Remote Solar PV, Streetlight and MURB EV charging

BCIT Overview of Research Projects
For the Public Sector Climate Leadership Symposium

November, 2019

We acknowledge and thank the Coast Salish Nations of Squamish, Musqueam, and Tsleil-Waututh, on whose ancestral, traditional and unceded territories we are privileged to learn, teach and play.

Agenda

- Background
- Projects Overview
- Remote Solar PV
- Energy Managed Charging
- Curbside Charging
- MURBs
- Q&A

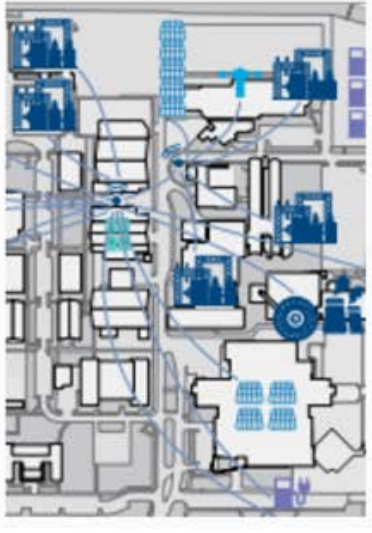
Background: Smart Microgrid Program

Microgrid and Energy Management Systems

Remote Community Micro Grid

Electric Vehicle Infrastructure

Critical Infrastructure Cybersecurity



Virtual Tour: https://www.bcit.ca/microgrid/tours.shtml

Background: Energy OASIS Project

In 2014, BCIT completed the NRCAN-funded "Energy OASIS"

- 250 kW of solar panels
- 500 kWh of lithium-ion battery energy storage
- Advanced Energy Management System
- "Islandable" from grid
- Two DCFC chargers, and initially two Level 2 EV chargers, later expanded to six Level 2s, and recently upgraded to ten "energy managed" Level 2s.

Overview Current Projects & Activities

Two projects progressively expand on Energy OASIS to demonstrate:

- Low-cost curbside charging installations, leveraging existing streetlight infrastructure
- Open protocols for interoperability, live status, and command & control of Level 2 and DCFC EV chargers

Canadian delegates working with IEA HEV on Task 39 “Interoperability of E-mobility Services”.

- One of currently seven member countries working on this Technology Collaboration Program

Driver engagement and awareness activities.

Energy Managed Charging

Dedicated vs Managed

- Dedicated power to each parking stall can be cost prohibitive, and quickly exhaust any spare installed electrical capacity
- By installing EVSEs that share or manage power, far more EV owners have the ability to charge

Energy Management:

- Control of the current drawn by the EVSE, at the main switchboard of the building or sub-panel.
- The available power for EV charging is dynamic, and can take advantage of the excess capacity in the building overnight.

Implementing Energy Management enabled us to demonstrate low-cost Curbside Streetlight and MURB charging solutions

Curbside Charging

Strategy to address “Garage Orphans”, which are:

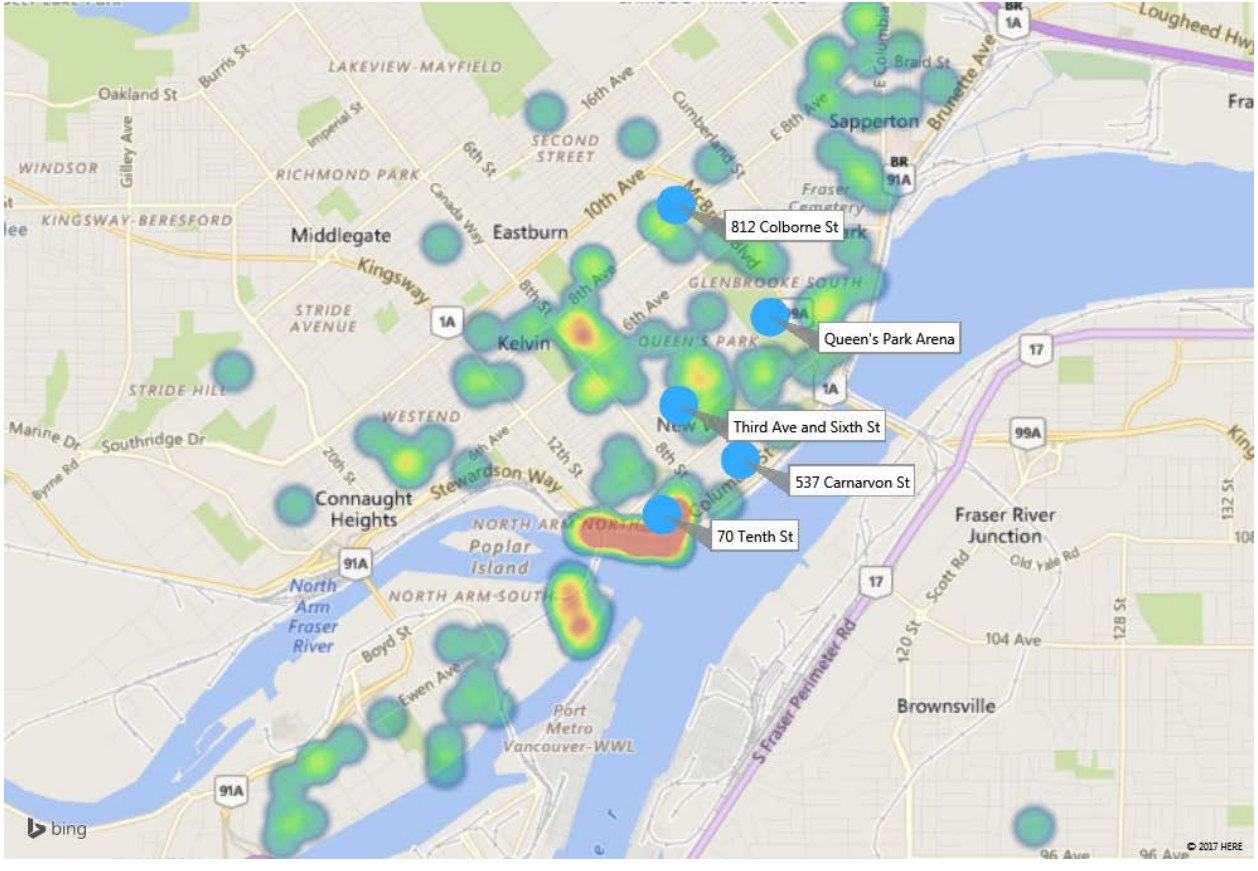
- EV owners, or potential EV buyers, who can’t charge at home
- No access to off-street parking
- Can’t run an extension cord over the sidewalk due to tripping hazard
- Can’t trench city owned property next to curb
- With no way to charge at home, it is usually inadvisable to purchase an EV
- This represents a significant barrier to EV adoption in dense urban areas
- BCIT partnered with the City of New Westminster to demonstrate curbside charging using streetlight infrastructure

Curbside Charging Site Selection

Community Outreach

- Engaged with City of New Westminster's Communications and Economic Development Manager Blair Fryer, who brought his Communications Team on board
- Together, BCIT & CoNW developed a survey to locate 'Garage Orphans' in the City of New Westminster
- CoNW also used Social Media Channels – Facebook, Twitter, Instagram, and paid advertising on Facebook to create awareness and distribute the on-line survey
- Printed and on-line surveys collected at in-person events at River Market, Century House, Urban Solar Garden Launch Event, Anvil Centre, Queensborough Community Centre, and new Uptown Parklette at corner of Belmont & 6th St in front of Tim Hortons at seating area

Curbside Charging – Survey Results



Curbside Charging

Streetlight Considerations

- While Community Outreach was taking place, we looked at existing street lighting in the CoNW
- Much was antiquated, with mostly Metal Halide (MH), or High Pressure Sodium (HPS), and few areas retrofit to LED
- In some cases, streetlights were fed by taps directly off of overhead power lines
- LEDs consume approximately 80 W, where HSP consume 150W, and MH consume 250 W
- Engineering Dept provided maps of areas that had been retrofit with LEDs
- Areas that had been retrofit to LEDs comprised neighbourhoods that either had off street parking (i.e. were not garage orphans), or had the streetlights installed on the far side of the sidewalk, which would necessitate trenching

Curbside Charging

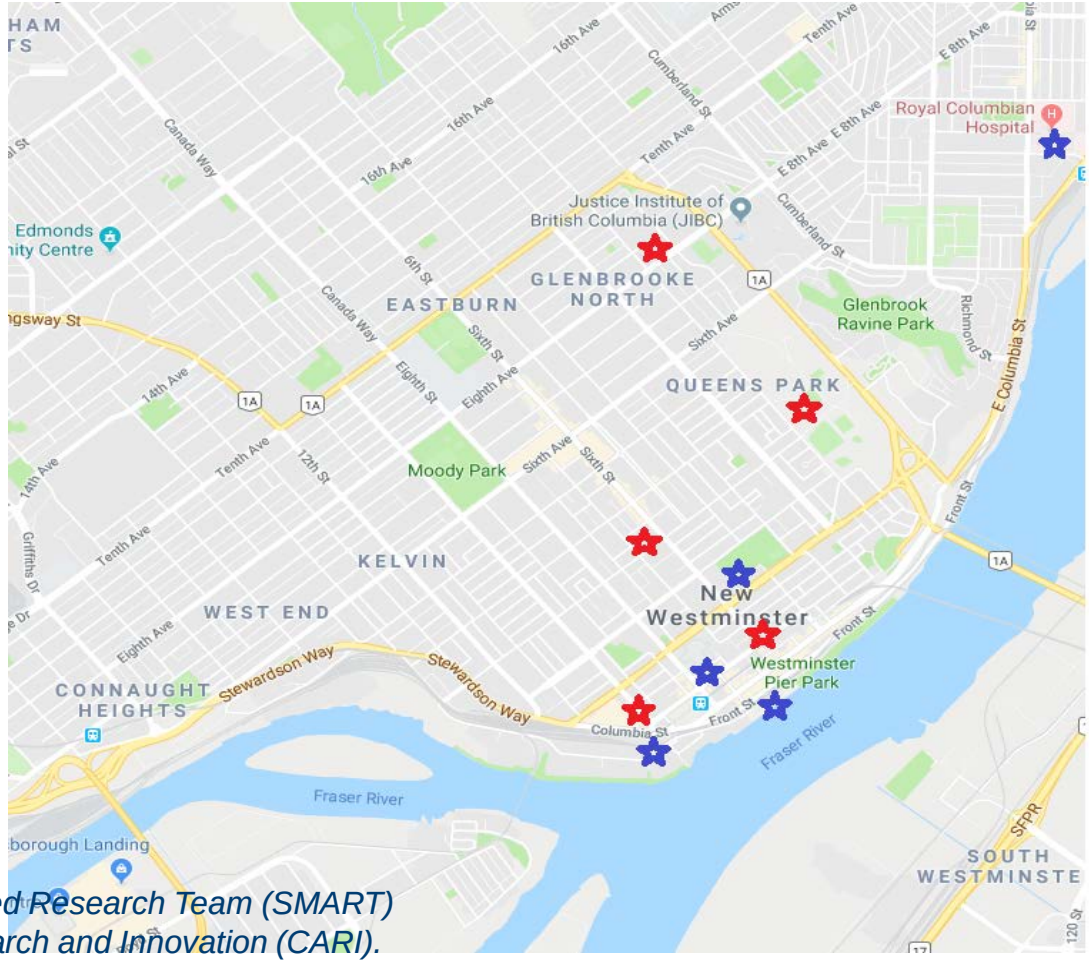
Electrical Considerations

- Majority of CoNW's lighting at 240V, some at 208V
- Load studies – needed to check how much current was on each phase of the lighting circuits
- Due to photocells on some light fixtures, some load studies had to be done at night
- Voltage checks
- Number of LEDs retrofits required

Curbside Demonstration Sites

Legend

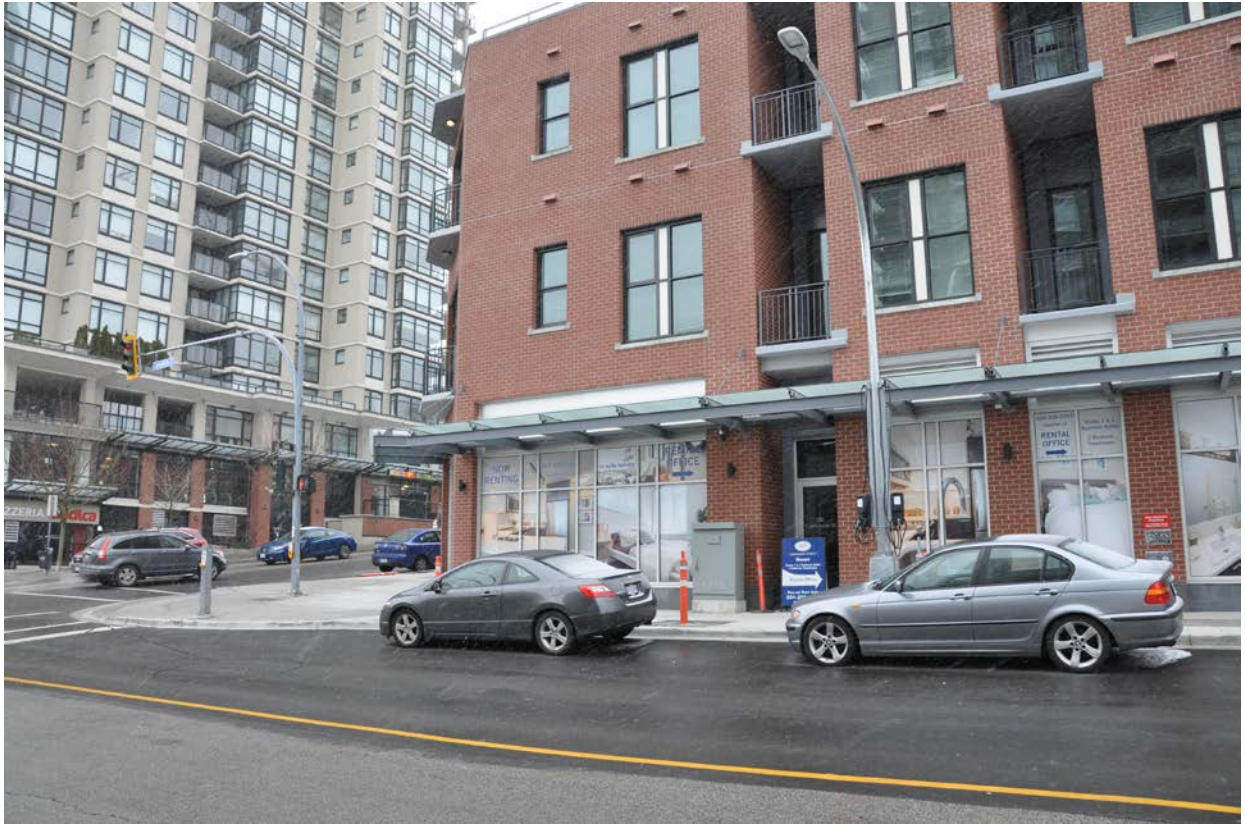
- Blue stars denote previously existing EV charge stations
- Red stars denote new EV charge station locations
- 5 new sites, with total of 10 new EV charger installs funded by the project.



Curbside Demonstration Sites

537 Carvarvon Street

- High density residential area
- Close to Douglas College, West Coast College of Massage, Law Courts, SkyTrain station
- Lighting retrofit HPS with LED
- Two AddEnergie EVSEs with load management



Curbside Demonstration Sites

70 10th Street

- High density residential area
- Downtown location, close to Columbia Square Plaza, Cinemas, SkyTrain station, River Market
- Lighting retrofit HPS with LED
- Back-in angle parking
- Two ClipperCreek EVSEs
- Will have overhead cable management system as in other locations

Curbside Demonstration Sites

3rd Ave & 6th Street

- High density residential area
- Close to commercial, uptown, Douglas College
- Lighting retrofit HPS with LED
- Two ClipperCreek EVSEs with load sharing
- Overhead cable management system as in other locations to reduce tripping hazard

Curbside Demonstration Sites

812 Colborne Street

- High density residential area
- Close to JIBC, Canada Games Pool, Glenbrook School, and Royal Square Mall
- Lighting retrofit HPS with LED
- Two AddEnergie EVSEs with load management
- Overhead cable management system as in other locations to reduce tripping hazard

Commercial Parking Lot Site

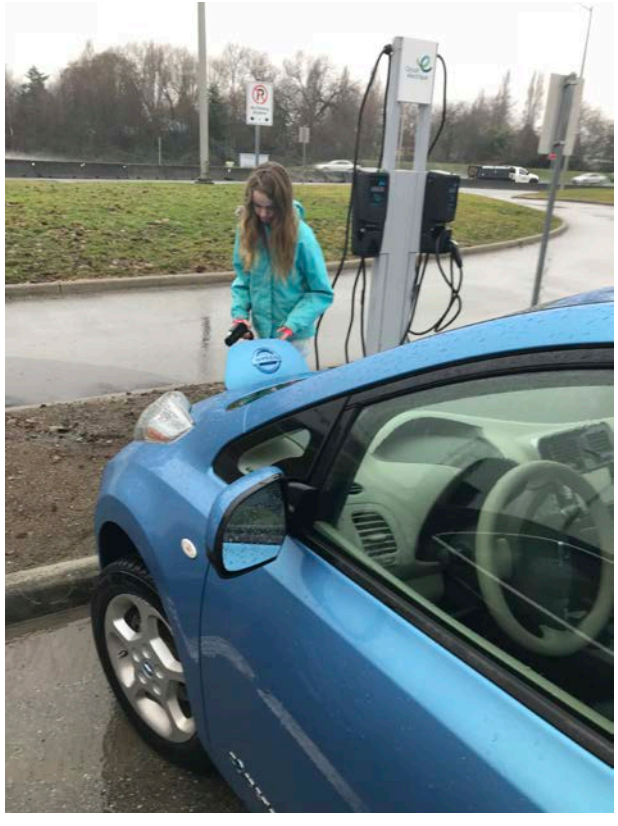
BCIT's Aerospace Technology Campus (ATC)

- Typical outdoor parking lot
- Mostly occupied during the day
- Mostly empty at night, when lights are on
- Generally lots of capacity during day
- 347 V three phase lighting
- EVSEs require 208 V – 240 V, so a transformer was needed
- Some municipalities have streetlighting on odd voltages, so this was a good test case of that scenario
- Six EVSEs funded and installed by the project

Commercial Parking Lot Site

AddEnergie Energy Managed Solution

- EV Chargers are from Quebec-based AddEnergie
- Network called Flo
- Automatically adjusts current delivered to each EVSE in response to lighting load, and aggregate charging load



MURB Demonstration Site

BCIT's Energy OASIS

- While not a Multi-Unit Residential Building (MURB), we can use the collection of ten Level 2s to emulate a typical MURB scenario
- The electrical feed to the ten chargers is inadequate to supply all simultaneously, and we use our own EVEMS to manage the chargers to throttle the level of charge up and down to manage the electrical load.
- Also using this site to investigate harmonics, which are a potential concern in MURB installations

MURBs: A Solution

Dedicated vs Shared or Managed

- Dedicated power to each parking stall can be cost prohibitive, and quickly exhaust any spare installed electrical capacity
- By installing EVSEs that share or manage power, far more EV owners have the ability to charge
- Charging may not be as fast as with dedicated, but most EV charging happens overnight, and most EVs are charged long before morning
- Leads to a much more efficient use of electrical resources
- Sharing and load management will also reduce demand charges and smart charging schemes can avoid charging during high TOU tariff times

What's Next? Implementing Low-Cost, Non-Proprietary, Standards-Based, Canada-Wide EV Charging Networks

Open Charge Point Protocol for Charging Interoperability

OpenADR Protocol for Utility Control

ROEV and/or Open Clearing House Protocol for Network Roaming

Payment Card Industry Compliant Payment

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Q&A

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