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Ms. Judith C. Whitney, Clerk
Vermont Public Utility Commission
112 State Street
Montpelier, VT 05620-2701

Re: GMP – Resilient Home Innovative Pilot - Update

Dear Ms. Whitney:

Please accept this as Green Mountain Power's ("GMP") six-month status update regarding our Resilient Home Innovative Pilot ("Pilot"), which commenced in May, 2019 after notice to the Public Utility Commission and Department of Public Service. The Pilot provides customers with an opportunity to install a whole-home backup battery system directly through GMP or through a certified 3rd party installer, while giving GMP the opportunity to test the data accuracy of the battery system's metering capabilities, as well as using the batteries to help reduce costs for all GMP customers.

Explanation of Resilient Home Innovative Pilot and Why it is Important

The Resilient Home Pilot provides 500 customers with the chance to install a whole-home backup battery solution directly through GMP or a certified 3rd party installer. Each system installed consists of two Tesla Powerwalls that are added to GMP's overall fleet of battery systems, and are used to reduce GMP's total peak demand, thereby directly reducing costs for all GMP customers. 450 of the 500 customer slots are for customers entering into a GMP Direct Lease or GMP Indirect Lease option, who make monthly payments of $30 for ten years, or a one-time up-front payment of $3,000. The remaining 50 open spots are for customers who will participate through the Bring Your Own Device ("BYOD") program that was included in the original filing as an extension of the now concluded BYOD Pilot. In all cases, GMP is testing the technology's capabilities by utilizing the data from the Tesla Energy Gateway to provide the necessary information for billing. There is also an option for customers to participate in an innovative billing structure comprised of fixed rate monthly bills for both the storage and consumption, whereby customers are placed into tiers based on their historical consumption, and pay a set price each month. Tiers are re-evaluated every 12 months, with customer placed in a new tier only if consumption exceeded or fell below the kilowatt hour allotment for their tier.

This pilot is important to GMP and our customers for multiple reasons. First, the battery systems provide far more data points than the utility AMI meter system. While GMP will rely on the current AMI

system for years to come, it is important that we do not miss an opportunity to test and consider usage of new technologies that can provide the same function, with much more granular information, while adding the benefit of storage for resiliency. By using the battery system for billing, we are working toward eliminating redundancy and adopting a system that can help GMP customers realize multiple values. Second, GMP believes it is imperative that we create and operate a more distributed grid, which includes an aggregated fleet of energy storage systems. Batteries provide resiliency, safety, and peace of mind during grid outages, while also serving as a grid resource to help drive down GMP's operating costs – which directly help cut costs for customers. Finally, this Pilot provides customers with the opportunity to fix their monthly electric payments in a subscription model that moves toward the way many other services are available to consumers today, such as cell phone plans or music/video streaming services. Providing customers with choices for this type of payment plan will inform GMP, and the electric utility industry generally, whether or not this type of billing is desirable in this space.

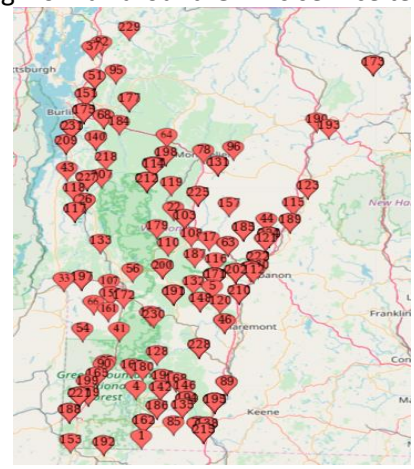
Participation in Pilot

As of December 10, 2019, there are 241 customers with completed installations through both GMP Direct and Indirect Lease options (see table below for breakdown). The remaining 209 lease spots are reserved by customers who either have a signed contract and are awaiting installation, or are proceeding through the sales process. It is reasonable to expect some level of attrition, which is why GMP is keeping a waitlist of customers who can fill a spot as it becomes open. This waitlist has been built on a first come, first served basis. As participating installers notify GMP of customers dropping out, GMP backfills the open spot by informing customers that they are off the waitlist, taking a one-out, one-in approach.

GMP Direct Lease Completed Installs	218
GMP Indirect Lease Completed Installs	23

The 50 BYOD slots have all been committed but are awaiting installation. The waitlist mentioned above includes customers who will participate through BYOD as well as the lease, and as such, already has all 50 spots reserved.

Customers are participating from all around GMP's service territory as seen in the map below:



We anticipate that the full 500 customers will be installed by mid-2020, as installs will increase pace once winter has passed and weather is more amenable. The majority of the remaining installs will be completed by the four certified installers that have chosen to participate and take advantage of this Pilot- SunCommon, Power Guru, Catamount Solar, and The Peck Company.

There are currently 15 customers participating in fixed rate tier billing. More details are provided below.

Goals & Measurement

As originally filed, GMP laid out several specific questions to ask and learn as part of this Pilot.

1. *Determine whether the consumption data provided by the battery systems is as accurate or within a reasonable margin of error compared to the existing AMI meter data.*
    a. *GMP will compare the data from both sources in retrofit installations to determine the accuracy of the battery metering data.*

Appendix A provides a detailed breakdown of data accuracy since billing with the battery system data started in September. GMP is consistently seeing around 75%-80% of customers being billed using the data from the battery system. There is a combination of factors that are contributing to this success rate.

First, there is a lag between the time systems are installed and in the GMP system and when the system is fully commissioned on the manufacturer's side to begin providing data. This results in customers with completed installs appearing in the "No Data Returned" category for a period of time. Removing these systems from the overall calculation will provide an improvement of approximately 2-3%.

Second, there are a number of systems that need, or have needed, onsite attention by Tesla or deeper troubleshooting to resolve outstanding issues in order to allow this level of data usage. While some issues that are identified are resolved promptly, others remain open and in need of a resolution. GMP works directly with Tesla to identify specific data issues in order to improve the success rate of billing using the battery data. We are confident that we can improve the 75%-80% number over the course of the Pilot, and are happy that the data has been as useful as it is at this early stage of deployment.

2. *Determine customer interest for Fixed Priced Billing and the impact, if any, on customer behavior as it relates to usage.*
    a. *Because the rate will be optional, GMP will quickly determine the level of interest and engagement from customers.*

There are currently 15 customers participating in fixed rate tier billing. While this uptake is lower than we had hoped at this point, there are a couple of reasons for it. First, over half of the customers enrolled in the pilot are not eligible for tier pricing, either because of an existing solar array, enrollment in Rate 3 (which requires a separate meter), or lack of sufficient usage history to confidently assign a tier. Second, we have learned that there is a need for significant up-front conversation to determine

whether this option is appealing to customers. GMP had many conversations with customers who ultimately decided not to opt for this aspect of the Pilot. In some cases, those customers were concerned about exceeding their tier limit and being locked into a high monthly price for the subsequent 12-month period. In other instances, customers did not look favorably on the possibility that they would pay more than they would have otherwise under a volumetric rate, despite the benefit of price stability. These have been extremely valuable lessons as we consider how to increase the desirability of a tiered pricing offering for customers.

With this in mind, GMP plans to contact all customers currently enrolled in the Pilot who do not have solar and are otherwise eligible, to review whether they would like to adopt this pricing after a few more months of experience.

b. Over time, GMP will be able to look at the consumption behavior of customers who have elected this billing option to understand where they fall within their assigned tiers and if usage behavior has changed and how much variation exists within the tier.

Each customer's initial tier was calculated using the historical average consumption from the three previous years. Table 1 below shows the consumption for each customer since enrolling in the tiered pricing, compared with the adjusted upper and lower limits of their current tier. The adjustments here reflect the customer's historical usage pattern, explained in further detail below. Table 1 also shows the resulting billing difference (the difference in amount paid to GMP compared to amount the customer would have paid under Rate 1).

Customer Number	Tier	Number of Months of Data	Actual Consumption	Tier Minimum (Adjusted)	Tier Maximum (Adjusted)	Over/Under Tier	Percent Over or Under Tier Limit	Billing Difference (vs Rate 1)
1	2	4	1545	1291	1936	-	-	$40
2	6	4	4156	3472	4051	Over	3%	$59
3	3	4	1996	1532	2042	-	-	$189
4	1	5	2045	0	770	Over	165%	-$144
5	7	5	7741	6997	7997	-	-	-$207
6	1	5	2355	0	1546	Over	52%	-$197
7	4	5	3303	2774	3467	-	-	$93
8	5	5	4389	4722	5666	Under	-7%	$60
9	2	5	2395	1608	2412	-	-	-$29
10	3	4	1875	1582	2109	-	-	$104
11	5	4	3490	3297	3956	-	-	$51
12	3	4	2238	1630	2173	Over	3%	$43
13	7	5	5972	6446	7366	Under	-7%	$92
14	1	5	1347	0	1671	-	-	-$26
15	4	5	2974	2923	3653	-	-	$149
							Total	**$276**
							Average per participant	**$18**

Table 1

Two customers (numbers 4 and 6), both in Tier 1, have deviated significantly from their tier limits. In the case of Customer 4, GMP only had the benefit of eleven months of consumption data from which to calculate the tier assignment. Examining that customer's usage, the first two months for which data is available had extremely low consumption, indicating that these may have been prior to the customer's move-in to the home. These values skewed the average (and subsequent tier assignment)

lower. There are several ways we can mitigate this issue, such as by excluding customers with less than two years of complete historical data, using consumption data from the previous homeowner (when available), and utilizing an online survey to estimate a homeowner's consumption.[1] We have not taken any of these steps yet due to the limited nature of the problem, but we will re-evaluate at the 12-month pilot report.

For Customer 6, there were two full years of historical data, but the customer has increased consumption significantly since enrolling in tier pricing. For example, in the August billing period, the customer consumed 662 kWh (net), whereas their previous high prior to tier pricing enrollment across all months was 415 kWh. We accept this deviation as a natural risk of subscription pricing. If the customer continues on this trend, they will bump up to Tier 2 after twelve months and pay a higher monthly tier price.

Regarding the columns labeled Tier Minimum (adjusted) and Tier Maximum (adjusted) in the table, consider a customer who historically uses more electricity in the winter than the summer. If looking at just winter consumption, it is likely that the values will exceed the tier limit's monthly average value. However, it may be incorrect to conclude that the customer is projected to exceed their tier, as consumption can be expected to decrease in warmer months. To mitigate this issue, we have computed, for each participant, the share of total annual consumption contributed by each month (historically), and then used those percentages to calculate a custom set of weighted tier limits. This helps GMP evaluate the economic impact of tier pricing throughout the pilot and notify customers when they are projected to bump out of their present tier. Table 2 below shows an example for a hypothetical customer in Tier 5, with a minimum and maximum annual consumption of 10,000 kWh and 11,999 kWh, respectively.

Month	Monthly Average	Month's Percentage of Total	Tier Minimum (Simple Average)	Tier Maximum (Simple Average)	Tier Minimum (Adjusted)	Tier Maximum (Adjusted)
Jan	1,167	11%	833	1000	1078	1294
Feb	965	9%	833	1000	892	1070
March	753	7%	833	1000	696	835
April	732	7%	833	1000	677	812
May	653	6%	833	1000	603	724
June	793	7%	833	1000	733	879
July	1,265	12%	833	1000	1169	1402
August	1,101	10%	833	1000	1018	1221
September	1,035	10%	833	1000	956	1147
October	624	6%	833	1000	577	692
November	807	7%	833	1000	746	895
December	926	9%	833	1000	856	1027

Table 2

[1] There are several such surveys, including SunMetrix's Power Consumption Calculator, supported by a Department of Energy SunShot grant (https://sunmetrix.com/power-consumption-calculator/)

Using these customer weighted limits, we are able to determine whether each customer is on track to stay within the assigned tier, shown in Table 1.

While this is a small sample, and there are some outliers (as discussed above), the results as a whole provide early evidence that fixed subscription pricing with tier limits does not significantly alter a customer's consumption behavior. Most of the tier customers are projected to either stay within their tier or fall outside the limits by only a small amount.

3. *Assess the value of connecting with the home builder market and create grid ready homes from the ground up including a battery storage system*
    a. *This will be reflected in GMP's ability to successfully help builders integrate technology and resources into new homes that provide value to both the homeowner and all GMP customers.*
    b. *The ability to repeat this process with multiple partners will also be a measure of success.*

Connecting with new home builders has proven to be more challenging than originally expected. GMP now is working with one modular home manufacturer that will install the system as the sole point of metering for two units in the first half of 2020. Working with them will provide beneficial information and strategy to assist in moving forward with other builders in the future. We will use this as an opportunity to learn best practices as well as a path to lessons learned that can be applied in the future.

Updated Pilot Financials

Through the end of November, the Resilient Home Pilot is experiencing a net gain of over $330,000, which benefits customers. In addition to the Power Supply value as described below, the Technical Advisory Group recently characterized each Tesla Powerwall to be worth 8.79MW as a Tier III measure. With a total of 241 installs completed, there are 482 Powerwalls to contribute to the Tier III value. Conservatively, GMP is calculating the Tier III value of the Resilient Home Powerwalls by multiplying $25, which is below the cost of a REC that could otherwise be purchased and retired to count toward Tier III, by the total number of MW in the program (482 Powerwalls * 8.79MW * $25 = $105,920). It should be noted that this is a one-time benefit.

Resilient Home Pilot	**CY19 Actuals**
Cumulative Installs	241
Equipment Revenue	$227,912
Power Supply Value	$139,228
T3 Value	$105,920
Depreciation	($68,110)
Return on Rate Base	($74,006)
Net Gain/Loss	**$330,934**

All Powerwalls installed as part of the Resilient Home Pilot are aggregated with GMP's total Powerwall fleet, and the table below shows the proportion of GMP's total fleet in the Resilient Home Pilot, its proportionate power supply value, and the total power supply value provided by GMP's total fleet.

	Resilient Home % of Total Fleet Installs	**Total Fleet Power Supply Value**	**Resilient Home Power Supply Value**
May	1%	$65,822	$594
June	9%	$49,025	$4,296
July	14%	674655	$95,636
August	16%	13122	$2,138
September	18%	$88,456	$15,586
October	18%	$315	$5
November	19%	$111,698	$20,919
			$139,228

Next Status Update

GMP will provide another status update regarding the Resilient Home Pilot progress after the one-year anniversary of the Pilot and upon completion after 18 months. In the event GMP decides to terminate the Pilot prior to the passage of 18 months or to tariff the program if strong customer interest remains, GMP will provide prompt notice to the PUC, the Department, Renewable Energy Vermont, and Efficiency Vermont.

If you should have any questions, please contact me at 802-747-6818.

Sincerely,

Craig Ferreira

Craig Ferreira
Innovation Development

Enclosure: Appendix A
cc: Daniel Burke, Esq., Vermont Department of Public Service
Rebecca Foster, Efficiency Vermont
Olivia Campbell Andersen, Renewable Energy Vermont

Appendix A

	Sep-19				Oct-19				Nov-19		
	Net/House Meter		**Solar Meter**		**Net/House Meter**		**Solar Meter**		**Net/House Meter**		**Solar Meter**
Performance	Consumed	Returned	Generated		Consumed	Returned	Generated		Consumed	Returned	Generated
Within 4% Tolerance	72.78%	87.22%	69.12%		75.56%	86.11%	72.37%		78.85%	82.38%	70.65%
Outside 4% Tolerance	20.56%	10.56%	22.06%		14.44%	7.78%	18.42%		11.45%	11.01%	9.78%
No Data being returned	6.67%	2.22%	8.82%		10.00%	6.11%	9.21%		9.69%	6.61%	19.57%
Total Not billed w/ Battery	27.22%	12.78%	30.88%		24.44%	13.89%	27.63%		21.15%	17.62%	29.35%