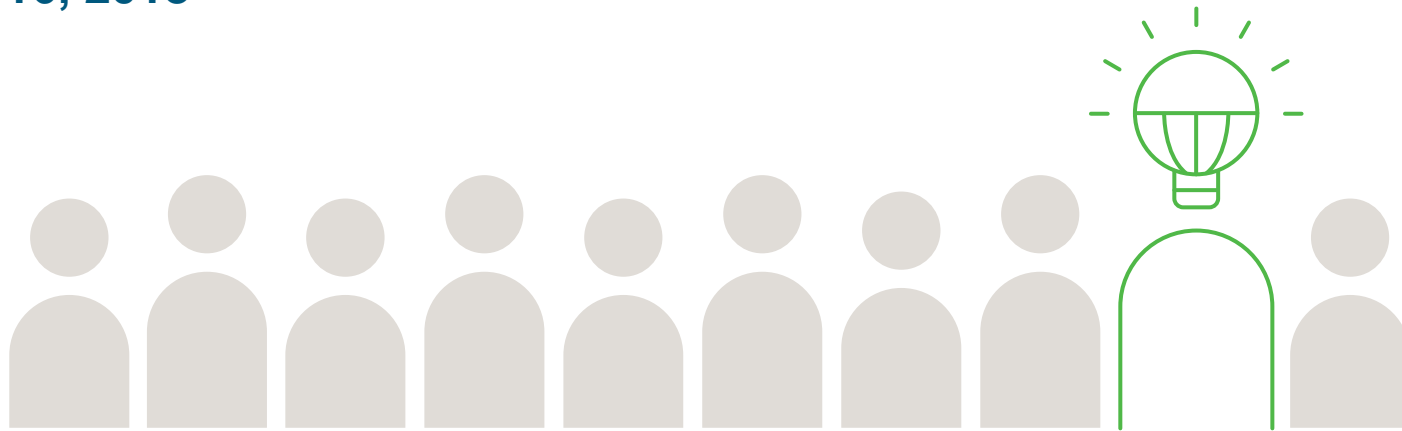


# BCUC Inquiry into the Regulation of Electric Vehicle Charging Service

**BC Hydro Presentation**  
**April 16, 2018**

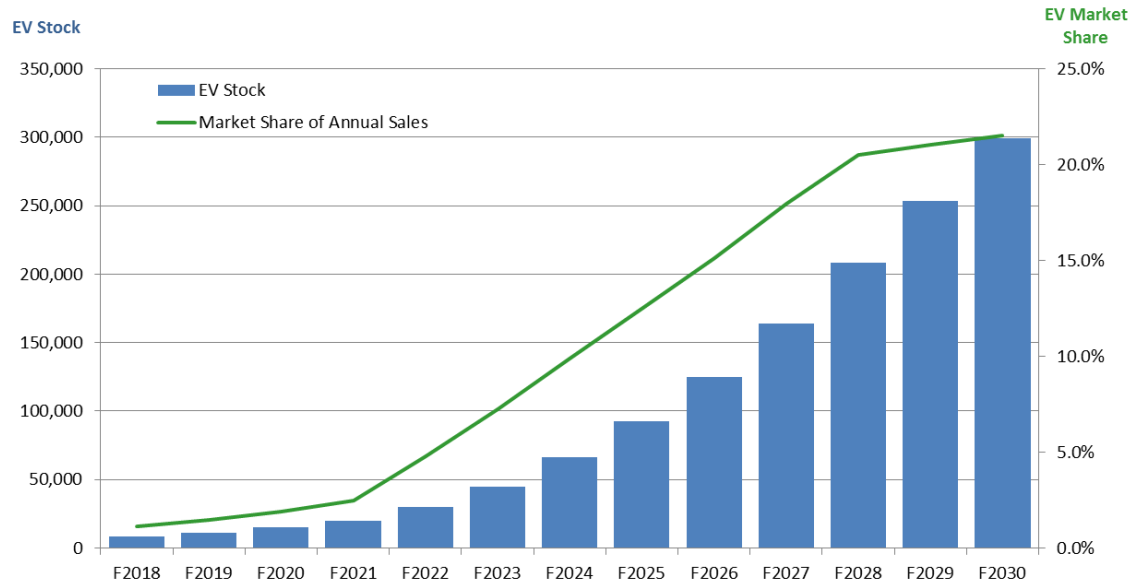


# Outline

1. Expected Growth in Electric Vehicle Ownership
  - BC Hydro forecast of EV market share
  - Factors affecting the market penetration of EVs
2. Enhancing the Availability of Reliable EV Charging
3. Types of EV Charging
4. BC Hydro Involvement in DCFC Station Deployment
5. Station Map – BC Hydro DCFC Stations
6. DC Fast Charging Station Deployment
  - 2013 – 2016 Station Deployment
  - 2017 – 2018 Station Deployment
  - Station Maintenance
7. Questions

# Expected Growth In Electric Vehicles

- BC Hydro Load Forecasting projects a growing market share of EVs and by F2030 the stock of EVs (light duty passenger vehicles) in BC is expected to be about 300,000 units



Assuming 3,000 kWh per year in electricity consumption per EV, total associated load by F2030 is expected to be in the order of 900 GWh per year.

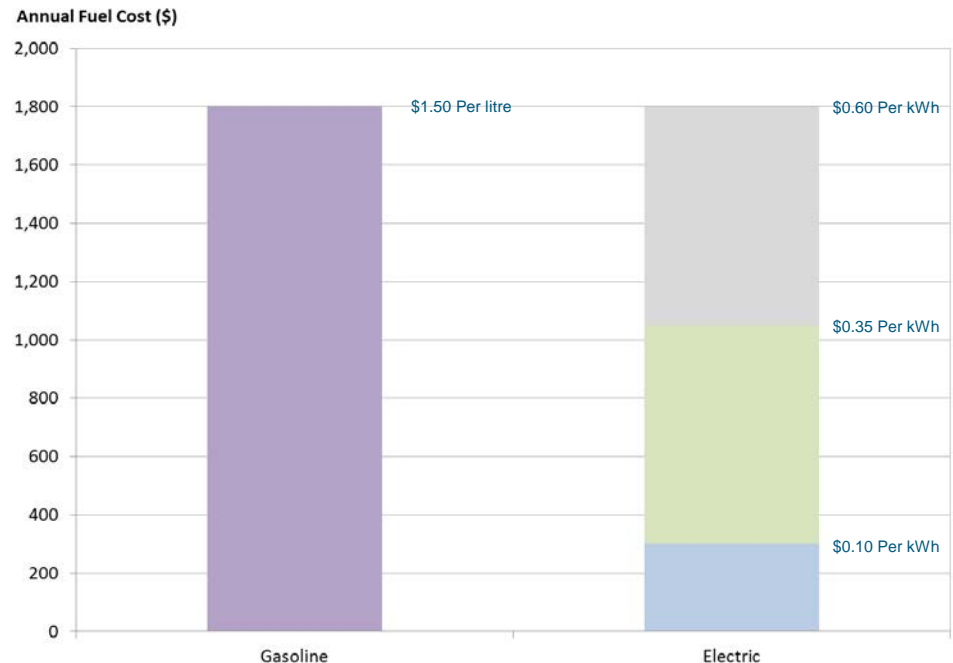
This is equivalent to the average consumption of 90,000 dwellings in BC.

# Expected Growth in Electric Vehicles

## Factors affecting the market penetration of EVs

- Availability of reliable charging opportunities
- Vehicle purchase price
- Vehicle purchase incentives
- Dealer inventory and wait times
- Variety of models available
- Ownership economics
  - Annual maintenance
  - Battery life
  - Price of gasoline vs electricity

Annual fuel costs for a gasoline internal combustion engine vehicle (8 litres per 100 km at \$1.50 per litre) vs. an electric vehicle (20 kWh per 100km) assuming 15,000 km travelled each year



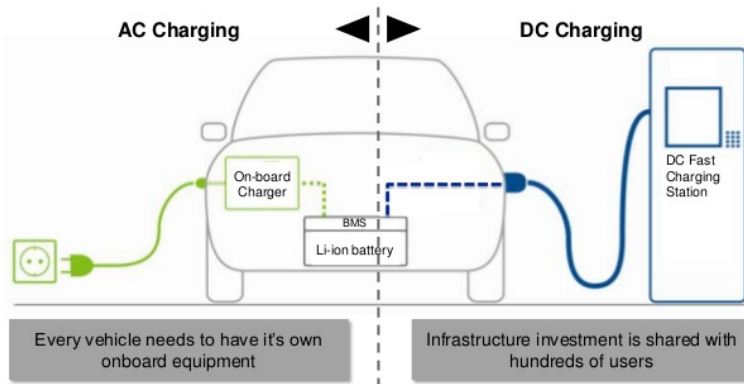
# BC Hydro's EV Related Activities

## Enhancing the Availability of Reliable EV Charging

- Since 2012, BC Hydro has been working with federal, provincial and local governments, businesses and other stakeholders to remove barriers to the adoption of EVs in BC. These efforts have included:
  - Charging stations - The deployment of 58 Direct Current Fast Charging (DCFC) stations across BC to provide reliable charging opportunities for EV owners
  - Charging technology - The development of a scalable charging solution with the objective of reducing the cost of installing and operating EV charging facilities in MURB settings
  - Grid standards that support EV load – Review customer distribution policy and equipment standards to accommodate EVs
  - Charger installation – identification of electricians with specific training in the installation of EV charging equipment (Alliance of Energy Professionals)

# Types of EV Charging

DC charging versus AC charging  
On-board versus Off-board equipment



- Since batteries are direct current (DC) devices, charging needs to occur using DC power
- If plugged into AC current, the vehicle's onboard charger must convert the AC current into DC current
- DC fast charging avoids the need for onboard conversion from AC to DC, and charges the battery directly
- The use of DC charging allows for significantly higher current levels and faster charging
  - Typically 50 kW (145 kW Tesla Supercharger)
  - BC Hydro has a new 150kW charger on order
- There are currently in the order of 1,100 public Level 2 stations in BC, and about 80 public DCFC stations (as of May 31, 2018)

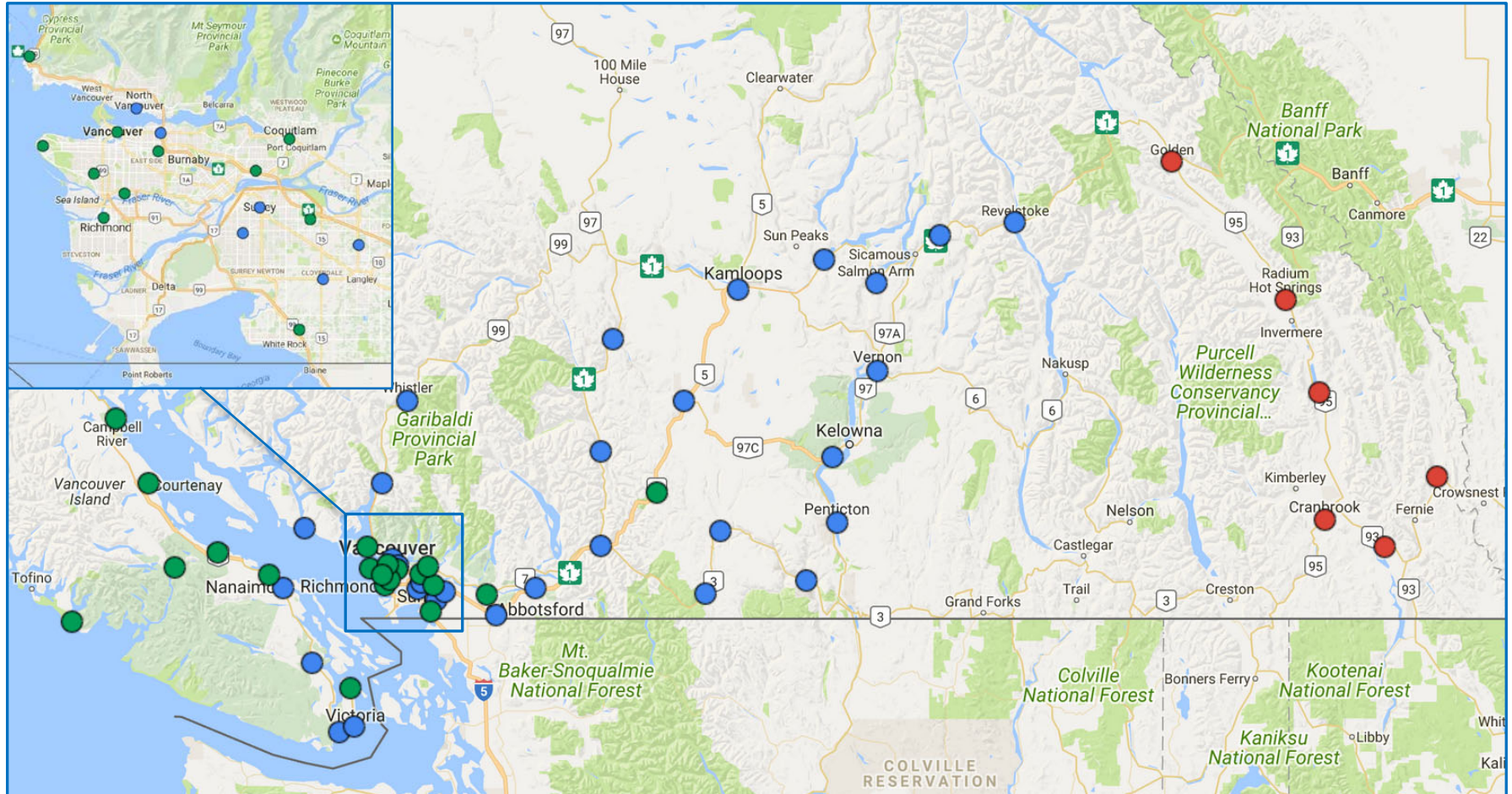
Charging Level	Specification	Total Charging Time	Application
<b>AC Level 1</b>	120V, 8-16A, 12A typical	PHEV: 8-12 hours BEV: 16+ hours	Suitable for PHEVs with smaller batteries. May be suitable for BEVs for overnight, workplace or long term parking.
<b>AC Level 2</b>	240V, 6-80A, 30A typical	PHEV: 2-4 hours BEV: 4-8 hours	Most common type of public charging.
<b>DCFC</b>	50 kW	30-40 mins to 80% Charge	Most common fast charging stations today

# BC Hydro Involvement in DCFC Station Deployment

## Climate Action and DCFC Stations

- Transportation electrification is a key contributor to the attainment of the province's climate action goals (reduction of total provincial GHGs to 80% below 2007 levels by 2050)
- Although the majority of EV charging occurs either at home or at work (about 80%), DCFC stations are considered to be critical to larger-scale use of electric vehicles
  - The presence of these stations on highway corridors makes intercity travel with an EV more practical
  - DCFC stations are necessary for EV owners who do not have access to charging stations either at home or at work
  - Faster charging can be required if the vehicle is in heavy use and a sufficient charge can't be achieved with Level 2 in the time available for charging

# DCFC Station Deployment – Phases I & II



- 2013 to 2016 Station Deployment
- 2017 to 2018 Station Deployment
- 2017 to 2018 Kootenay Station Deployment



# DCFC Station Deployment

## Smart EV Infrastructure Project (2012 to 2016)

- 30 Stations deployed on a pilot basis
- Project capital provided by the Province of BC, NRCan, and BC Hydro
  - First station deployed in 2013, and the last deployed in October 2016
- BC Hydro owns all 30 stations and leases these to the station operator for a nominal amount
  - As station owner, BC Hydro is responsible for station repairs and maintenance
  - The station operator purchases electricity at tariff rates (General Service) and collects any revenue if a fee is levied for vehicle charging
  - Of the 30 stations, 28 are operated by the Municipality in which they are located and are thus exempt from the definition of “Public Utility” in the *Utilities Commission Act* (UCA)
  - EcoDairy, a private sector operation, received an exemption from the UCA (BCUC Order No. G-71-16)
  - The remaining site is located at Powertech Labs and is operated as a testing site

# DCFC Station Deployment

## 2017 to 2018 Deployment

- BC Hydro is currently deploying an additional 22 DCFC stations. All are expected to be complete and operational by May 31, 2018
- Funding for project capital costs provided by the station hosts, NRCan, the Province of BC (Ministry of Energy, Mines, and Petroleum Resources as well as the Ministry of Transportation Infrastructure), and BC Hydro
- In addition to these 22 stations, the Community Energy Association has provided funding for the deployment of 6 DCFC stations located along the highway corridors in the Kootenay region. All are expected to be operational by May 31, 2018
- For each of the 28 stations, BC Hydro will be both the owner and the operator
  - BC Hydro intends to file for DC Fast Charging Rate in September 2018

# DCFC Station Deployment

## Station Maintenance

- Upon completion of the Phase II deployment, BC Hydro will be responsible for the ongoing maintenance of 58 stations and ensuring that all stations remain operational
- Over the past year, BC Hydro has implemented an operating model so that charging units are operated and maintained to the same standards as other utility assets
  - Power Pros Electrical has been retained province wide to provide on site service should a station fault occur
  - Powertech Labs has created an inventory of station parts to avoid issues with lead times associated with the ordering of replacement parts
  - First generation fast charging units are being replaced by more reliable current generation units
- With this operation model BC Hydro expects a significant improvement in both station reliability and station downtime

