for the importance of having both demand-focused PEV policies that encourage consumer adoption of PEVs (such as financial and non-financial incentives) as well as supply-focused policies that require automakers to increase the availability and variety of PEV models (e.g. like California's Zero Emissions Vehicle Mandate).

Figure E-11: Emissions intensity of plug-in electric vehicles, well-to wheels grams CO2e/km (using hourly marginal emissions factors for electricity, including regional electricity trade)



Notes: Gas = gasoline vehicle; HEV = conventional hybrid-electric vehicle (e.g. Toyota Prius); PEV Scenarios 1—2 = respondent designed PEV adoption and varied charging access; PEV Scenario 3 = wide-scale 240 km BEV adoption and Level 2 charging access at home and work.

Figure E-12: Impact of constraints on PEV sales in British Columbia, 2020

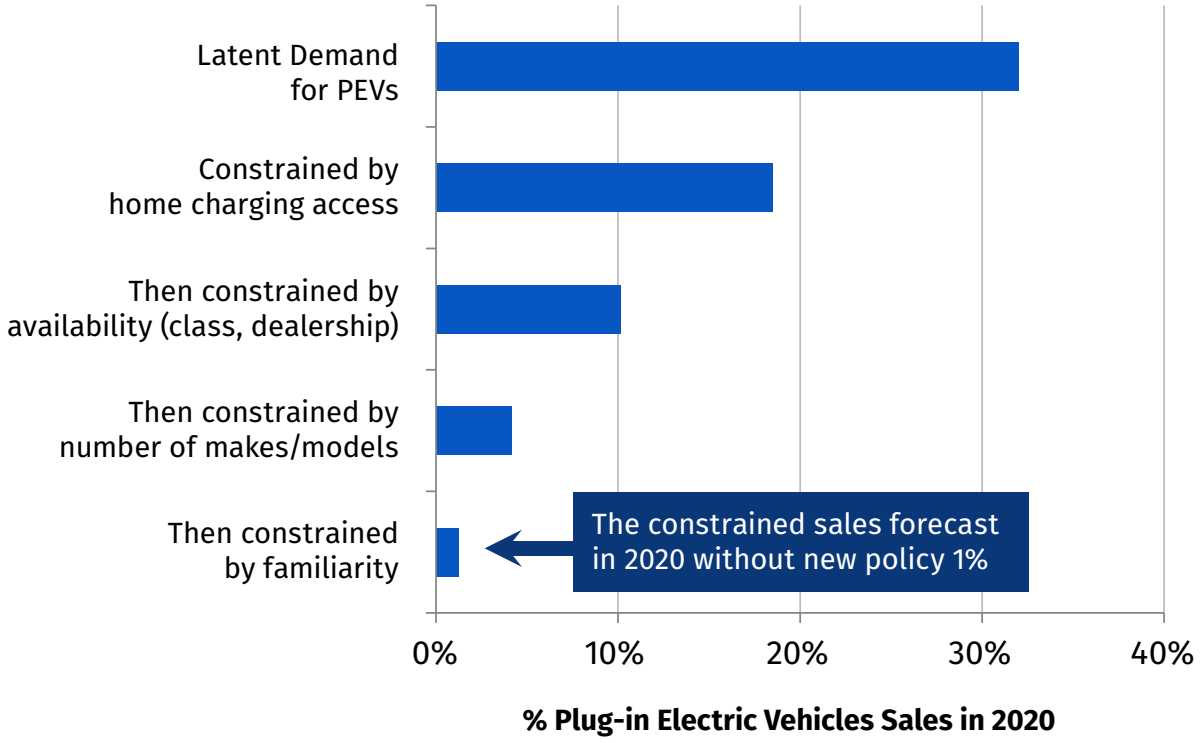
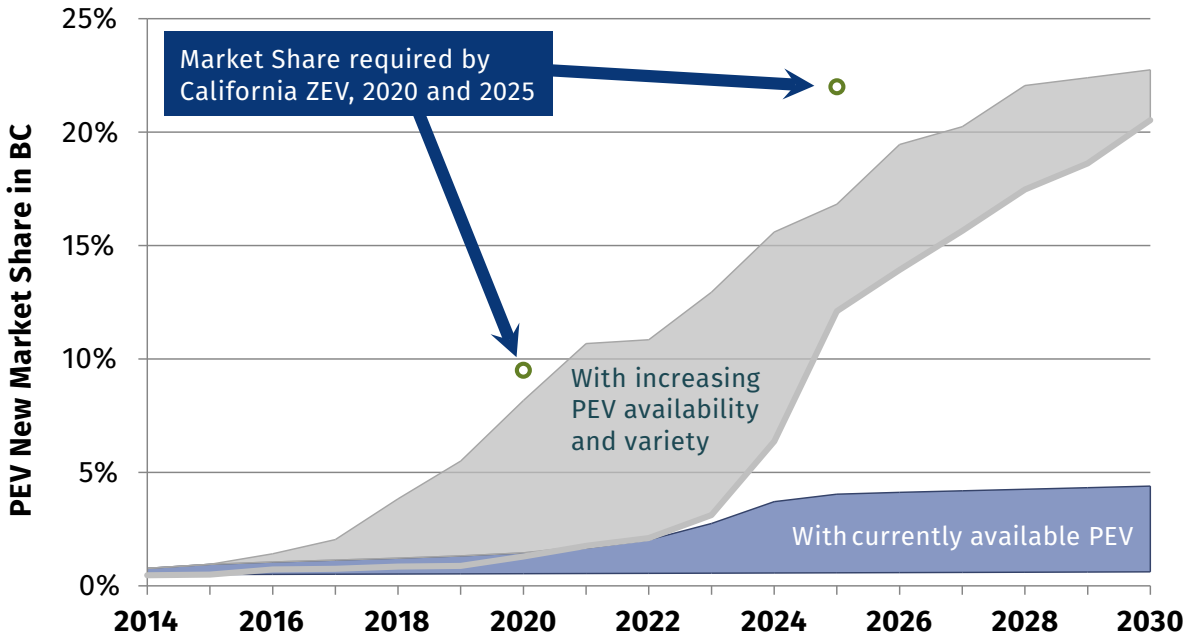


Figure E-13: PEV new market share scenario forecasts (for passenger vehicles in British Columbia)



Objective #10: Assess Consumer Acceptance of Utility-Controlled Charging

"Utility controlled charging" (UCC) could be an important method to control the timing of PEV charging to reduce environmental impacts, increase the use of renewable energy, and potentially reduce grid costs.

We explore respondent acceptance of various UCC programs, finding that among Mainstream (NVOS) respondents, awareness and understanding of electricity sources and the idea of UCC is very low.

Once explained, there is general openness to UCC programs, where probability of enrollment is higher with decreased electrical bill, increased proportion of renewable electricity, and increased "guaranteed minimum charge" each morning. We use latent class modeling to identify four segments of Early Mainstream respondents with differing valuation of UCC:

The "Anti-UCC" class (21% of Early Mainstream respondents) expressed negative valuation of UCC and renewable sources of electricity. The Anti-UCC class was more likely to be significantly older and less highly educated than members of the other classes.

The "Pro-UCC" classes expressed positive valuation of UCC, and include:

1. The "Charged focused" class (33% of Early Mainstream respondents) are relatively sensitive to changes in the guaranteed minimum charge level and monthly electricity bill. These respondents are most likely to see UCC as an "invasion of privacy."
2. The "Cost motivated" class (28%) had a significantly positive constant estimate for UCC. These respondents are the most sensitive to increases in costs savings (e.g. an electrical bill discount) and are willing to pay the least for additional units of renewables relative to the other Pro-UCC classes.
3. The "Renewables focused" class (17%) includes respondents that most highly value UCC and renewable electricity. These respondents are less cost sensitive than the other Pro-UCC classes. These respondents are significantly more likely to be highly educated and have a higher level of biospheric values than the other classes.

Among PEV Pioneer respondents, UCC acceptance is much higher relative to Mainstream respondents, where PEV Pioneer respondents are, on average, willing to pay 50% more for guaranteed minimum charge, and 4 times more for increased renewables.

Interviews indicate that PEV Pioneers' interest in UCC enrollment is primarily related to supporting the environment (renewables) or supporting technology development. Some respondents are also concerned about potential battery degradation.

Future Research

This report presents the latest results from the Canadian Plug-in Electric Vehicle Study (CPEVS) as of May 25, 2015. Several of these analyses are presented in greater detail in other publications (see Section 1.3 for details).

Moving forward, our research team plans to release more publications, white-papers and reports on these and related analyses. Future research directions may include (subject to funding):

- Conducting a dynamic, long-run analysis of how PEV usage could reduce GHG emissions, with regional electricity grids transitioning with the transportation sector.
- Implementing the CPEVS method in other countries to assess PEV market potential.
- Applying the PEV market share forecast model to other Canadian regions (beyond British Columbia) and other countries.
- Linking the PEV discrete choice model with the utility-controlled charging choice model to create an integrated model of PEV choice and usage.
- Linking the PEV usage model with a detailed electricity dispatch model to quantify the potential for utility controlled charging of PEVs to facilitate the deployment of renewable energy.
- Using the PEV market share forecast model to quantify the effectiveness of different demand-focused and supply-focused policies, e.g. deploying public charging infrastructure, providing charging at multi-unit residential buildings, implementing a zero emissions vehicle mandate, and providing various financial and non-financial incentives.

Please contact Jonn Axsen (jaxsen@sfu.ca) or Suzanne Goldberg (sgoldber@sfu.ca) for information on the most recent PEV analyses conducted by the EMRG Sustainable Transportation Group at Simon Fraser University.

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Read the full report -----> link

Go to the study webpage -----> link