Selected 2018 National EV Survey Results and Comparisons with 2015
Outline

• Intro and Survey Overview
• 2015-2018 Changes in Attitudes
• 2018 Choice Experiment
• Barriers, Incentives and Urgency
• Selected EV Owners Results
• Conclusions
Per Annum Sales of EVs in Canada

As of September 2018

Evolution of the Potential EV Consumer
Survey Overview
Two National Consumer Surveys

• Two large national surveys of about 20,000 observations

• A “Research Now” consumer survey panel has been important for both

• EV owners (about 500) from panel and associations

• General consumer comparisons here focus on new respondents from 2015 and 2018
Distributions of Survey Respondents by Province

Evolution of the Potential EV Consumer
Distributions of Survey Respondents by Age Group

Evolution of the Potential EV Consumer
Types of Information Collected

- Household Income
- Education Levels
- Labour Force Status
- Household Size
- Dwelling Type
- Own/Rent and how long at current dwelling
- Dwelling Parking Infrastructure
- Where they park
- Many charging variables for EV owners
- Driving Patterns and other aspects
2015-2018 Changes in Attitudes
I am very concerned about human behaviour and its influence on climate change and the environment.
People who are close to me think that it is important to consider the environment when I purchase a vehicle.
I feel some social pressure to purchase an electric vehicle
I am willing to spend more money to buy an electric vehicle
I already know several locations where I could plug in if I had an Electric Vehicle.

Here is the breakdown for different regions in Canada:

- **British Columbia**: Strongly Agree (2015: 60%, 2018: 40%)
- **Prairies**: Strongly Agree (2015: 70%, 2018: 30%)
- **Ontario**: Neutral (2015: 50%, 2018: 50%)
- **Quebec**: Disagree (2015: 80%, 2018: 20%)
- **Atlantic Canada**: Strongly Disagree (2015: 100%, 2018: 0%)
I feel some social pressure to purchase an electric vehicle (by age)
I am willing to spend more money to buy an EV (by urban-rural index)
2018 Choice Experiment
### Vehicle Powertrain Options

#### Internal Combustion Engine Vehicle (ICE)
- Gasoline is the fuel,
- No charging or plugging-in required,
- Similar to most present day vehicles.

#### Hybrid Electric Vehicle (HEV)
- Gasoline is the fuel,
- No charging or plugging-in required,
- No tailpipe emissions when idling or going slow.

#### Plug-in Hybrid Electric Vehicle (PHEV)
- Vehicle powered by either gasoline or electricity,
- For electric travel, the battery is charged by plugging-in,
- No tailpipe emissions when the battery is powering the vehicle,
- 40km of electric travel can be added per hour of charging at home and public charging can be faster still,
- But gasoline travel is always an option.

#### Battery Electric Vehicle (BEV)
- Electricity is the fuel and you would never purchase gasoline,
- There are never any tailpipe emissions,
- A BEV has fewer parts to maintain,
- A BEV has 3-5 times the electric range of a PHEV and takes proportionally longer to charge,
- Round-trip distances that exceed battery range require a public charging session.
### Scenario 2 of 6: Luxury Sedan Category

Please 'MOUSE OVER' any of the 8 icons on this screen for more information.

<table>
<thead>
<tr>
<th></th>
<th>Option A</th>
<th>Option B</th>
<th>Option C</th>
<th>Option D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle Cost (Price - Cash Incentives)</strong></td>
<td>$70000 = $70000</td>
<td>$80000-14000 = $66000</td>
<td>$90000-0 = $90000</td>
<td>$80000-0 = $80000</td>
</tr>
<tr>
<td><strong>Monthly Operating Costs</strong></td>
<td>$263.00</td>
<td>$263.00</td>
<td>$103.00</td>
<td>$225.00</td>
</tr>
<tr>
<td><strong>Gasoline Range</strong></td>
<td>600 km</td>
<td>800 km</td>
<td>0 km</td>
<td>800 km</td>
</tr>
<tr>
<td><strong>Battery Range</strong></td>
<td>0 km</td>
<td>150 km</td>
<td>450 km</td>
<td>0 km Electric Idle &amp; Low Speed</td>
</tr>
<tr>
<td><strong>Performance / Acceleration (0 - 100km/h)</strong></td>
<td>4.0 sec</td>
<td>6.5 sec</td>
<td>6.5 sec</td>
<td>6.5 sec</td>
</tr>
<tr>
<td><strong>Quality of Public Charging Experience</strong></td>
<td>No Charging Required</td>
<td>Within 5 Min Drive - 10+ Mins to Plug In - 40 km Range/Hr</td>
<td>Within 15+ Min Drive - No Wait to Plug In - 200+ km Range/Hr</td>
<td>No Charging Required</td>
</tr>
</tbody>
</table>

**For the Replacement Vehicle, I would choose**

![Selection button]
4 Classes from 2018 National Model

• **ICE-Oriented (16%)**
  – Older with medium price sensitivity
  – resistance to EV behaviours
  – exhibits the most relative concern about whether charging stations are nearby (i.e. range anxiety)

• **HEV-Oriented (27%)**
  – Older with low price sensitivity
  – a lot of attention on all aspects of the public charging experience
  – Concern with achieving low operating costs and long driving ranges
  – Little or no concern with dynamic vehicle performance
  – EV government incentives are discounted the most among the classes

• **EV-Oriented (36%)**
  – Higher income and low purchase price sensitivity
  – Oriented to vehicle performance and to an incremental household vehicle
  – Pay a lot of attention to how fast public chargers are

• **Purchase Price Sensitive (21%)**
  – The youngest class and well-educated
  – But purchase price trumps everything else at present
  – They don’t discount government incentives
  – other things being equal, they would just as soon acquire an EV
How much extra would I pay for a vehicle to gain an extra km of driving range?

<table>
<thead>
<tr>
<th></th>
<th>ICE-Class</th>
<th>HEV-Class</th>
<th>EV-Class</th>
<th>Price Sensitive Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Range</td>
<td>$6.09</td>
<td>$54.58</td>
<td>$12.54</td>
<td>$8.45</td>
</tr>
<tr>
<td>Electric Range</td>
<td>$11.63</td>
<td>$31.27</td>
<td>$16.38</td>
<td>$0</td>
</tr>
</tbody>
</table>
How much extra would I pay for a vehicle to ensure a high-quality public charging experience?

<table>
<thead>
<tr>
<th></th>
<th>ICE-Class</th>
<th>HEV-Class</th>
<th>EV-Class</th>
<th>Price Sensitive Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wait Versus 10+ Minute Wait</td>
<td>$2,434</td>
<td>$6,518</td>
<td>$2,019</td>
<td>$68</td>
</tr>
<tr>
<td>to Plug-In</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200+ km Range Added/Hour</td>
<td>$1,881</td>
<td>$7,288</td>
<td>$5,729</td>
<td>$650</td>
</tr>
<tr>
<td>Versus 40 km Range/Hour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within 5 min Drive versus</td>
<td>$2,537</td>
<td>$4,799</td>
<td>$2,304</td>
<td>$333</td>
</tr>
<tr>
<td>Within 15+ min Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How much extra would I pay for a vehicle to benefit from a $1000 cash incentive on Plug-ins?

<table>
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<tr>
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<th>HEV-Class</th>
<th>EV-Class</th>
<th>Price Sensitive Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Incentive</td>
<td>$770.00</td>
<td>$580.00</td>
<td>$793.00</td>
<td>$957.00</td>
</tr>
</tbody>
</table>
Barriers, Incentives and Urgency
Overview of Barriers to Electric Vehicle Adoption

- A charging station may not be nearby when I really need to charge
- EVs just cost too much to buy
- Public charging is much slower than filling my tank
- I am concerned about the time required for an EV to pay off
- I am concerned about EV technology (e.g. battery durability, safety)
- I am content with conventional ICE vehicles
- I am worried about EV resale value
- There is a lack of marketing on EVs
- I prefer larger vehicles that do not come as EVs
- The purchase experience for an EV (initial inquiry to delivery) is more difficult
- I find that dealers steer me away from EVs

[Bar chart showing the extent of importance and reasons for barriers to EV adoption]
A charging station may not be nearby when I really need to charge (by Urban-Rural Index)
My province offers a substantial cash incentive towards purchasing an EV.
Urgency felt for the next household vehicle to be a plug-in electric vehicle (by Age)

Evolution of the Potential EV Consumer
Selected Results for EV Owners
Average Weekly Charging Events and Utilization

(40% of Owners do not think of public charging (Level 1, 2, or 3) as part of their weekly routine)
Potential Public Charging
Improvements to be Ranked

- Acquiring new access to Level 2 (240V) charging where I park during the workday
- Better access to Level 2 (240V) charging at public places
- Better access to Level 3 DC fast charging at public places
- Additional charging ports at public charging sites to avoid waits
- Reduced fees to use public charging
- Acquiring a longer range EV to reduce my need for public charging
- More seamless charging experiences (e.g. wireless charging, new smartphone capabilities)
- Improved local signage to find the precise location of charging stations
Importance Ranking of Charging Improvements (N=441)
Charging Improvements by Locational Context

- Where I live (if a multi-dwelling context)
- Within easy walking distance of where I live
- Where I park during the workday
- Local coffee shops, grocery stores and the like
- Local shopping malls, movie theatres and the like
- Regional shopping malls, leisure attractions and the like
- Sites farther from home (near highway interchanges, hotels, conference venues and the like)
### Ranking of Location Contexts (N=423)

- **Easy Walking from Home**
- **Local Coffee/Grocery**
- **Where I Live**
- **Local Malls**
- **Workday Parking Sites**
- **Regional Sites**
- **Far from Home**

Legend:
- **1 (most)**
- **2**
- **3**
- **4**
- **5**
- **6**
- **7 (least)**
Conclusions

• A lot of evidence of positive shifts in attitudes toward EVs in varying contexts
• Much stronger recognition of the connection between the vehicle purchase decision and the environment
• Evidence that ICE-oriented attitudes are under pressure and “openness to EVs” is spreading
• Evidence that there is more to do in generating awareness
• Evidence that “diffusion” of the EV concept is taking place from urban to rural and from younger to older and in other ways
• Owners favour faster, multi-port public charging facilities -- maybe not so close to home -- for new infrastructure