EV Charging Infrastructure Deployment in British Columbia

Utility Role

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Outline

- Introduction
- British Columbia Context
- Electric Vehicle Smart Infrastructure (EVSI) Project Overview and update
- Lessons Learned from the project thus far
- Role of the utility in BC
Powertech Labs Inc.
a multidisciplinary testing, research and development facility.

We offer a one-stop-shop approach for businesses that require technical engineering expertise, standards and codes testing, as well as quality testing and failure analysis services.

Powertech is a subsidiary of BC Hydro. We provide specialized testing and investigation services to support BC Hydro's capital assets: generation, transmission and distribution.
Areas of Expertise

- High Power, High Voltage and High Current Testing
- Transmission & Distribution Class Cable Condition Assessment
- Mechanical Testing and Applied Materials Engineering
- Non-Destructive testing, Forensic and Root Cause Investigations
- Software Applications and Development
- Applied Chemistry Laboratories and Research
- Gas Systems Engineering and Hydrogen Stations
- Smart Grid Technologies and Electric Vehicles
- Power System Studies
Powertech Labs supports the rapidly expanding EV market by providing engineering and consulting services to both local and global clientele. We are leading experts in all aspects of EV technologies, from infrastructure and smart grid integration, through to fleet deployments and component testing.
We offer an independent commercial testing facility that supports utilities, electricity utility vendors and telecommunication OEMs that require network design, interoperability testing and pre-deployment validation to support telecommunication systems, distribution automation and controls.
We have experience with a number of energy storage technologies, including compressed hydrogen storage and lithium-ion batteries. Powertech’s energy storage projects have been coupled with renewable energy sources, such as photovoltaic solar power and micro-hydroelectric power, and have helped to support fueling of EV and hydrogen powered vehicles.
Hydrogen Stations and Gas Systems Engineering

We've taken our extensive knowledge of hydrogen components and gas systems to develop reliable hydrogen fuelling station designs for clients around the world.
• Largest differential between electricity and gasoline prices in North America (~ $2,000 fuel cost savings)
• Expected high EV adoption 2.1X higher adoption of hybrids than the Canadian national average (like California)
• 75% of population urbanized concentrated in urban areas
• 95% of trips less than 30 km

Carbon Intensity of EV in BC

<table>
<thead>
<tr>
<th>CO2e/km</th>
<th>Description</th>
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<tbody>
<tr>
<td>4.4</td>
<td>Electric Vehicle g CO2e/km</td>
</tr>
<tr>
<td>239</td>
<td>ICE gCO2e/km</td>
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• Over 90% Clean generation
• Low rates ~$.10/kWh
• Vertically integrated government owned utility covering 95% of the province
• Regulated – BCUC watch dog only
• Provincial government creates energy policy
• 1.8 million smart meters deployed supported by proprietary telecom network

Sounds pretty ideal…. but
• No ancillary markets
• No time based rate regime
• Very limited renewables penetration
• Limited business model options

….No incentive for smart charging????
Multiple stakeholders
- Province
- NGOs – Fraser Basin Council
- Municipalities
- BC Hydro
- Industry

Infrastructure deployments – “at home, at work and on the go”

Purchase Incentives $5,000 (expired March 31, 2014)

Outreach – “Emotive” Campaign

EVSI Project
Promote EV adoption through elimination of market barriers:

1. Range Anxiety - build public infrastructure (L2/DCFC)
2. Grid Impacts – validate pathways to manage EV loads
3. Business Models – develop sustainable ownership models
4. Enabling Technologies – showcase new technologies
5. Public Awareness – outreach campaigns and signature sites
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BC Infrastructure Initiatives: L2

970 EVSEs

- 200 SFD (rebates)
- 200 MURB
- 570 public spaces (CCI fund)
BC Infrastructure Initiatives: DCFC

30 CHARGERS
- Pacific Coast Collaborative
- Planning framework
- Business models
- OCPP, Harmonized Payment System
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Smart Grid Initiatives

**evCloud**
- infrastructure usage data collection
- cloud to cloud data exchange
- consumer services

**Grid-Aware**
- utility metering of EV loads
- load forecasting
- Renewable and Low Carbon Fuel Requirement Reporting (RLCFRR)

**Smart-Charging**
- utility control of EV loads
- support for grid operations
- increased use of renewables
1. **evCloud:** Use of 3\textsuperscript{rd} party EV Service Providers to collect EV charging data.

2. **Direct Paths:** Use of utility SMI infrastructure for Smart Charging

3. **B2B paths:** Use of 3\textsuperscript{rd} party service providers and/or internet infrastructure for Smart Charging
Interoperability Charge Park

PLI Development BackOffice

- Back-Office Application Simulators (DR / DLC)
- Distribution Management System

Simulated ESB

- Utility Web Server
- Automatic Data Collection System
- D-SCADA

Internet

Smart Meters
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Multi-vendor EVSE data aggregation platform
Assessing grid impacts and environmental benefits

- Public charging infrastructure used predominantly during the day

- Significant spikes from 50kW DC fast chargers

- Weekend usage shifted slightly later in the day

- Fuel savings and GHG emissions reductions estimated based on energy delivered and typical vehicle efficiencies
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Raising public awareness

www.evCloud.ca

www.emotivebc.ca
**EVSI: Project Goals**

*Promote EV adoption through elimination of market barriers:*

1. **Range Anxiety** - build public infrastructure (L2/DCFC)
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3. **Business Models** – **develop sustainable ownership models**
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• 32 busiest locations (out of 250+) have dispensed 50% of total energy
• The 3 busiest locations are used 4 times per day
• The 100 busiest locations are used once per day on average
• 7 of the 10 busiest stations are at shopping malls
Business Models - Role of the Utility in BC

- Two solitudes
  - Utility owned operated
  - Commercial for profit (?)
- The utility owns 90% of charging events
- L2 public – we just want to know what’s happening
- DCFC is ours by default
- Regulatory constraints have shaped the outcome in BC
  - Only registered utilities may sell electricity
  - Private sector prevented from participation in DCFC Network
- Economics also drive the outcome
Role of the Utility in BC

So what do we have in BC?

• under the regulations DCFC is a new class of service – requires new tariff but that will take a time
• Private sector must register as utility
• Municipalities are exempt (much like landlords) have the ability to resell electricity and they can own the infrastructure.....
• But federal funding requires the project proponents to own the assets
• Interim solution BC Hydro build it then lease the infrastructure to municipalities to act as operators of the DCFCs.
• Lease/ hosting arrangements highly complex and protracted
  – Liability
  – Local budget constraints
  – Limited opportunity to recover costs
Charging for charging commenced June 2014

BC Hydro rate set at $.35 / kWh – guiding principles
  – Market pricing
  – Cost recovery; target break even on operating costs only
  – Consumer preference; fairness, transparency and simplicity $/ kWh was chosen over time or flat fee
The math
- Average charge 9.0 kWhs
- Average cost / charge $4.11
- Average revenue per charge $3.22
- To break even on operating costs alone requires 80 events per month – currently ~50

Conclusion
- Not very popular!
- Not very compelling
- Must be another driver
  - Tesla selling cars not electricity
  - Utility selling electricity not charging,
  - Tim Horton's selling donuts not electricity or charging
Hi I don't know who you are but I'd like to give you a peace of my mind. I can't think you own an EV. Here some figure for you. My Prius needs 37 Lt to go 600 plus at the outrages price of $139 per liter costs $51.43. With My leaf to go the same distance $50.40 not much difference. We know this outrages price of gas will go down but the electric price won't. Prius cost 33,500 with lots of extras and the Leaf cost 36,600 with a rebate of 5000 so the car would cost 41,000 plus. The rebate was to encourage people go electric. I have level II Charger in My underground parking space and I am paying $50.00 a month Parking Fee. That makes 35 cents per kilowatt look like gouging.

$0.35 is not a small fee! It is $8.40 to charge my Nissan Leaf and that is more than 6 times what the electricity costs BC Hydro. It is outrageous and enough to make me consider selling my Leaf. I would only use your exhorbitant chargers in an extreme emergency.

There are roughly 10kWh in one liter of gasoline so that means charging 35 cents per kWh equates to $3.50/L gasoline. How is this cheaper than current gasoline prices? You can't possibly be trying to argue it is cheaper because EVs are more efficient than ICEs. That would be like saying a Toyota Prius should pay more per liter than a Hummer because their per km cost is less.

The only thing I would say is that this suicidal idea. BC Hydro supply electricity at less than 10 cents/kWh and you are going to turn around and charge more than 3.5 times of that. Do you think Electric Car owners will...
Thank you
EViVÉ
TRADESHOW + CONFERENCE + SALON COMMERCIAL
2014 | 10 | 28-30
Sheraton Wall Centre | Vancouver, BC
ElectriCITIES | ÉlectriCITÉS
Move Electric | Prenez le virage électrique

Save the date!
À vos agendas!