An Overview

HYDRO-QUÉBEC

An Overview

July 2^{nd}, 2020
Quebec’s Energy System
>99% of our electricity is produced from water, an energy source that is clean, renewable, and reliable.
Hydro-Québec in numbers

Canada’s largest electric utility
36,700 MW of hydro power (~50% of Canada’s total hydro hydro)
19,477 employees (Dec 31st, 2019)
62 hydroelectric generating stations
260,106 km of transmission lines
Crown Corporation (100% owned by Quebec Government)

<table>
<thead>
<tr>
<th></th>
<th>Québec</th>
<th>UK</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (M)</td>
<td>8,5</td>
<td>64</td>
<td>1 : 7,5</td>
</tr>
<tr>
<td>Land Area (million km²)</td>
<td>1,67</td>
<td>0,24</td>
<td>7 : 1</td>
</tr>
<tr>
<td>Vehicles (M)</td>
<td>5,5</td>
<td>32,5</td>
<td>1 : 6</td>
</tr>
<tr>
<td>Electric vehicles (K)</td>
<td>72 (1,3%)</td>
<td>280 (0,9%)</td>
<td>1 : 4</td>
</tr>
</tbody>
</table>
Comparative index of electricity prices
As of April 1st, 2019 – Residential customers

1. Index representing the monthly bill (before taxes) for an energy consumption of 1,000 kWh.
Particularities of Quebec’s Power Consumption
Variation of Power Demand – Distribution in Qc

Occurrences through the year
Peak Power Demand: Defined by Electrical Heating

Power demand curve – January 22nd, 2020

Consumption Breakdown
- Heating & AC: 54%
- Hot water: 20%
- Appliances & electronics: 18%
- Lighting: 5%
- Other: 3%

Demand Breakdown:
- Heating & AC: 54%
- Hot water: 20%
- Appliances & electronics: 18%
- Lighting: 5%
- Other: 3%
EVs in Quebec and the Charging Network
Number of EVs in Québec and Canada

QUÉBEC
23% OF THE CANADIAN POPULATION

REST OF CANADA
77% OF THE POPULATION

OBJECTIVE
100,000 EVs in 2020

OBJECTIVE
none
By 2027
1,600
Additional fast-charging stations

End of 2020
100,000 EV’s

By 2030
1 M EV’s
To what degree does temperature impact EV range?

Real-world range vs. rated range

- Average (50th percentile)
- 90th percentile
- 10th percentile
1M of VE’s = less than 2% additional power peak demand.

EV ‘s IMPACT ON POWER PEAK

From: General José Lévy Vaillant et Fils

Maximum : 0.7 kW/VE’s
Winter Challenges
The Electric Circuit

- First and largest public charging network in Canada
- Launched in 2012 by four founding partners
- Current number of partners: almost 325
- Number of stations: Over 2500, including 310 DCFC

60,000 members
Various types of charging stations

240-V CHARGING STATIONS

DC FAST-CHARGE STATIONS: 50 or 100 kW

CURBSIDE CHARGING STATIONS
Superstations, DCFC: The 5 S

- **Standardised**
  - Same equipment everywhere

- **Scalable**
  - 50 kW to 400 kW chargers

- **modular Set-up**
  - Allow for different configurations

- **Straightforward to install**
  - Prefab components

- **Spectacular**
  - Make non EV drivers Jealous!
DCFC DEPLOYMENT BY A RATE-BASE FINANCING

Adding more fast-charge stations: a completely self-supporting project
Some of Hydro-Quebec’s Electric Mobility Projects
R&D ACTIVITIES

Hydro-Québec has 3 main R&D facilities:

**IREQ**: the largest research institute of its kind in North America

**LTE**: Energy technologies laboratory

**CETEES**: Center of Excellence in Transportation Electrification and Energy Storage

Thanks to its partnership approach with universities, public research agencies and industrial firms, Hydro-Québec also benefits from complementary expertise and the sharing of both resources and risks.

$110 million
IN R&D per year
Business Models

Residential

Connected home
Electric mobility
Solar self-generation

Commercial, institutional, industrial

Energy services
Electric mobility
Solar self-generation
Smart storage
Demand response
Quick connection

Hilo launched in 2019 – Connected home coming before end of 2020!
Maximum power demand increase on December 2017
Appendices
CEPAGE Project

HQ building integrating

• Modified BMS to integrate DERs
• 126 kWh battery from HQES
• 4 « market » bi-directional charging stations
• 1 prototype bi-directional charging station
• 4 BEV & 1 PHEV

Objectives

• Test available & prototype technologies in bi-directional charging
• Test DR events integrated with the BMS managing DERs
• Validate savings for customer by doing peak-shaving with the DERs
Our objectives and strategies

Objectives

- Contribute to the reduction of GHG emissions in all our markets.
- Power Quebec’s economic development.
- Be a benchmark in customer experience.
- Increase our net income.

Strategies

1. Electrify Québec and be a leader of the energy transition.
2. Seize growth opportunities in Québec and beyond our borders.
3. Develop a culture focused on customers and occupational health and safety.
Power at DCFC:
- Difference decreases between winter/summer
- Increases slowly: 32kw

Time at DCFC:
- Difference between winter/summer
- Increases due to increase of batteries capacities
Average sessions per month per BRCC: around 100
USAGE OF A DCFC: max of 25% of the time (per month) i.e 17 sessions per day
June 2019: New Mobile Application and Back office developed internally
October 2019: Operational Test of DCFC of 150 to 350 kW
USER’S NEGLIGENCE / MITIGATION
## Load Factor and Demand Charges

### Rates at a Glance – 4 Different rates with Energy and demand charges

| Load Factor | 11.0 | 10.4 | 10.3 | 10.2 | 10.1 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 30%         | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 |
| 25%         | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 |
| 20%         | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| 15%         | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 |
| 10%         | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |

### kW Load Levels

- **Québec**
- **Load Levels:** 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140