Electric Vehicles and Strata Complexes

Jim Hindson P.Eng (ON)
Straw Poll – Show of hands

1) Your total average daily drive (commute and errands) is
   a) More than 50 miles (80 km) per day?
   b) Less than 50 miles (80 km) per day?

2) Do you take your vehicle to the mainland (on average)
   a) More than once a week?
   b) About 1 - 4 times a month?
   c) About 1 - 12 times per year?
   d) (Almost) never?
What is an Electric Vehicle (EV)?

Types of Electric Vehicles

HEV (Hybrid “Electric” Vehicles)

These vehicles use an electric motor for start/stop functions and low speed driving, and are not Electric Vehicles (EVs)

Examples

- Toyota Prius Hybrid
- Toyota Camry Hybrid

All “Hybrids”
What is an Electric Vehicle (EV)?

**PHEV (Plug-In Hybrid Electric Vehicles) – Transition to full electric**
PHEVs can be plugged in and are capable of highway speeds in electric-only mode.

**Examples**
- Ford Fusion Energie
- Chevrolet Volt
- Chrysler Minivan PHEV

**BEV (Battery Electric Vehicles)**
An electric vehicle powered by an electric motor, with the power exclusively stored in batteries.

**Examples**
- Chevy Bolt
- Kia Soul EV
- Nissan Leaf
- BMW i3
- Tesla Model X
Why Electric?

The Environmental Impacts of Fossil Fuels

In Canada, oil is predominantly mined

Alberta Tar Sands
Why Electric?

then boiled

then transported
Why Electric?

The average Internal Combustion Engine vehicle emits 6 tonnes of CO2 per year and finally burned in the atmosphere.
What is Driving EV Sales?

Climate Change Concerns

To hold the temperature increase to 2.0 degrees we can only emit another 565 gigatonnes of CO2

The transportation sector represents a major opportunity to reduce CO2 emissions

Existing Fossil Reserves

565 GIGATONNES
2.0 °C
(BUDGET)

2,795 GIGATONNES CO2
(REPORTED RESERVES)

= 5 to 6 °C increase

Courtesy OurHorizon.org
What is Driving EV Sales?

Pollution Concerns

Internal Combustion Engine (ICE) vehicles

<table>
<thead>
<tr>
<th></th>
<th>Average ICE Vehicle (per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>2,270 litres (1.8 tons)</td>
</tr>
<tr>
<td>CO2</td>
<td>6 tonnes</td>
</tr>
<tr>
<td>NOx</td>
<td>40 lbs</td>
</tr>
<tr>
<td>VOCs</td>
<td>2 lbs</td>
</tr>
<tr>
<td>PM</td>
<td>Particulates</td>
</tr>
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</table>

Electric Vehicle (per year)

<table>
<thead>
<tr>
<th></th>
<th>Electric Vehicle (per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>4,300 kWh</td>
</tr>
<tr>
<td>CO2 (Carbon Dioxide)</td>
<td>0</td>
</tr>
<tr>
<td>NOx (Nitrous Oxides)</td>
<td>0</td>
</tr>
<tr>
<td>VOCs (Volatile Organics)</td>
<td>0</td>
</tr>
<tr>
<td>PM (Particulates)</td>
<td>0</td>
</tr>
</tbody>
</table>

100% Electric vehicles

What is Driving EV Sales?
What is Driving EV Sales?

The Simplicity of the Technology

Engine Compartment (Gas)

- Engine compartment is filled with complex systems

Power Compartment (Electric)

- No transmission or clutches
- No pistons, rings, rods, valves or camshafts
- No drive belts for A/C, steering, or alternator
- No sparks plugs, fuel injectors, or turbos
- No timing chain
- No Engine Control Module or sub modules
- No oil system, pollution controls, or sensors
- No headers, catalytic converters, mufflers or tailpipe
- Only 3 moving parts to the drive shafts

300 + moving parts to the drive shaft
What is Driving EV Sales?

Operating Cost

- 10 - 20% the cost of gasoline per km
- no oil changes
- brake work is rare (160,000 km plus) due to EV regenerative braking
- no regular maintenance

SAVINGS OF $1,500 - $4,800 per year
What is Driving EV Sales?

Purchase Cost (entry level)

New: $32K – $42K

Used: $12K – $25K

- Short term purchase incentives in BC of up to $11,000
  - Up to $5,000 off purchase or lease of an electric vehicle
  - and
  - $3,000 - $6,000 off the purchase or lease of a new or used electric vehicle if old vehicle is scrapped
The Market for EVs on Vancouver Island

- Island vehicles average travel is less than the mainland
- Major island population centres are less than 300 km apart
- Largest BC City is just a ferry ride away
- Businesses can also go electric
  - save operating costs
  - project a “Green” image to their customers
The Disruptive “S” curve

Disruptive technologies

- Camera market disrupted by smart phones
- CD market disrupted by thumb drives
- TV market disrupted by flatscreens
A slow initial adoption rate followed by very rapid growth - Even though the disruptive product is more expensive
The Disruptive “S” curve

Disruptive technology growth is usually heavily underestimated.

In 1980 Motorola Predicted that by the year 2000 there would be 900,000 cell phones in operation.

In 2000 there were 140 million cellphones in operation and they were increasing by 900,000 every three days (the prediction was off by 150 times).
The EV Disruptive “S” curve

Electric Vehicles are also a disruptive technology:
- a slow initial adoption rate followed by very rapid growth

Original Forecast

New Forecast
All major vehicle manufacturer’s have announced commitments and production plans for electric vehicles.

- Internal Combustion Engine (ICE) vehicles are on the way out

Audi  Ford  Kia  Toyota
Bentley  General Motors  Mercedes  Volkswagen
BMW  Hyundai  Mitsubishi  Volvo
Chrysler  Honda  Nissan

* Availability of makes and models is currently subject to manufacturer’s policies
## The EV Disruptive “S” curve

### PHEV (Plug-In Hybrid Electric Vehicle) – transition to full electric

Many more PHEVs are entering the market* in the next 18-36 months

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Compact</th>
<th>Mid-Size</th>
<th>SUV</th>
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<tbody>
<tr>
<td>Audi</td>
<td></td>
<td>X</td>
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<tr>
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<tr>
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<td>Kia</td>
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<td>X</td>
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<td>Mercedes</td>
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<td>Nissan</td>
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<td>Toyota</td>
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<tr>
<td>Volvo</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Volkswagen</td>
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<td>X</td>
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* Manufacturers are not currently required to make them available in BC
Many additional 320 km+ BEVs are coming* in the next 12 to 36 months

* Manufacturers are currently not required to make them available in BC

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<tr>
<td>Tesla</td>
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<td>X</td>
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The “game changer” – the 320 km (200 mile) EV

Bolt - 380 km

Tesla 3 - 340 + km

Leaf 2.0 - 340 + km

320 km EV planning range: 300 km in summer 200 km in winter
The “game changer” – the 320 km (200 mile) EV

Current Electric Vehicle charger locations

240 Volt AC ➔

480 Volt DC ➔
The S curve impact on Strata Value

BC Light Duty Fleet Mix Projection

By 2035, 30% of BC passenger vehicles could be electric
Impacts on Strata Value

Prospective Buyers Want:

- Parking
- In-unit washer and dryer
- Dishwasher
- Fireplace
- 2nd Bathroom
- Electric Vehicle Charging
Impacts on Strata Value

EV adoption rates are (already) slower because of lack of access to chargers in apartments and strata units. (30% - 50% of households in BC are Strata units)

“Future-proofing” buildings

- Property values will be affected as prospective buyers increasingly regard EV charging as a “must have”
- Being proactive and keeping up with EV demand will help to maintain property values and access to all prospective buyers
- Retention of existing owners/tenants
- The environmental moral / ethical issue
Straw Poll – Show of hands

How many of you have:

- a Plug in Electric Vehicle?
- Driven or had a ride in a Plug in Electric Vehicle?

How many of you:

- Have heard about someone asking about EV charging in your building?
- Think that it is a matter of time before someone asks about EV charging?
## Types of EV charging for Residential Buildings

<table>
<thead>
<tr>
<th>EV Type</th>
<th>Variable</th>
<th>Level 1 110 Volts</th>
<th>Level 2 220 Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plug – in Hybrid</strong></td>
<td>Charge Time</td>
<td>5 hrs</td>
<td>2.5 hrs</td>
</tr>
<tr>
<td></td>
<td>Typical night Charge</td>
<td>5 hrs</td>
<td>2.5 hrs</td>
</tr>
<tr>
<td></td>
<td>kW rate</td>
<td>1.7 kW</td>
<td>3.3 kW</td>
</tr>
<tr>
<td><strong>100% Electric Gen 1 160 km</strong></td>
<td><strong>Leaf /Kia/Smart</strong></td>
<td><strong>12-15 hrs</strong></td>
<td>4 – 7 hrs</td>
</tr>
<tr>
<td></td>
<td>Charge Time</td>
<td>4-8 hrs</td>
<td>1-2 hrs</td>
</tr>
<tr>
<td></td>
<td>kW rate</td>
<td>1.7 kW</td>
<td>3.3 - 10 kW</td>
</tr>
<tr>
<td><strong>100% Electric Gen 2 320+ km</strong></td>
<td><strong>Tesla/Bolt</strong></td>
<td><strong>24-30 hours</strong></td>
<td><strong>8 hrs</strong></td>
</tr>
<tr>
<td></td>
<td>Charge Time</td>
<td>4 -8 hrs</td>
<td>1-2 hrs</td>
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<tr>
<td></td>
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<td>1.7 kW</td>
<td>6.6 -15 kW</td>
</tr>
</tbody>
</table>

[1] Typical night charge estimated for Vancouver Island (with lower commute distances and times)
[2] Charging rates in kW vary between 3.3 and 10 kW depending on make and model (Tesla exception)
[3] Level 3 450 Volt DC charging not applicable to residential units. Typical 80% charge in 30 minutes
[4] Teslas have access to the Supercharger Network providing up to 550 km of charge per hour
Types of EV charging for Residential Buildings

- Ways to reduce charging equipment costs
  - Separate hydro meter for EV charging (BC Hydro)
  - Shared charging – share power with multiple EVs
  - Shared charging spaces
Types of EV charging for Residential Buildings

- **Every Building is different**
  - Type of parking and ownership/control of spaces
  - Location of parking
  - Location of electrical room
  - Physical conditions around the parking spaces
  - Ability to share charging infrastructure
Additional Information

EV Chargers in Condominiums – Video

https://youtu.be/28KXX3Favk8
Additional Information

Multiple Residential Unit Charging Infrastructure

<table>
<thead>
<tr>
<th>Organization</th>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISOA</td>
<td>visoa.bc.ca</td>
<td>seminar notes</td>
</tr>
<tr>
<td>CMHC</td>
<td>insideevs.com</td>
<td>EV news and information</td>
</tr>
<tr>
<td>MURB Subsidies</td>
<td>pluginbc.ca</td>
<td>Ministry of Energy and Mines</td>
</tr>
</tbody>
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Electric Vehicles

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<td>Victoria EV Club</td>
<td>victoriaevclub.com</td>
<td>membership is free</td>
</tr>
<tr>
<td>Vancouver EV Association</td>
<td>veva.ca</td>
<td>Electric Vehicle information</td>
</tr>
<tr>
<td>Inside EVs</td>
<td>insideevs.com</td>
<td>EV news and information</td>
</tr>
<tr>
<td>Charging locations</td>
<td>plugshare.com</td>
<td>EV charging locations for Canada and U.S.A.</td>
</tr>
<tr>
<td>CEV (Clean Energy Vehicles for BC)</td>
<td>cevforbc.ca</td>
<td>$5,000 off an EV PLUS</td>
</tr>
<tr>
<td>BC Scrap It Program</td>
<td>scrapit.ca</td>
<td>$3,000 - $6,000 off an electric vehicle (EV)</td>
</tr>
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</table>