Electrifying Fleets: Trends, Barriers & Opportunities

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Accelerating electrification has been a priority for Plug In BC.

One of the main focuses is on zero emission fleet transportation.
Major Barriers that have Prevented Fleets from Electrification

Plug In BC surveyed 100 fleets

- Vehicle availability
- EV cost
- Infrastructure
- Lack of awareness
- Other (Internal management policies/plans, risks)
## Breaking Barriers

### Drivers

- Sustainability goals
- Lower cost of ownership
- Financial incentives
- Policy changes
Setting the Scene: Sales Trend by Type

Global passenger EV sales

- Over 5 million EVs
- Growth rate: 46%

Canada passenger EV sales

- Growth rate: 140%

In 2017, the global Fuel Cell car stock surpassed 7200 units compared to 3 million EVs.
Global Trends: Setting the Scene

Important factors driving the EV market forward:

- Lithium-ion battery prices have fallen in recent years.
- Policy support
- Rising commitments from automakers
Battery Prices

<table>
<thead>
<tr>
<th>Year</th>
<th>CAD/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>$1,320</td>
</tr>
<tr>
<td>2017</td>
<td>$276</td>
</tr>
<tr>
<td>2018</td>
<td>$251</td>
</tr>
<tr>
<td>2030</td>
<td>$92</td>
</tr>
</tbody>
</table>

Prices Dropped 81%
Energy Density Improved 5-7% Per Year

63% DROP

Prediction 2030
Policy Support

- EV purchase incentives, to keep the market rolling
- Charging station incentives
- Local and international bans of ICEVs

### Chart

- **Alberta**: 845 # of stations, 921 # of outlets
- **BC**: 3320 # of stations, 3725 # of outlets
- **Washington**: 3991 # of stations, 4777 # of outlets

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**Demand side**  <br> **Clean BC Policy**  <br> **Supply side**
Policy Support

- 100,000 EVs on road
- 21,000 publicly accessible chargers
- Ratio of 5 EVs for every plug-in point

Range anxiety  Emotive  Range Confidence

39 kilometers
Average Daily Utilization
Rising Commitments from Automakers

A growing number of electric freight truck models will soon hit the market, offering larger sizes and wider ranges.

BNEF: 2018 EV Outlook
Suite of Specialty Use Vehicles in B.C.

**Motorcycle**
- Vespa Elettrica

**Low Speed**
- Super SOCO
- GEM
- Piaggio
- MOTREC

**Medium-duty & Heavy-duty**
- BYD
- E Lion
  - School bus
- Freightliner Odyne (Hybrid)
- eCanter

- 16, 22, 45, 49 seats
- 19-100 seats

**EV STAR**
- COBUS
- CANADIAN Electric Vehicles Ltd.
Suite of Specialty Use Vehicles in B.C.

- 69 models of Motorbikes
- 27 models of Low Speed Vehicle
- 37 models of Medium & Heavy Duty
- 17 models of Airport & Port
- 174 models of Forklift

Total of 37 makes and 324 models available in B.C. covered by incentives
After purchase rebates

$2,000 up to $50,000

Fleets and individuals

5 rebates per fleet

90 days after purchase

TOTAL FUND ALLOCATED: $2.2 MILLION

Remaining fund,
$1.14 Million

Total incentive
given,
$1,066,691
SUVI: Specialty Use Vehicle Incentive Program

BYD C6 2016
MSRP: $338,000
Max Incentive: $50,000

Mitsubishi Ecanter 2018
MSRP: TBD
Max Incentive: $20,000
Economic Benefits from Fleet Electrification

Source: CAA 2018

Annual Fuel Cost Comparison - British Columbia
Annual Mileage - 20,000 km

Nissan Versa: $1502
Nissan Leaf: $0
Chevrolet Cruze: $1612
Chevrolet Bolt: $0
BMW 3 Series 330i: $2000
BMW I3 S 5D: $0

Source: CAA 2018
Environmental Benefits from Fleet Electrification

Medium and Heavy Duty Tool for B.C. Fleets

Jointly developing a Medium and Heavy Duty Toolkit, under Fleet Champions Program

- Helps fleets in decision making,
- Faster transition to clean energy vehicles,
- Total Cost of Ownership,
- Helps choosing a suitable vehicle option for a specific application.

Timeline: June 2019
Vehicle expansion plan (1yr, 5yrs, 10yrs)

Utilization: km per day per vehicle?

Return to base?

Power capacity (at facility)?

What charging type is needed? (level 1, level 2 and DCFC)?

Non-networked or networked chargers? (Do I need power management, data tracking?)
Power Management System

Allows multiple vehicles to charge on same circuit.
Sample size : 82 charging stations Level 2 installed for Fleets
Average cost: $8,948
Total cost: $733,774 for 82 stations
Join WCEF!
Further info

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## Charging Infrastructure Types

<table>
<thead>
<tr>
<th>Charge Level</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>1.4</td>
<td>3.5-19</td>
<td>25-250+</td>
</tr>
<tr>
<td>100 miles of range</td>
<td>20 hours</td>
<td>2-10 hours</td>
<td>30 minutes</td>
</tr>
<tr>
<td>AC/DC</td>
<td>AC 110 V 20 Amp</td>
<td>AC 208-240V 40-80 Amp</td>
<td>DC 200-600V 400 Amp 1 or 3 phase</td>
</tr>
</tbody>
</table>
# Connector Types

<table>
<thead>
<tr>
<th>Standard</th>
<th>A/C J1772</th>
<th>DC CHAdeMO</th>
<th>SAE Combo CCS</th>
<th>Tesla</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle Types</strong></td>
<td>Most vehicles have a J1772 port</td>
<td>Japanese Vehicles</td>
<td>Non-Japanese, Non-Tesla vehicles</td>
<td>Tesla</td>
</tr>
<tr>
<td><strong>Key Facts</strong></td>
<td>Universal, but 20 kW max</td>
<td>Nissan, Honda</td>
<td>Will this standard overtake CHAdeMO?</td>
<td>Tesla can convert to J1772</td>
</tr>
</tbody>
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