REPORT TO THE VERMONT STATE LEGISLATURE

Act 55: 2022 Report on Electric Rates for Electric Vehicles

Submitted by the Vermont Public Utility Commission to the Senate Committees on Finance, on Natural Resources & Energy, and on Transportation, and to the House Committees on Energy & Technology and on Transportation

January 14, 2022

VERMONT

PUBLIC UTILITY COMMISSION

I. Introduction and Statutory Basis

On June 3, 2021, Act 55, an act relating to the Transportation Program and miscellaneous changes to laws related to transportation, was signed into law. Among other things, Act 55 directs the Vermont Public Utility Commission ("Commission") to file a report to the Legislature annually for four years regarding progress on rates related to electric vehicles ("EVs") and electric vehicle supply equipment ("EVSE").

Section 33 of Act 55 directs distribution utilities to develop rates that manage loads for greater cost containment, while supporting greater customer participation in such efforts and promoting the adoption of electric vehicles. Utilities are required to propose rates to the Commission by June 30, 2024. Three utilities have already put into place special EV and EVSE rates. Section 33 also requires the Commission "in consultation with the Department of Public Service and State electric distribution utilities" to "file written reports…that address the goals delineated in subdivisions (c)(1)(A)–(F) of this section, as applicable, and any progress barriers towards the goals contained in subsections (a) and (b) of this section."[1,2]

EV rates can direct loads away from peak times and help to contain the costs of electrifying the transportation sector.

[1] Act 55, Section 33, (c)(1)(A)-(F): "(c) PEV rates approved by the Public Utility Commission under subdivisions (1) and (2) of this subsection comply with subsection (b) of this section. (1) The Public Utility Commission shall approve PEV rates that it finds, at a minimum: (A) support greater adoption of PEVs; (B) adequately compensate PEV operators and owners of EVSE available to the public for the value of grid-related services, including costs avoided through peak management; (C) adequately compensate the electric distribution utility and its customers for the additional costs that are directly attributable to the delivery of electricity through a PEV rate; (D) include a reasonable contribution to historic or embedded costs required to meet the overall cost of service; (E) do not discourage EVSE available to the public; and (F) do not have an adverse impact to ratepayers not utilizing the PEV rate."

[2] Act 55, 2021, Section 33, (a)-(b): "(a) This section serves to encourage efficient integration of PEVs and EVSE into the electric system and the timely adoption of PEVs and public charging through managed loads or time-differentiated price signals. (b) Unless an extension is granted pursuant to subsection (e) of this section, all State electric distribution utilities shall offer PEV rates, which may include rates for electricity sales to an entire customer premises, for public and private EVSE not later than June 30, 2024. These rates shall, pursuant to 30 V.S.A. § 225, be filed for review and approval by the Public Utility Commission and encourage: (1) efficient use of PEV loads consistent with objectives of least-cost integrated planning, set out in 30 V.S.A. § 218c, and 30 V.S.A. § 202(b) and (c); (2) participation in the PEV rates; (3) travel by PEV relative to available alternatives; and (4) greater adoption of PEVs."

The Commission requested comments from stakeholders and integrated those comments into this report.[3] The Commission is, as always, grateful for the time and effort of stakeholders in preparing comments for this report. The Commission has previously submitted two reports that address electric vehicle deployment more generally.[4] This report specifically and narrowly addresses the topics raised by Act 55.[5]

Utilities are required by Act 55 to propose EV rates by June 30, 2024.[6] Some utilities already offer EV, EVSE, and/or whole-house time-of-use rates. Others are working toward proposing such rates by June of 2024.

The Vermont Department of Public Service ("Department") is working with utilities to develop EV and EVSE rates. In 2019 and 2020, the Department convened Phase I of the Rate Design Initiative ("RDI") to analyze innovative retail rate applications. In 2021, the Department commenced Phase II of RDI to assist municipal and cooperative distribution utilities to develop and implement innovative rates and pilot projects.

The following two EV-focused projects proposed by utilities were selected in December 2021 to receive State Energy Program grant funds and are now proceeding through the contracting process.[7]

1. Vermont Public Power Supply Authority ("VPPSA") EV Charging Rate Development ($51,660): The project consists of research, data acquisition, and implementation of innovative tariffs by deploying residential Level 2 EV chargers, developing customer load-management incentives, and understanding customer behavior and billing system

[3] See Commission case number 21-5271-INV.

[4] *Report to the Vermont State Legislature: Promoting the Ownership and Use of Electric Vehicles in the State of Vermont*, submitted to the Senate and House Committees on Transportation, the Senate Committee on Finance, the Senate Committee on Natural Resources & Energy, and the House Committee on Energy & Technology, on June 27, 2019; *Report to the Vermont State Legislature: Supplemental Electric Vehicle Report Submitted Pursuant to Section 35 of Act 59 of the 2019-2020 Vermont Legislative Session*, submitted to the Senate and House Committees on Transportation, the Senate Committee on Natural Resources & Energy, and the House Committee on Energy & Technology, on December 13, 2019.

[5] Act 55, section 33(f): "The Public Utility Commission, in consultation with the Department of Public Service and State electric distribution utilities, shall file written reports with the House Committees on Energy and Technology and on Transportation and the Senate Committees on Finance, on Natural Resources and Energy, and on Transportation that address the goals delineated in subdivisions (c)(1)(A)–(F) of this section, as applicable, and any progress barriers towards the goals contained in subsections (a) and (b) of this section not later than January 15, 2022, January 15, 2023, January 15, 2024, and January 15, 2025.

[6] Renewable Energy Vermont recommended that the Commission further define the objective laid out in Act 55, Section 33, (c)(1)(A)-(F).

[7] Two other selected projects address rates for non-EV loads.

capabilities. Three of VPPSA's members will be involved, but the methodology developed will be applicable to all eleven member utilities.

2. Level 1 EV Charging by Vermont Electric Cooperative, Washington Electric Cooperative, and Burlington Electric Department ($13,340): These three utilities will work together on a combined project to use low-cost, web-connected "smart plugs" to monitor Level 1 residential EV charging and to promote off-peak charging through EV-specific rates.

The following sections of this report include an inventory of existing utility rates and programs and a description of the barriers to implementing EV rates identified by stakeholders.

II. EV-Specific Utility Rates and Programs (existing and proposed)

There are two general categories of existing rates for both EVs and EVSE.[8] (1) Time-varying rates allow customers to charge their vehicles during off-peak hours when the costs for energy and capacity are low. The utility passes the savings through to the customer.[9] (2) Direct load-control rates give customers financial incentives to allow the utility to disable charging during peak events. Both of these categories require customers to install a charging or metering device, approved by the utility, that can meter the kWh supplied to the vehicle separately from the kWh used generally at the site.

[8] Rates adopted prior to the passage of Act 55 were evaluated using traditional ratemaking principles. In Act 55, the Legislature directs the Commission to approve rates if they meet certain conditions (Act 55, Section 33, (c)(1)(A)-(F)). See footnote 1 above. The rates described in this report may or may not meet each criterion identified in Act 55, as the Commission did not explicitly consider those criteria at the time the rates were adopted.

[9] Some of the time-varying rates discussed in this report pertain to EVs in particular and apply only to the EV load. For these rates, EV electricity use is metered by the charging equipment; credits are then added to the customer's bill. Other time-varying rates may instead apply to the usage of the whole house, not just the EV charging. Act 55 contemplates either approach. *See* Act 55, Section 33(b)("[A]ll State electric distribution utilities shall offer PEV rates, which may include rates for electricity sales to an entire customer premises, for public and private EVSE….").

A. City of Burlington Electric Department

1. Rate Options

The City of Burlington Electric Department ("BED") began offering EV charging rates in 2018. There are three options: (1) Under "fixed EV charging," customers receive a bill credit for charging during off-peak hours. (2) Under the "flexible load" option, BED varies the level of EV charging according to market and load information, including the current wholesale price of energy and the probability of a peak, or due to local grid constraints. Customers are given advance notice of peak events. (3) Under the "flexible real-time load" option, BED dynamically varies charging levels, but without advance notice to customers. If customers override BED's signal and charge during peaking hours, they will lose the bill credit for the month.

Details

EV Charging Hours	
Fixed EV Charging off-peak hours	10 p.m. – 12 p.m. (next day)
Flexible Load peak hours	Designated by Burlington Electric in advance
Flexible Real-Time Load peak hours	Designated by Burlington Electric
EV Charging Credit	
Energy credit – Residential Service	$0.067735 per kWh
Demand credit – Large general service	$20.03 per kW

2. Enrollment

BED provides purchase incentives for EVs as part of its program implementing Tier III of the Renewable Energy Standard.[10] Currently, 95 BED customers – 28% of the 340 BED customers who have received EV purchase incentives – are enrolled in BED's EV rate. Participation in the EV rate requires a customer to purchase and install a BED-approved charger, which enables BED to submeter and control (as necessary) the customer's EV charging. This may be a barrier to enrollment in the EV rate.[11]

3. Effectiveness

For customers enrolled in EV rates, the rates are highly effective at directing charging away from peak times. As shown in the graph below, 94% of BED charging at the EV

[10] 30 V.S.A. § 8005.

[11] A list of approved chargers can be found at www.burlingtonelectric.com/evrate.

rate avoids peak hours. Customers who are not enrolled in EV rates are much less likely to charge after peak hours, when the utility incurs high costs to serve customer load.

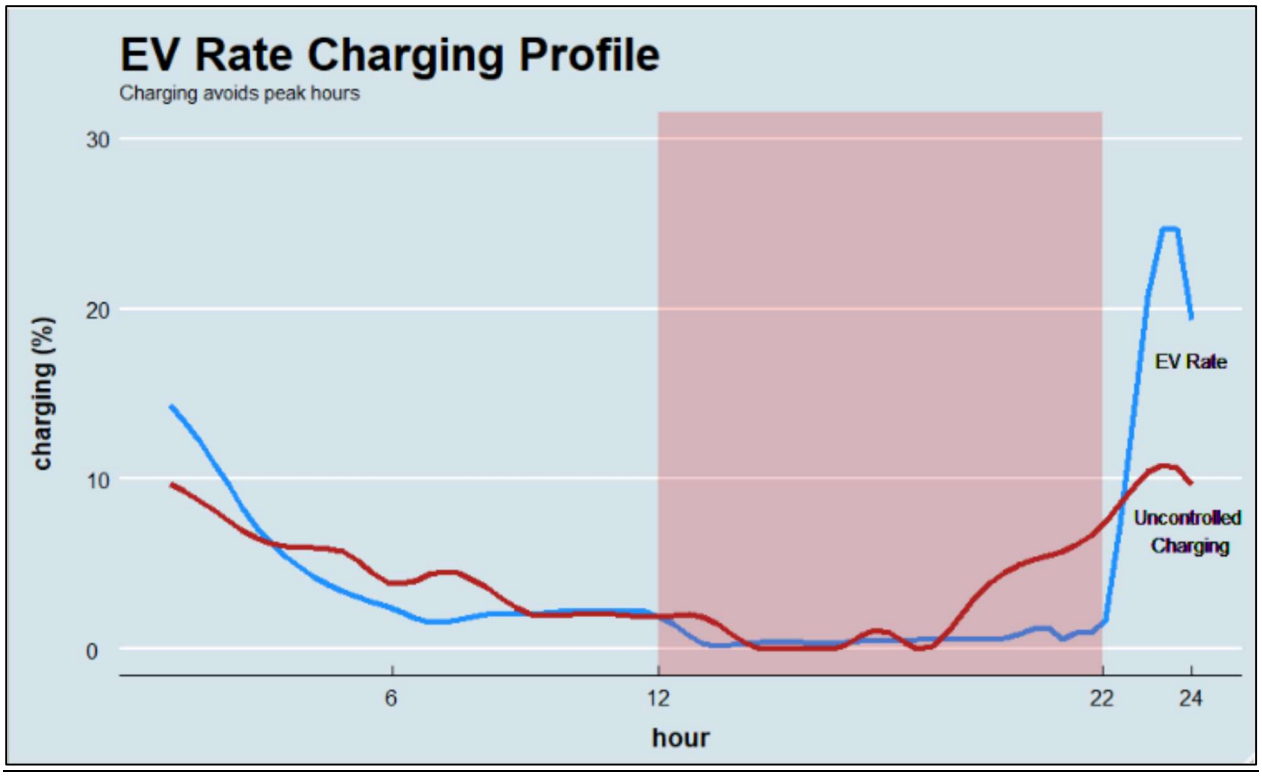

Figure 1: BED profile of charging times for customers enrolled in EV rates (blue line) and customers not enrolled in EV rates (red line). Expensive peak times generally occur during the red block from noon until 10 p.m.

B. Municipal Utilities

VPPSA filed comments on behalf of most of the small municipal utilities in the state. VPPSA members continue to investigate options for implementing EV-specific and time-of-use rates that will encourage customers to conduct charging during off-peak periods. In 2022, VPPSA and Efficiency Vermont plan to implement an EV charging pilot.

Under the pilot, the chargers that will be provided to certain customers who purchase electric vehicles will be equipped with Open Charge Point Protocol (OCPP) technology, which allows chargers to be integrated with multiple control platforms through open-source software standards. At the time of installation, these chargers will be programmed to charge an EV during off-peak hours and may facilitate direct control of EV charging in the future. Theoretically, installing open-source technology will help

utilities avoid the risk of being tied to one load-management platform that can increase its prices.

As described in the introduction of this report, VPPSA recently was awarded a grant from the Department of Public Service to support EV rate development. These grant funds will, in part, be used for consultants with expertise designing cost-based EV and EVSE rates for small municipal utilities around the country.

Finally, VPPSA continues to move forward with development of a centralized advanced metering infrastructure ("AMI") system for its members, with deployment anticipated to begin in 2022. This technology will facilitate development and implementation of time-varying rates.

C. Green Mountain Power Corporation

Green Mountain Power Corporation ("GMP") offers two EV rates to residential customers, a direct load-control rate and a time-of-use rate. GMP also offers an exemption from retail demand charges for EVSE, and it is offering a limited special contract for electric school bus charging.

1. Rate Options

GMP offers two EV-specific rate options to its customers.

a) Off-Peak EV Residential Rate 72

GMP's off-peak electric vehicle residential service rate ("Rate 72") is available throughout GMP's service territory for EV charging using specific EVSE. Rate 72 requires customers to have a GMP-approved Level 2 or compatible charger, reliable Internet access, and residual electric service under GMP's Residential Rate Schedule 1. To calculate usage under Rate 72, GMP measures electric use by the charging equipment and subtracts it from the household billing meter.

Rate 72 requires customers to enroll their EVSE in GMP's energy management platform, which provides GMP the ability to control the EV charging, including turning the customer's EVSE off, during times of peak demand ("Peak Events"). Customers are also required to provide information to the third-party manufacturers of the EVSE for use by GMP to assist in the energy efficiency programming of the EVSE.

Customers are notified of Peak Events anywhere from 4 to 24 hours in advance of the Peak Event. GMP Peak Events occur an average of 5 to 10 times per month for an average of 2 to 6 hours at a time. At any time after the receipt of a Peak Event

notification from GMP, customers may override the Peak Event and continue charging at the on-peak EV rate. If a customer does not override the Peak Event, GMP will control the EVSE during the Peak Event period.

Details

Off-peak EV rate	$0.13969 per kWh
Peak Event EV rate	$0.71822 per kWh

b) Time-of-Use EV Residential Rate 74

GMP's time-of-use electric vehicle residential service rate ("Rate 74") is available throughout GMP's service territory for EV charging using specific EV supply equipment ("EVSE"). The rate requires customers to have a GMP-approved Level 2 or compatible charger, reliable Internet access, and residual electric service under GMP's Residential Rate 1. To calculate usage under Rate 74, GMP measures electric use by the charging equipment and subtracts it from the household billing meter.

The rate requires customers to enroll their EVSE in GMP's Energy Management Platform, which provides GMP with access to the EVSE for the purpose of measuring electricity use. Customers are also required to provide information to the third-party manufacturers of the EVSE for use by GMP to assist in the energy efficiency programming of the EVSE.

Details

Hours	
Peak	1:00 p.m. to 9:00 p.m., Monday through Friday
Off-peak	All other times
Rates	
Off-peak EV rate	$0.13433 per kWh
Peak hours EV rate	$0.17650 per kWh

c) General Service Rate 6 EVSE Exemption

GMP also offers non-residential customers service under General Service Rate Schedule 6, which has a daily customer charge and a flat kWh rate. Wherever the usage under this rate is restricted to public EVSE, the 200 kW demand and 7,600 kWh/month consumption service limitations are not enforced. Without this exemption, the default rate schedule for usage above the service limitations would be Commercial and

Industrial Time-of-Use Rate Schedule 63/65, which consists of a customer charge and time-of-use kW and kWh rates.

Details

Rate 6	
Customer charge	$0.641 per day
Per kWh charge	$0.17945 per kWh

d) Generic Special Contract for Electric Bus Charging

GMP also has a generic special contract for electric bus charging.[12] Similar to the EVSE Exemption for General Service Rate 6, contract participants are not subject to the 200 kW demand or 7,600 kWh/month consumption limitations of Rate 6. This contract was developed for the four GMP customers participating in the Vermont Agency of Natural Resources Electric School and Transit Bus Pilot Program. However, the general special contract is open to any other qualifying entities that pilot electric bus charging equipment while the special contract is in effect. The default rate classes for these customers would otherwise be General Service Rate Schedule 6 and Commercial and Industrial Time-of-Use Rate Schedule 63/65, depending on usage levels.

2. Enrollment

GMP has 1,002 customers enrolled in its EV-specific rate programs. Of those customers, 40% are enrolled in Rate 72's managed charging program, and 60% are enrolled in Rate 74 (time-of-use).

Of all the GMP customers who received one of GMP's EV-related incentives,[13] 36% are enrolled in one of GMP's EV rates. GMP customers who receive a free Level 2 charger are required to enroll in one of GMP's two EV rates within 60 days. GMP has not been enforcing this requirement due to the short supply of electricians and other pandemic-related challenges. GMP states that it will continue its outreach efforts and will be launching an online registration system to facilitate additional enrollment in its EV programs.

[12] This generic special contract was approved by the Commission on December 8, 2021, in Case No. 21-4593-SC and is in effect through July 31, 2023.

[13] GMP explains that the incentives include an EV-purchase incentive and a free Level 2 charger. Among customers who have received a Tier III EV purchase incentive since September 2020, 78% received a free smart Level 2 charger. (Tesla currently does not have a charger that communicates with GMP's platform.)

3. Effectiveness

GMP has found that its managed charging Rate 72 and time-of-use Rate 74 are effective at directing load away from peak times. In 2021, approximately 2% of Rate 72 customers opted out of managed charging during a Peak Event. For customers using GMP's time-of-use Rate 74, 95% of EV charging has occurred during off-peak hours.

GMP has also identified additional load-management opportunities through its customers' use of EV rates. For example, GMP has detected a spike in charging at the beginning of off-peak hours and at the end of a Peak Event, which GMP explains it could address by staggering off-peak hours among customers and gradually reactivating managed chargers after a Peak Event.

GMP has also found that providing a customer with a Level 2 charging solution at the point of EV sale increases enrollment in EV rates. In this scenario, GMP customers complete GMP's EV rebate form at the EV dealership, and the form includes a checkbox for a free Level 2 charger. A condition of receiving the free charger is enrollment in one of GMP's EV-specific rates.

D. Town of Stowe Electric Department

1. Rate Option

The Town of Stowe Electric Department ("Stowe Electric") has an EV charging rate under Tariff Rate 35 that applies at each of the utility's public charging stations. Stowe Electric does not have a commercial, residential, or multi-family EV charging rate.

Details

Rates	
Flat fee regardless of actual charging time	$2.03
Hourly fee for first 4 hours	$0.51
Hourly fee thereafter	$1.01

2. Enrollment

Stowe Electric has 11 stations (20 ports) enrolled in Rate 35 and publicly available to any EV user.

3. Effectiveness

Stowe Electric's rate does not reflect the different costs associated with peak or off-peak times, so Stowe Electric has not analyzed whether Tariff Rate 35 shifts load away from peak times.

III. Whole-Premises Time-of-Use Rates

Several utilities are considering whole-house time-of-use rates that apply not only to the electricity used to charge an EV, but to all electricity used at a site. Other utilities already have whole-premises time-of-use rates in place.[14]

E. Vermont Electric Cooperative, Inc.

1. Rate Options

Vermont Electric Cooperative, Inc. ("VEC") offers several whole-premises time-of-use rates to customers as well as a load-management program for members who use Level 2 EV chargers, home batteries, or flexible-load water heaters. VEC is also developing a program to provide load management to VEC customers who use Level 1 chargers. VEC does not offer any EV-specific rates.

a) Residential Time-of-Use Rate

VEC's Service Classification 1.2 is a pilot time-of-use optional rate available to residential customers participating in VEC's Energy Transformation Program, which is its program for implementing Tier III of the Renewable Energy Standard. VEC's whole-house Service Classification 1.2 provides an incentive for customers to shift their electric usage, including EV charging, away from high-cost hours and does not require submetering.

Details

Hours	
On peak	5:01 p.m. to 9:00 p.m., weekdays
Mid peak	7:01 a.m. to 5:00 p.m., weekdays
Off peak	9:01 p.m. to 7:00 a.m., weekdays; all day weekends and holidays
Rates	
On peak	$0.33716 per kWh
Mid peak	$0.17947 per kWh

[14] Historically, whole-premises time-of-use rates have very low enrollment.

Off peak	$0.12426 per kWh

b) Commercial Time-of-Use Rates

VEC also offers Service Classification 2.2 for Small Commercial members and 2.3 for Large Commercial members that participate in VEC's Energy Transformation projects, which include EV incentives and public charging EVSE. The Service Classification 2.2 and 2.3 rates are non-demand time-of-use rates, provided that the customer remains under certain usage thresholds. VEC's default commercial time-of-use rates do include a demand charge.

c) Other VEC EV Load-Management Programs

VEC offers an opt-in load-management program for members who use Level 2 electric vehicle chargers, home batteries, or flexible-load water heaters. For the vehicle charger program, VEC offers a $250 bill credit when the charger is purchased and the member either enrolls in the load-management program or otherwise avoids charging during peak times.

Members who enroll in the load-management platform receive an additional $50 incentive and an additional $8/month bill credit if they participate in load reduction during peak events, which VEC estimates occur 5-6 times per month, for up to 3-4 hours per event. VEC can request that chargers enrolled in the load-management program not operate during peak events.

Using the funding provided by the Department described in the introduction of this report, VEC is also developing a load-management pilot program to target the 38% of VEC electric vehicle drivers who do not use Level 2 chargers, but instead charge at home using a regular wall outlet (Level 1 charging). The primary reasons given by these members for not using Level 2 chargers was that plugging into a regular outlet is sufficient and that setting up a Level 2 charger is too expensive. VEC plans to offer smart plugs, which will provide a load-management option for all VEC members who own EVs.

2. Enrollment

A total of 173 VEC residential customers have received EV purchase incentives from VEC, and 11 of those customers participate in VEC's Service Classification 1.2 whole-home time-of-use rate.

None of VEC's commercial accounts participates in its Service Classification 2.2 or 2.3 non-demand time-of-use rates through EV-related incentives.

Twenty-two VEC customers are enrolled in VEC's load-management program and allow VEC to manage load during potential peak periods. Another 50 customers that have received VEC's EVSE incentives participate in load management by setting a charging schedule that avoids charging from 5:00 to 9:00 p.m. on weekdays.

3. Effectiveness

The VEC customers who are enrolled in VEC's load-management program rarely opt out of participation during peak events.

IV. Challenges and Barriers

Vermont utilities cited several challenges and barriers to implementation of EV rates. We discuss them below.

A. Metering

Electric rates that apply only to a single use, such as EV charging, require special metering capability.[15] Many current EV rates require a Level 2 charger as a meter to measure EV load. The cost of purchasing and installing designated equipment can be a barrier to some utility customers, but GMP offers free Level 2 chargers to customers who enroll in EV rates and agree to avoid charging during peak events. BED provides a $400 rebate for qualifying EV chargers to customers who enroll in an EV rate.

B. Changing Technology

EV charger control platforms have expanded rapidly over the past decade and will continue to change. Companies will enter and exit the market throughout this period of rapid transformation. Many Vermont utilities have recognized the importance of remaining agnostic to specific hardware and software offerings to minimize exposure to a sole vendor and maintain longevity of the program. With rapidly changing technology, utilities must remain aware of new developments in chargers, software platforms, and billing systems. VEC states that it has encountered challenges resulting from the rapidly developing EV market, with several of the EVSE products it selected

[15] Currently, EV rates generally require a Level 2 charger to meter the energy used to charge an EV. However, many other types of equipment may be used to meter that energy, including a secondary meter, a collar on an existing meter, the telematics of the EV, or devices plugged into Level 1 chargers.

for eligibility in its program changing ownership or communications platforms and no longer supporting the communications needed by VEC.

VPPSA explains that its upcoming charging pilot program in several VPPSA member utilities' service territories will use the Open Charge Point Protocol technology, which relies on open-source standards that can integrate with multiple control platforms to mitigate the risk of changing technologies or lock-in costs.[16]

C. Cost

Several utilities cited cost to the utility as the most significant barrier to implementing EV rates. For example, in researching a pilot program, VPPSA has learned that the integration costs required to enable direct control of EV charging will be significant. Direct load-control programs are more expensive than time-of-use programs due to high software and integration costs. VEC has also noted that, although it continues to evaluate EV rate options, it is not convinced that the benefits of an EV-specific rate, as opposed to a whole-home load-management rate, will outweigh the administrative and technological costs in its service territory.

VPPSA has raised concerns about access to data for metering and billing. Typically, manufacturers of EV chargers own the data from the EV charger. Often, data will be made available to the utility free of charge for a set period of time, and after this initial period the manufacturers require payment for the data. The data are necessary for the utility to determine when charging occurred and accurately bill an EV rate. Once the data are obtained from the charging meter, there is a manual process required for getting the EV charging data into the utility billing system. This means that the "discount" that can be offered in a cost-based EV rate may not be significant enough to encourage customer participation.

D. Broadband Access

To transmit data about charging back to utilities and to enable utility control, a customer must have access to broadband or relatively reliable cellular service. The lack of universal broadband and cellular service coverage in Vermont limits the technologies that can be used to implement EV charging rates in some locations. As broadband is developed throughout the state, this barrier will be lowered over time.

[16] VPPSA recommended that the State explore whether to mandate that charging companies utilize open-source data technology to minimize ratepayer costs associated with the use of proprietary data standards.

E. Whole-House Time-of-Use Rates

Because of the significant hardware, software, and personnel costs associated with implementing EV rates, some Vermont utilities, such as VEC and some VPPSA utilities, have indicated that whole-house time-of-use rates are their preferred solution to satisfy the requirements of Act 55. These utilities posit that such rates provide an incentive for customers to shift their electric usage away from high-cost hours and do not require the submetering and additional costs associated with EV-specific rates.

V. Conclusion

This interim report is the first of four reports on this topic that the Commission will provide to the Legislature. The Commission looks forward to exploring this rapidly changing field and to updating the Legislature as utilities continue to develop EV and EVSE rates.