Filed via ePUC

November 12, 2024

Ms. Holly Anderson, Clerk
Vermont Public Utility Commission
112 State Street
Montpelier, VT 05620-2701

Re: Innovative Pilot – Support Your Local Grid

Dear Ms. Anderson:

Pursuant to 30 V.S.A. § 218d(n) and the Standards and Procedures for Innovative Rates and Services Offered by Municipal and Cooperative Electric Utilities adopted by the Public Utility Commission and effective on January 20, 2022 (the Standards and Procedures), Vermont Electric Cooperative (VEC) proposes an innovative pilot program to be effective January 20, 2025.

- Customer Notice

Included with this filing is the Customer Notice that has been posted on VEC's publication *Coop Life* sent to all members by mail and electronically (for members choosing a paperless option) on November 22, 2024. This means that members would have received the notice at least 45 days before the January 20, 2025 proposed implementation date. The notice includes (1) a narrative description of the innovative program, and (2) its effective date.

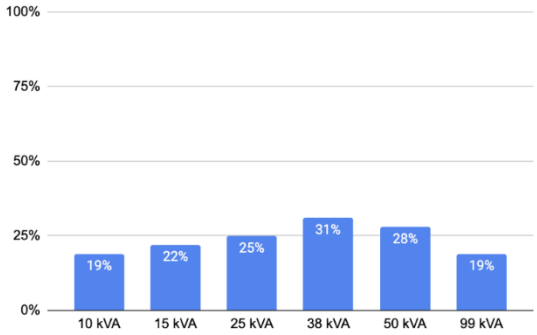
- Background

Even though overall growth of EVs has not met state policy goals, unmanaged EV charging activity is causing distribution transformer overloads on VEC's system. The median peak utilization of a 10 kVA transformer on VEC's system is currently 57%, which does not leave much room for additional electrification growth. 15 kVA transformers are loaded less during peak times though often have more than one member on them, making them vulnerable to increased load resulting from electrification.

VEC ANALYSIS (JULY 2024)

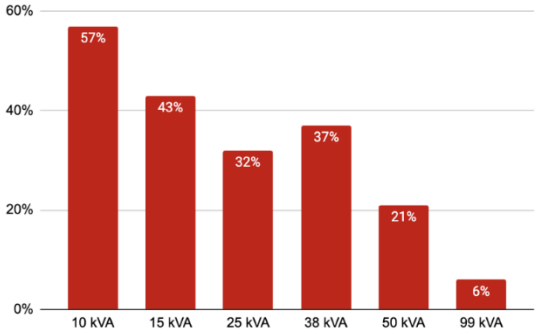
Service transformers see low overall utilization, higher

Load Factor per Transformer Size - Median



Load factor calculated as total annual loading divided by loading if running at 100% of rated capacity. N = 24,085. Does not include 5% of transformers of other sizes.

Peak Utilization per Transformer Size - Median



Utilization factor is calculated as the peak measured loading divided by rated capacity. N = 24,085. Does not include 5% of transformers of other sizes.

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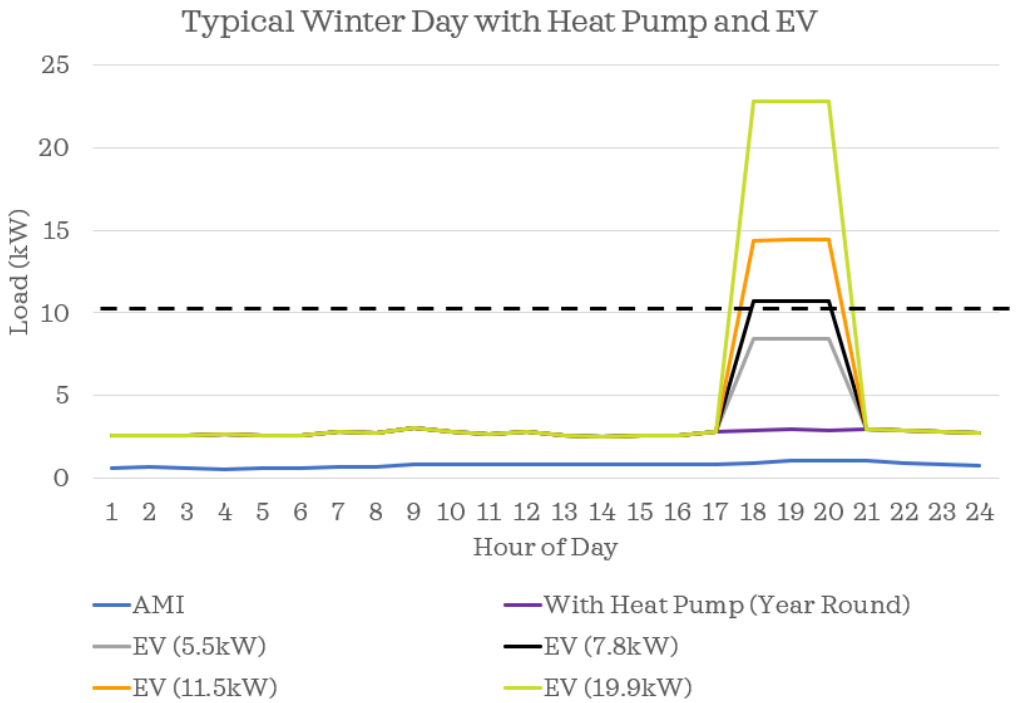
In the past, a 10 kVA transformer would have been adequate for two or even three members. However, with electrification and, in particular, EV charging, members' electricity loads can quickly overload transformers when not managed according to distribution system constraints.

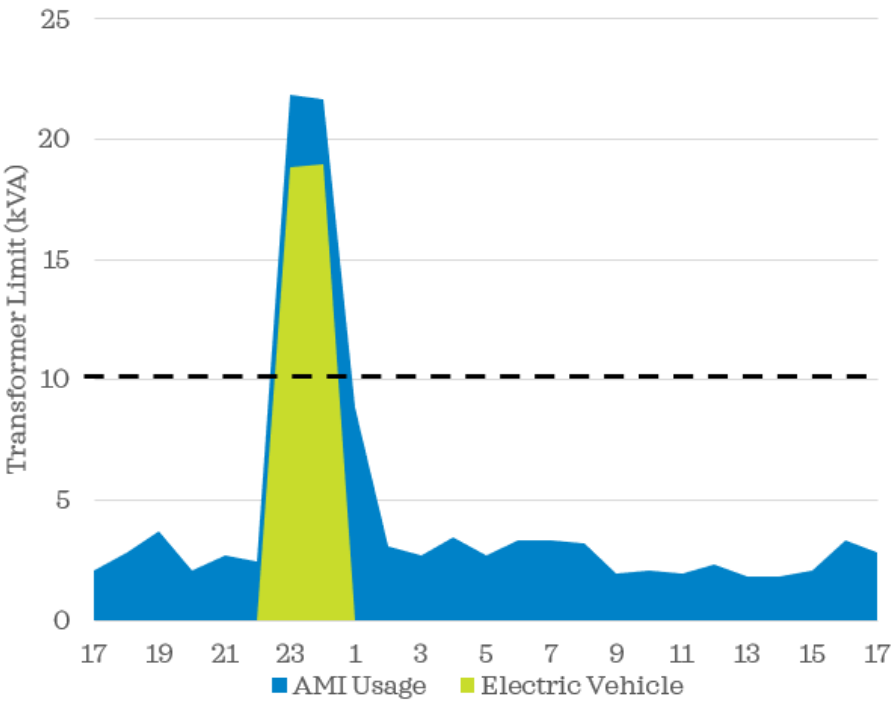


To date, VEC has upgraded almost 50 transformers due to EV charging overloads and upgrades between 10 to 20 transformers annually to accommodate EV load growth. VEC projects an estimated cost of up to $100 million in upgrades to the distribution system as a result of electrification load growth. Distribution transformers make up almost 25% of this estimated cost with VEC needing to replace almost 10,000 10 kVA and 15 kVA transformers. VELCO estimates more than $500 million in upgrades due to load growth in the 2024 VELCO Long Range Transmission Plan.

In 2020, VEC increased its standard service transformer size:

- For two or fewer meters on a transformer, from 10 kVA to 15 kVA.
- For three or more meters on a transformer, from 15 kVA to 25 kVA or larger on a case-by-case basis.

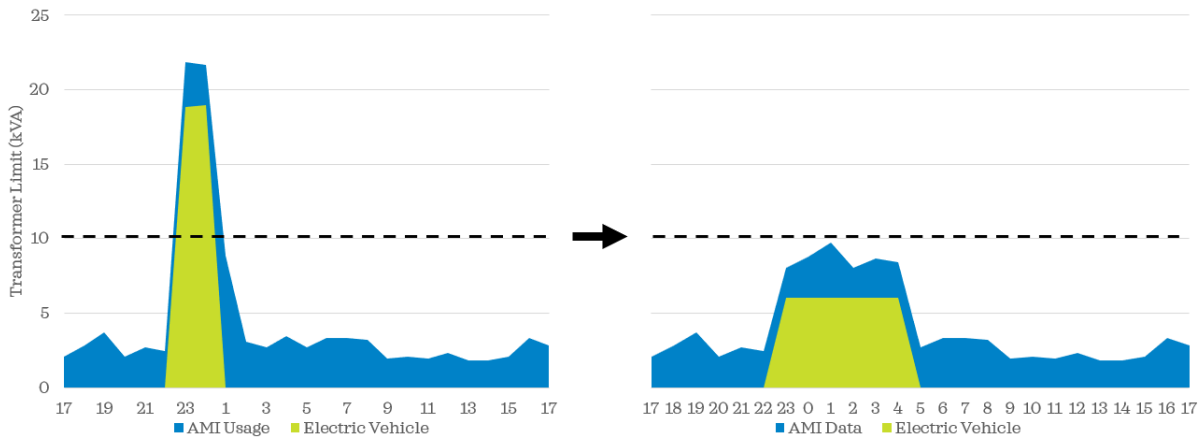
However, more than half of the approximately 24,000 transformers installed on VEC's system are 10kVA or smaller. Given VEC's rural nature, there are only one to two members on average per transformer. The chart below is a real-world example of a member charging their EV at 19.9 kW who also has a heat pump.



While in some situations replacing the transformer is the most reliable intervention and the replacement cost can be justified through additional kWH sales from EV charging, VEC intends

to use the Pilot to explore the types of constraints and charging behaviors that are conducive to using managed charging to avoid or defer transformer replacement. VEC also seeks to showcase the benefits of managing EV charging loads in situations in which transformer upgrades are not immediately feasible and/or in which managing EV charging loads can reduce or eliminate infrastructure impacts.

As the transformer is being significantly overloaded, VEC would typically upgrade this transformer from 10 kVA to 25 kVA at a cost to the VEC membership of about $5,000. In June 2020, VEC began offering free transformer upgrades to support EV charging through an addition to Section 17 of VEC's Line Extension Tariff (20-1528-TF). Across VEC's system, a typical EV charging session lasts between two to three hours. By optimizing the charging speed to utilize all available transformer capacity while not overloading the equipment, VEC can leverage the nascent flexibility of EV charging to defer the transformer upgrade while ensuring the driver has sufficient charge for their needs, as illustrated in the chart below



VEC believes that through this type of DER (Distributed Energy Resource) management VEC can significantly reduce the amount of investment needed on the distribution system, potentially by up to $50 million. The Pilot will be VEC's initial implementation of this philosophy in action, turning an idea of cost savings into an understanding of the actual practical opportunity at a small scale.

- <u>Terms and Conditions of Innovative Service</u>

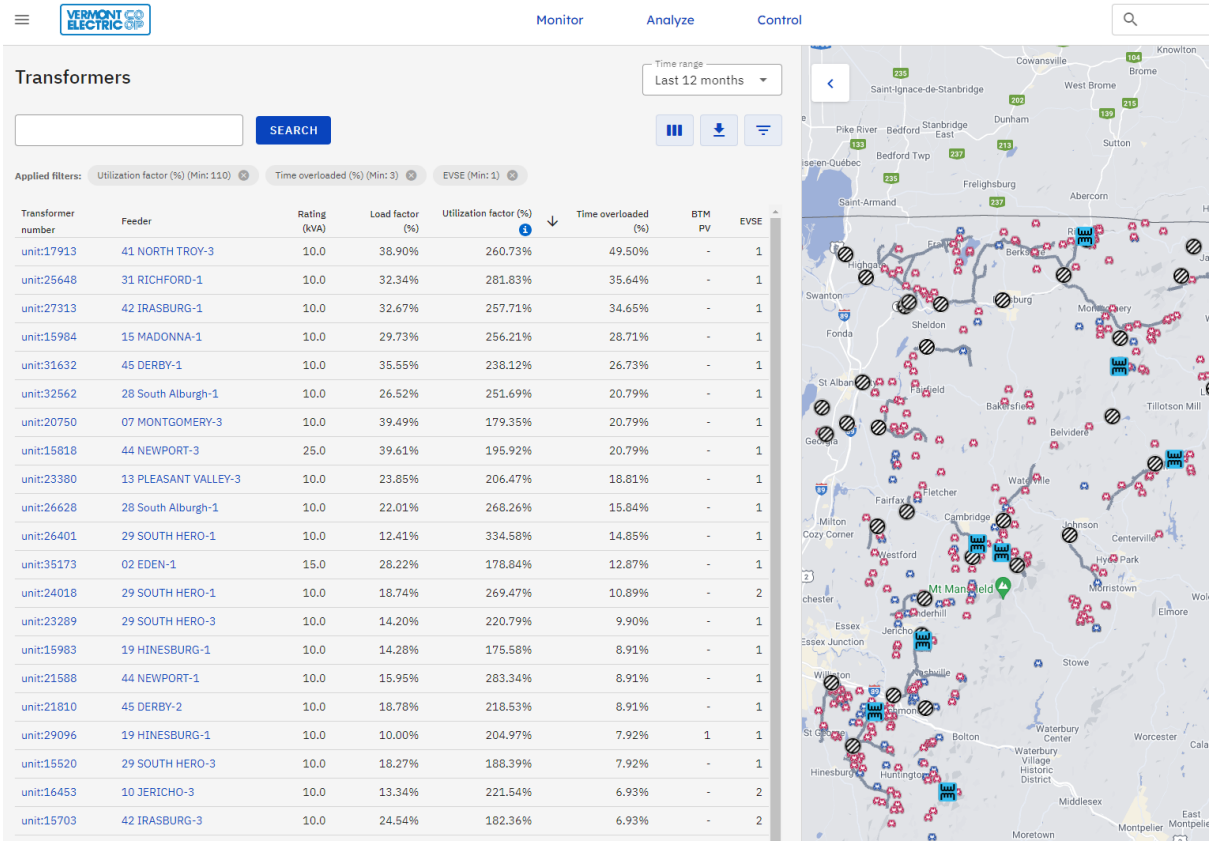
This Pilot seeks to demonstrate the use of behind-the-meter flexible load assets to defer distribution system investment required as a result of electrification load growth. The Pilot focuses on managing member-owned EVs or chargers that contribute to overloaded distribution service transformers.

The Pilot has five key components:

a) Constraint Identification

The Pilot focuses on overloaded distribution transformers. VEC partnered with Camus Energy, a Distributed Energy Resource Management Systems (DERMS) provider, to provide grid visibility and DERMS software services in April 2023. The Camus software identifies which distribution transformers are overloaded based on Automated Metering Infrastructure (AMI) data, nameplate data from Geographic Information Systems (GIS), and statistics such as percentage overload and duration. VEC is also able to leverage EV detection analysis that utilizes its AMI data to identify potential EVs and associate those with the appropriate distribution transformer.

Below is an example of the Camus software interface:



Transformer number	Feeder	Rating (kVA)	Load factor (%)	Utilization factor (%)	Time overloaded (%)	BTM PV	EVSE
unit:17913	41 NORTH TROY-3	10.0	38.90%	260.73%	49.50%	-	1
unit:25648	31 RICHFORD-1	10.0	32.34%	281.83%	35.64%	-	1
unit:27313	42 IRASBURG-1	10.0	32.67%	257.71%	34.65%	-	1
unit:15984	15 MADONNA-1	10.0	29.73%	256.21%	28.71%	-	1
unit:31632	45 DERBY-1	10.0	35.55%	238.12%	26.73%	-	1
unit:32562	28 South Alburgh-1	10.0	26.52%	251.69%	20.79%	-	1
unit:20750	07 MONTGOMERY-3	10.0	39.49%	179.35%	20.79%	-	1
unit:15818	44 NEWPORT-3	25.0	39.61%	195.92%	20.79%	-	1
unit:23380	13 PLEASANT VALLEY-3	10.0	23.85%	206.47%	18.81%	-	1
unit:26628	28 South Alburgh-1	10.0	22.01%	268.26%	15.84%	-	1
unit:26401	29 SOUTH HERO-1	10.0	12.41%	334.58%	14.85%	-	1
unit:35173	02 EDEN-1	15.0	28.22%	178.84%	12.87%	-	1
unit:24018	29 SOUTH HERO-1	10.0	18.74%	269.47%	10.89%	-	2
unit:23289	29 SOUTH HERO-3	10.0	14.20%	220.79%	9.90%	-	1
unit:15983	19 HINESBURG-1	10.0	14.28%	175.58%	8.91%	-	1
unit:21588	44 NEWPORT-1	10.0	15.95%	283.34%	8.91%	-	1
unit:21810	45 DERBY-2	10.0	18.78%	218.53%	8.91%	-	1
unit:29096	19 HINESBURG-1	10.0	10.00%	204.97%	7.92%	1	1
unit:15520	29 SOUTH HERO-3	10.0	18.27%	188.39%	7.92%	-	1
unit:16453	10 JERICHO-3	10.0	13.34%	221.54%	6.93%	-	2
unit:15703	42 IRASBURG-3	10.0	24.54%	182.36%	6.93%	-	2

Once an overloaded transformer with an EV is identified and a member enrolls in the Pilot, VEC can manage the charging of the EV to that transformer limit through grid-aware DERMS.

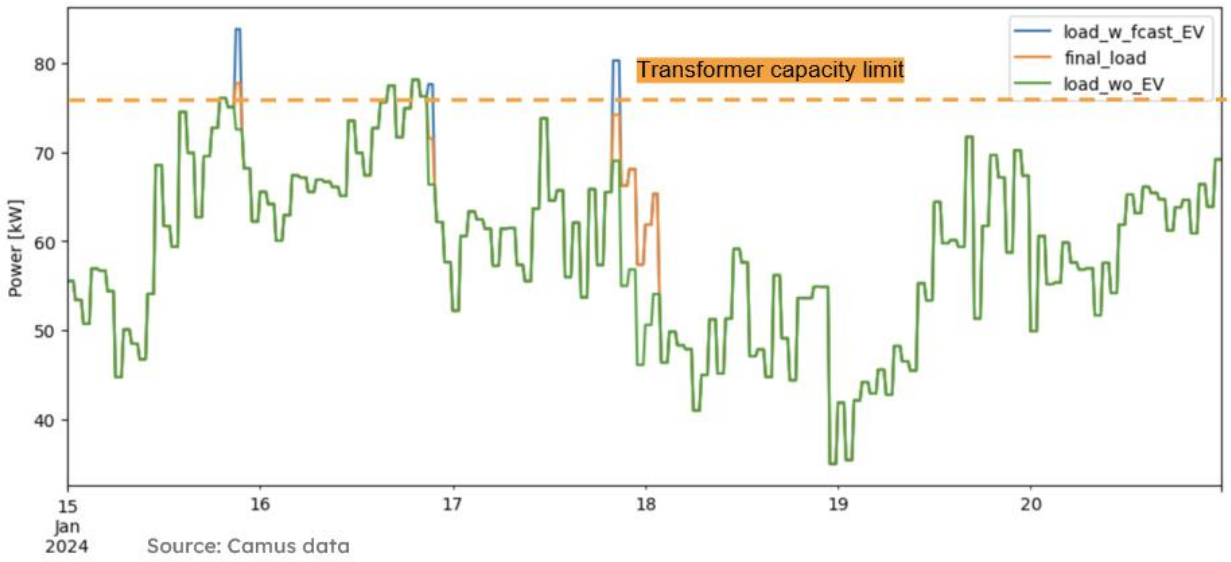
b) Grid-Aware Distributed Energy Resource Management System (DERMS)

Orchestrating DER for capital deferral requires a robust understanding of real-time and near-future network constraints as well as available DER flexibility.

The Camus platform provides both capabilities. Through VEC's Flexible Load Program VEC currently manages approximately 300 FLO, ChargePoint and Emporia chargers and an EV telematics program with FlexCharging, that was launched in April 2024. The Flexible Load Program dispatches EV chargers and vehicles four to six times per month for between two to four hours per event.

The Pilot is intended for members who have ChargePoint charges or participate in the FlexCharging telematics program. As Camus and Grid Edge DERMS vendors like FlexCharging build additional integration, the Pilot could include members with other charger types.

To manage EVs to an identified constraint, the Camus platform uses operating envelopes or do-not-exceed values to prevent transformer overloads. The chart below shows electricity demand for a distribution service transformer with managed vs. unmanaged EV charging.



The Pilot will initially concentrate on fixed operating envelopes, as they are a static limit that does not change with other variables. Eventually, as part of the Pilot, VEC plans to explore dynamic operating envelopes, which will change the capacity limit based on temperature, duration of overload, and other variables.

c) Valuation

VEC will compensate members who participate in the Pilot based on the value of deferring the distribution transformer and the amount of kW that the member can shift. VEC has developed a deferral value calculator tool that is included as Attachment 1. The valuation includes these variables:

- T&D Upgrade Cost Today ($): Total upgrade cost of the asset in today's dollars including labor, materials, overheads and stores. This value changes based on the size of the transformer and could be applied to other T&D assets like primary lines or substation transformers.
- Expected Deferral Timeframe (years): An estimate of the expected deferral of the asset based on the age and condition of the asset. The estimate will be lower for older or more conditionally poor assets as at some point the assets will need to be replaced regardless of the DER management.
- Load Reduction Need (kW): This is the total kW reduction needed to defer the upgrade and calculated via the Camus tool. For distribution transformers, Load Reduction Need will typically be associated with one member though for future use cases it could be spread over many members.
- T&D Cost Escalator (%): The annual percentage increase in costs of replacing T&D assets while accounting for inflation
- T&D Financial Asset Life (years): The estimated duration over which VEC's assets are expected to remain functional and economically viable. For VEC, this is 33.33 years.
- WACC (%): Weighted Average Cost of Capital or the cost of borrowing to finance VEC's assets.
- Annual O&M Deferred Costs ($): In some cases, operating and maintenance costs or savings may result from the upgrade. For a distribution service transformer, there may be a slight increase or decrease in property taxes for a smaller or larger transformer. In the future, VEC may be able to defer an upgrade that would reduce annual vegetation management expenses, for example an overhead to underground or roadside relocation.
- Annual Software Costs for Management ($): VEC anticipates that all participating members will already be participating in VEC's Flexible Load Program and therefore VEC will not incur an additional cost. The Flexible Load Program incorporates software costs in its compensation structure.
- Assumed # of Participating Members Per Deferral: This will typically be "1" as we are focused on distribution transformer constraints. In future use cases, such as substation transformers or transmission, there may be many participants for a particular constraint.

- Value Percentage Share with Member (%): VEC's Flexible Load Program targets a 50% value share. The goal is to maximize the savings for the non-participating members while maintaining a high enough incentive to encourage participation.

The attached calculator is used to develop the total deferral value to VEC. VEC uses that deferral value to then calculate the following:

- Deferral value per kW, the total deferral value based on the duration of the asset deferral;
- Annual Deferral Value per kW, the total deferral value divided by the number of deferral years
- Annual Value Shared with Member per kW, which is based on the Value Percentage Share with Member (%);
- Monthly Value Shared with Member per kW, the Annual Value Shared with Member per kW divided by 12 months
- Monthly Bill Credit, the amount that members receive to participate in the Pilot.

d) Distribution Operator Trust

The Pilot will explore the reliability of this type of demand management. VEC system operators and engineering staff must trust that managed charging strategies will effectively alleviate transformer overloads consistently and predictably without causing reliability impacts. While this is a small Pilot, the goal is to build trust that this type of management can scale further upstream to constraints such as substation transformer overloads or VELCO/ISO-NE transmission constraints. VELCO has identified several future constrained regions of the transmission network in the 2024 VELCO Long Range Transmission Plan. Grid-aware managed charging could reduce or defer costly transmission investments.

To build this trust, the Camus software will log every instance of device management and whether it was successful at preventing overloads. The Pilot will also explore how to navigate device connectivity issues caused by member Wi-Fi constraints or device communication failures.

e) Member Experience

Identifying Member Participants
VEC will pre-screen members for the Pilot using the Camus platform to identify overloaded transformers where an EV is present. The goal of VEC's Flexible Load Program is to maximize savings to the non-participating members while device management remains invisible to participating members. VEC has been running these programs since 2020 and, so far, has consistently found that participating members

want two things: limited or no involvement in management and for their EV to be fully charged in the morning.

Member Compensation

Compensation will vary based on the value of the asset deferral and whether a participating member is already enrolled in VEC's Flexible Load Program. VEC will compensate members based on the following

- If a participating member is not already enrolled in VEC's Flexible Load Program, VEC will send them a communication to encourage them to enroll. The communication will include the monthly bill credit associated with the Flexible Load Program and the calculated monthly bill credit for asset deferral.

- For a participating member already enrolled in VEC's Flexible Load Program, VEC will send them a communication with the additional calculated monthly bill credit for asset deferral.

If the distribution transformer needs to be replaced or fails, the participating members will no longer receive the additional calculated monthly bill credit for asset deferral. Members will be asked to commit to good-faith participation for a period of at least one year after enrollment. If the Pilot is successful, VEC will apply for a tariff that would establish a permanent compensation structure.

Opting out of an Event

When peak events are called in VEC's Flexible Load Program, members receive an email describing the timing of the event and providing a link to opt out of the event. Since 2020, VEC has called roughly 200 events with approximately 100 participants and seen fewer than 20 opt outs (less than 0.05%)

In this Pilot, VEC does not plan to notify participating members every time VEC is managing their charging. As VEC will be managing EVs and chargers more frequently (potentially several times a day), it would be overwhelming for participating members to receive multiple daily emails.

VEC plans to explore how to perform grid-aware managed charging while ensuring that members' use of their EVs is not impacted. To achieve this, the Pilot will consider using:

- Minimum states of charge. For example, VEC could guarantee a 20% minimum charge.

- Setting a fixed time that an EV will be charged to its set maximum by. For example, charged to 80% to –90% by 5 A.M.
- The value of additional software integrations with OEMs or aggregators to enable easier opt-outs.

- Analysis of Compliance with Eligibility Criteria in Section III of the Standards and Procedures

  This filing complies with the Criteria set forth in Section III, as demonstrated below:

  a) The Pilot is designed to (a) satisfy VEC's 30 V.S.A. § 8005(a)(3) requirements or (b) advance the goals of Vermont's Comprehensive Energy Plan (CEP).

  The Pilot is designed to advance the goals of Vermont's Comprehensive Energy Plan. In VEC's latest IRP filing, VEC indicated that load management is key to maintaining affordability for its members and also increasingly important to alleviate, if not eliminate, many infrastructure upgrades. This Pilot is a necessary element in VEC's broader load management effort and increases the flexibility of VEC's capital investment strategy. The Pilot lays the groundwork for future asset classes such as substation transformer overloads or VELCO/ISO-NE transmission investments and/or contingencies

  b) The Pilot has a duration of 18 months or less.

  VEC's plan is to offer this Pilot for an 18-month period. If the Pilot is successful and VEC can demonstrate grid optimized charging, VEC will consider filing a tariff, using the lessons learned from the Pilot or may file another Pilot to explore substation transformer or primary line DER management.

  c) The Pilot will not result in additions of more than two percent of VEC's Net Asset or an increase in VEC's Overall Cost-of-Service by more than two percent.

  The Pilot will target an initial 50 participants. To be eligible, members must enroll in VEC's Flexible Load Program for managed charging. Expected costs incurred under this Pilot include a portion of annual software license fees for DERMS and participating member incentives provided during the Pilot. For planning purposes, VEC assumes each asset deferral would be a 10 kVA to 15 kVA transformer upgrade cost with a deferral timeframe of 10 years.

  Given the above assumptions, VEC projects that the Pilot would provide a net present value of approximately -$64,923 the equivalent of a 0.07% percent rate increase, as illustrated in the table below.

	NPV	2025	2026	2027	2028
Benefits	$15,971	$2,619	$3,929	$5,239	$6,549
Costs - Software Fees	($72,909)	($12,000)	($12,000)	($30,000)	($30,000)
Costs - Participating Member Incentives	($7,986)	($1,310)	($1,965)	($2,619)	($3,274)
Net Benefits	($64,923)	($10,690)	($10,035)	($27,381)	($26,726)

Assumed New Participants Per Year		20	10	10	10
Cumulative Participants		20	30	40	50

Value Share					
Software	456%	458%	305%	573%	458%
Participating Member Incentives	50%	50%	50%	50%	50%
VEC - Non-Participating Members	-406%	-408%	-255%	-523%	-408%
	100%	100%	100%	100%	100%

VEC hopes to apply this strategy to more valuable T&D assets like primary lines or substation transformers or even to decrease transmission investments. Examples have been provided as part of the deferral value calculator tool that is included as Attachment 1

- Availability to Customers

VEC will pre-screen members for the Pilot using such factors as constrained distribution assets, types of loads, flexibility of those loads, and amount of load. VEC will ask members to commit to good-faith participation for a period of at least one year after enrollment. If the Pilot is successful, VEC will consider applying for a tariff that would establish an ongoing program and compensation structure.

- Expected Costs and Revenues of the Innovative Pilot

Please see section c) above in the Analysis of Compliance with Eligibility Criteria in Section III of the Standards and Procedures

Very truly yours,

Cyril Brunner

Cyril Brunner
Innovation and Technology Leader