Richmond Electric Vehicle Charging Station
2021 Annual Report to the Select Board

22 June, 2022

Reporting period: Dec 1, 2020 to Dec 31, 2021

Contents

Background

Richmond, Vermont, installed an electric vehicle (EV) charging station in November, 2020, at the Town Center parking lot. The Town received a grant of $21,897 from the State Electric Vehicle Supply Equipment Grant program, which covered about 90% of the total project cost.

Per the grant agreement, the Town must provide usage data to the Department of Public Service, annually for five years. The first Usage Data report was provided to the State on February 24.

The charging station is a ChargePoint CT4020-HD-GW, a level-2 (220V) charger with 2 charging heads. The station is web-enabled to handle payments and track activity. Drivers can locate the charging station on various widely-used mobile apps and web sites. ChargePoint usage reports provided the data for this Annual Report.

Usage Data

The first recorded charging session was Dec 1, 2020. The reporting period for this report is Dec 1, 2020 through Dec 31, 2021, the first 13 months of operation. Subsequent annual reports will be by calendar year.

Key metrics:

Charging Sessions	371
Electric Energy Charged	3,827 kWh
Gasoline Saved	475 gallons
Fuel cost savings to users	$658
Equivalent gasoline saved (adjusted for CO2-equivalent of electric energy used)	377 gallons
CO2e savings	3,207 kg (7,072 lb)

Key observations:

- There were more than twice as many charging sessions in the second half of the year than the first half
- The number of unique drivers charging per month generally increased through the year
- On 37 days (9% of the days), both chargers were occupied for some portion of the day.

The following tables provide usage data for the first 13 months of operation.

Monthly Usage Data

	Sessions		kWh Charged			Gasoline Saved			
Source:	ChargePt	ChargePt	ChargePt	ChargePt	Calc	Calc [1]	Calc [2]	[3]	Calc
Month	**Charging Sessions**	**Unique Drivers**	**kWh Charged**	**kWh Charge Rate**	**kWh Total Cost**	**Estimated Driving Miles**	**Equivalent Gallons of Gas**	**Gasoline $/gal**	**Equivalent Gas Cost**
Dec-2020	15	8	153.3	$0.20	$31	475	19	$2.24	$43
Jan-2021	16	9	264.8	$0.20	$53	821	33	$2.24	$74
Feb-2021	20	9	291.3	$0.20	$58	903	36	$2.40	$87
Mar-2021	13	7	205.8	$0.20	$41	638	26	$2.64	$67
Apr-2021	10	8	138.0	$0.19	$26	428	17	$2.76	$47
May-2021	22	17	154.1	$0.19	$29	478	19	$2.80	$54
Jun-2021	39	19	457.3	$0.19	$87	1,418	57	$2.95	$167
Jul-2021	32	20	290.2	$0.19	$55	900	36	$3.04	$109
Aug-2021	48	24	441.3	$0.19	$84	1,368	55	$3.05	$167
Sep-2021	42	18	451.2	$0.19	$86	1,399	56	$3.09	$173
Oct-2021	28	19	183.4	$0.19	$35	569	23	$3.10	$70
Nov-2021	42	18	444.3	$0.19	$84	1,377	55	$3.40	$187
Dec-2021	44	25	352.0	$0.19	$67	1,091	44	$3.40	$148
TOTAL	**371**	**201**	**3,827**		**$736**	**11,864**	**475**		**$1,394**

	Climate Impact				Charging Port Occupation			Revenue
Source:	Calc [4]	Calc [5]	ChrgPt [6]	ChargePt	ChargePt	ChargePt	ChargePt	ChargePt
Month	**Equivalent Gallons Saved**	**CO2 Saved per Equiv. Gal. (kg)**	**GHG Savings (kg)**	**GHG Savings (kg/kWh)**	**Days with Max 2 Ports Occupied**	**Days with Max 1 Port Occupied**	**Days with 0 Ports Occupied**	**Gross Revenue**
Dec-2020	15.1	128	64	0.42	0	14	17	$36.44
Jan-2021	26.1	222	134	0.51	0	14	17	$66.10
Feb-2021	28.7	244	207	0.71	1	14	13	$64.62
Mar-2021	20.3	172	146	0.71	1	9	21	$46.74
Apr-2021	13.6	116	98	0.71	1	7	22	$35.51
May-2021	15.2	129	109	0.71	2	13	16	$32.80
Jun-2021	45.1	383	325	0.71	5	14	11	$103.46
Jul-2021	28.6	243	206	0.71	4	14	13	$55.18
Aug-2021	43.5	370	313	0.71	7	17	7	$89.71
Sep-2021	44.5	378	320	0.71	4	21	5	$98.59
Oct-2021	18.1	154	130	0.71	3	15	13	$36.89
Nov-2021	43.8	372	315	0.71	3	18	9	$103.08
Dec-2021	34.7	295	250	0.71	6	18	7	$79.63
TOTAL	**377.3**	**3,207**	**2,617**		**37**	**188**	**171**	**$848.75**

Usage Data Notes:

[1] Assumes 3.1 mi/kWh for EVs

[2] Assumes 25 mi/gal for gas-only vehicles

[3a] Source for Dec-2020 through Nov-2021 (the State website apparently no longer has this data available as of 22-Feb-2022): https://vtrans.vermont.gov/contract-admin/resources/construction-contracting/fuel-price-adjustment

[3b] Source for Dec-2021: GasBuddy.com, https://www.gasbuddy.com/charts

[4] Assumes 122 MPGe for EVs in Vermont based on life-cycle analysis of EV impacts for New England power sources: https://blog.ucsusa.org/dave-reichmuth/plug-in-or-gas-up-why-driving-on-electricity-is-better-than-gasoline/

[5] Assumes 8.50 kg CO2/gallon of gasoline - presumably ignores the ethanol portion of the gasoline. US EIA, accessed 18-Dec-2021: https://www.eia.gov/environment/emissions/co2_vol_mass.php

[6] GHG savings per ChargePoint report - assumptions provided in the Admin FAQ: https://na.chargepoint.com/admin_faq

An Excel spreadsheet of usage data is available at https://tinyurl.com/2p8ssax5.

Usage Charges and Revenue

The usage charge (the cost to users) was set at $0.20/kWh during initial setup, and lowered to $0.19/kWh after four months. The Town pays $0.16864/kWh for the electricity and ChargePoint charges a 10% fee, thus the cost to the Town is $0.1855/kWh. This was rounded to $0.19/kWh.

For the 13-month reporting period:

Gross Revenue	$848.75
ChargePoint Fees	$84.67
Net Revenue	$764.08

The dwelling fee was set at $1/hour after four hours, to discourage occupying a space for more than 4 hours.

Dwelling fees collected are estimated at $28, based on revenues less the electric usage costs.

Climate Impacts

EVs have much lower greenhouse gas (GHG) emissions than gas vehicles. Gas engines are very inefficient (much of the energy is lost as heat), while electric power in Vermont is relatively clean since most of it is generated from hydroelectric, nuclear, and other low-GHG sources.

ChargePoint reported GHG savings of 2,617 kg (5,770 lbs) over the 13-month reporting period.

A custom calculation found somewhat higher CO2-equivalent savings of 3,207 kg (7,072 lbs), which equates to the impact of about 377 gallons of gasoline saved.

Charging Port Occupation

For the first 13 months of operation:

Charging Port Occupation	Days	% of Days
Maximum of 2 Ports Occupied	37	9%
Maximum of 1 Port Occupied	188	47%
No Ports Occupied	171	43%

When both ports (charging heads) are occupied, a potential user could arrive to find they have to wait to charge up, or leave disappointed. For now that's a fairly rare occurrence.

However, demand for the chargers appears to be increasing, and the Town's new Tesla EV police cruiser could become a regular user of the station. When the Town's Tesla goes into regular use, both charging ports will be occupied more frequently. If and when that happens, the Town can consider ways to minimize having both heads occupied at the same time.

In the future, the Town can consider expanding the number of charging heads if demand continues to rise. There is conduit to the existing station that can support a second 2-head charging station.

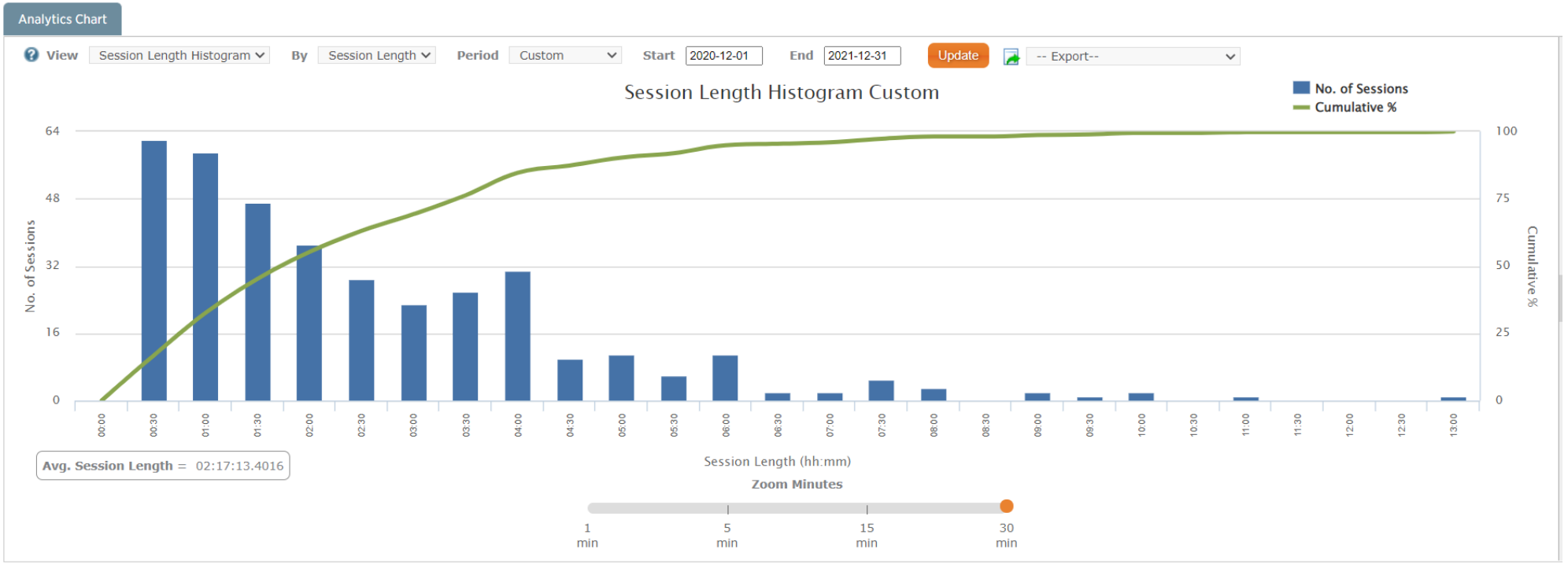
Session Time Histogram

A histogram of charging session times is provided on the following page.

Most session are less than 4 hours in length, but about one quarter were longer than 4 hours.

To discourage users from occupying the spaces for excessive time, the Town could consider raising the dwelling fee from its current rate of $1/hour after four hours. However, it appears to be fairly rare that someone wanting to charge is unable to due to a dwelling vehicle – so this option could be revisited in the future.

Session Time Histogram



Summary of session times:

Length of session	# of sessions	% of sessions
>= 9 hours	7	2%
4-9 hours	81	22%
2-4 hours	115	31%
0-2 hours	168	45%
Total	**371**	