



JOSH CASTONGUAY
Chief Innovation Officer

Direct Dial Number: (802) 655.8754
Josh.Castonguay@GreenMountainPower.com

VIA HAND DELIVERY
December 2, 2015

Mrs. Susan Hudson, Clerk
VERMONT PUBLIC SERVICE BOARD
Peoples United Bank Building, 4th Floor
112 State Street
Montpelier, VT 05620-2701

Re: GMP – Tesla Powerwall Innovative Pilot

Dear Mrs. Hudson:

Please accept this Innovative Pilot filing as notice that Green Mountain Power will begin offering Tesla Powerwall batteries to its customers on a pilot-basis on or after January 1, 2016. This exciting innovation in distributed battery technology is part of Green Mountain Power's mission to deliver cost effective, low carbon and reliable energy solutions for its customers. The Powerwall will improve customers' reliability and resiliency while at the same time empowering them to save money and be part of a radical transformation in how energy is generated and stored. Green Mountain Power is the first utility to offer the Tesla Powerwall to customers and we believe this unique offering will advance state energy policy and keep Vermont on the cutting edge of innovation.

About the Tesla Powerwall

The Tesla Powerwall is a 7kWh, rechargeable lithium-ion battery designed to store energy at the residential level with several benefits:

- (1) Backup Power - *the batteries can provide back up to critical loads in the event of an outage for as many as 6 hours¹, or up to several days when paired with solar.*
- (2) Load Shifting – *the batteries can provide financial savings by charging during lower priced “off-peak” periods and discharging during higher priced “peak” periods when demand for energy is greater.*

¹ Powerwall duration will vary depending on size of critical loads it is serving.

- (3) Peak Reduction – *the batteries can be dispatched at specific times to coincide with the monthly Vermont system peaks as well as the annual ISO NE peaks. In doing so, GMP will reduce its overall contribution to these peaks, reducing capacity and transmission costs for customers.*
- (4) Smoothing of Solar – *when aggregated as part of a micro-grid network, the energy storage can be controlled to reduce the grid impact of solar intermittency.*

Tesla Motors, Inc. (“Tesla”) will initially manufacture a 7kWh Powerwall storage system, which is optimized for pairing with solar or standing alone and can be cycled daily to provide a number of benefits to the customer and to the grid. GMP will provide the 7kWh system paired with a bi-directional inverter, which is optimal for pairing with solar or standing alone and charging directly from the grid. The Powerwall comes with a 10-year warranty, and Tesla will take back and recycle the Powerwall at the end of their useful lives. The wall-mounted battery is compact with a sleek modern appearance.

A key value of the Powerwall is the ability to dispatch the batteries when the output has the most value. This will be done through control software that comes standard with the SolarEdge inverter as part of the Powerwall package.

Powerwalls Will Be Used To Lower GMP’s Power Supply Costs

GMP’s ability to control the Powerwalls provides a unique value stream that will lower power supply costs. During normal (i.e., non-outage) conditions, GMP will have the ability to control the charging and discharging cycles of the batteries. For customers who agree, this will enable GMP to discharge batteries during (1) times of high market prices to help lower its energy costs and (2) times of peak load to help reduce significant capacity and transmission expenses. Those savings will directly benefit customers.

As described below, in this Pilot, we seek to return this significant value back to participating customers as a credit toward the price of the Powerwall in exchange for allowing GMP to control the system during critical peak times.

Pilot Offerings

Tesla announced GMP as its first utility partner and one of its four highlighted Powerwall distribution partners in late April 2015. Since then, we have heard from many of our customers asking to be on the waiting list for our first round of Powerwalls. This has provided the opportunity to ask our customers what they want.

Some customers want to buy the Powerwalls outright and maintain sole access to the battery for continuous use. Other customers wish to include the Powerwalls with new home construction owning the Powerwall outright, although many are open to giving GMP some level of access to the Powerwall (in other words, they don’t need the Powerwall to be operating

continuously). Finally, another category of customers are those who don't want to incur the up front cost and for whom sharing access is acceptable.

We have designed three price options with these categories of customers in mind:

Pricing Options	Cost	Monthly Bill Credit
Option 1: Direct Sale w/ no GMP access	\$6,501	\$0
Option 2: Direct Sale w/ GMP shared access	\$6,501	\$31.76
Option 3: Rate Rider	\$1.25/day	Built into daily price

OPTION 1: Direct Sale of Battery – Customer Maintains Full Access

Under this first option, GMP will sell the Powerwall and bi-directional inverter to the customer outright and the customer will maintain control of the Powerwall. The cost to the customer will be \$6,501, which includes the 7kWh Powerwall, bi-directional inverter, sales tax, and a 20% mark-up covering GMP costs as well as provide a margin that will flow back to GMP customers in rates. Under this option, the customer will have responsibility to install and maintain the Powerwall, subject to Tesla's 10-year warranty.

This option is designed for customers who want to purchase the Powerwall outright and who wish to maintain access to the Powerwall, for example, pairing the Powerwall with solar without limitation.

GMP's preliminary projection is that of the 510 pilot Powerwall units, approximately 75 units will be sold under option 1.

OPTION 2: Direct Sale of Battery – Customer Shares Access

Under this second option, GMP will sell the Powerwall and bi-directional inverter to the customer outright and share access to the Powerwall with the customer (as described above). The cost to the customer will be \$6,501, which includes the 7kWh Powerwall, bi-directional inverter, sales tax, and a 20% mark-up covering GMP costs as well as provides a margin that will flow back to GMP customers in rates. Under this option, customers will receive a monthly bill credit of \$31.76, which represents the value of a reduction in both capacity (FCM) and transmission (regional network service or RNS) costs by controlling the battery at peak. As in option 1, the customer will have the responsibility to install and maintain the Powerwall, subject to Tesla's 10-year warranty.

In this scenario, GMP is assuming that the Powerwalls are dispatched to hit the FCM peaks 75% of the time and the RNS peaks 50% of the time.²

² These values reflect GMP's preliminary projections regarding our ability to dispatch the batteries in tandem with RNS and FCM peaks. The estimates take into consideration some variability in communication systems, battery control systems, and the ability to successfully predict the peaks.

This option is designed for customers who prefer to buy the system outright and who are able to share access to the Powerwall. GMP's preliminary projection is that of the 510 pilot Powerwall units, approximately 225 units will be sold under option 2.

OPTION 3: Rate Rider Option – Customer Shares Access

Under this third option, GMP installs, owns, and maintains the Powerwall, subject to Tesla's 10-year warranty. The pricing structure under this option is similar to how GMP charges for street lights. The customer pays nothing up front for use of the Powerwall in their home and is charged a daily adder to their residential rate, reflecting the depreciated cost of the battery less the power supply savings value of GMP sharing access to the battery and using it to manage load (i.e., store during off-peak periods and dispatch back onto the grid during peak periods). The customer will also commit to stay on this rider for 10 years, representing the useful life of the Powerwall.

For purposes of the initial pilot, we have estimated the net daily adder as follows:

Using a standard cost of service model, we determined the revenue requirement for a fully installed Powerwall system. This resulted in a daily adder to a residential customer of \$2.84 per day or approximately \$86 per month.

We then performed an NPV analysis of the 10-year value stream that would be expected from the 7kWh Powerwall system. This includes the assumption that we will successfully reduce 100% of the FCM peaks, 75%³ of the RNS peaks and utilize the Powerwall for energy arbitrage as well. The resulting value is a credit of \$1.69 per day, which when netted against the daily adder produces a cost to the customer of \$1.25 per day or approximately \$37.50 per month.

This option is designed for customers who prefer no upfront cost and who are able to share access to the Powerwall. This "rider" option, including details regarding disconnection and other customer service issues, is set forth in additional detail in the attached document.

GMP estimates that of the 510 pilot Powerwall units, approximately 200 units will be installed under option 3.

Timing and Scope

In December, GMP will test the Powerwalls with approximately 5 customers located in our Rutland pilot micro-grid circuit as well as approximately 5 customers located in areas that experience a high frequency of outages at no cost to the initial 10 customers⁴.

³ GMP assumes a higher success rate at hitting the FCM and RNS peaks for the rate rider as opposed to the direct purchase option. This is due to GMP owning the assets under the rate rider option providing greater certainty of status and condition of the battery system.

⁴ 10 initial Powerwalls not included in the financial modeling in Appendix A

By January 2016, GMP expects to receive its first shipment of 100 Powerwalls, with approximately 100 to follow on a monthly basis until GMP takes receipt of approximately 510 Powerwalls. GMP will make Powerwalls available on a first come, first serve basis.

To start, GMP seeks to accomplish the following as part of this Pilot:

1. Sell a portion of initial Powerwall stock as a simple resale to customers;
2. Enroll customers in the new Residential Rate Rider;
3. Work with homebuilders and solar installers to package the Powerwall into a new home-build or new solar-install;
4. Improve CAIDI & CAIFI⁵ metrics for customers that install a Powerwall; and
5. Demonstrate GMP can successfully control Powerwalls and reduce energy, capacity, and transmission costs.

The Powerwall Advances State Energy Goals

The Powerwall offering will help advance state energy goals. First, the Powerwall provides a clean alternative back-up power solution for customers that would otherwise rely on a fossil-fuel-generator. Second, the Powerwall represents an innovative, dispatchable resource that can be used during peak periods to help reduce GMP's power supply costs, which lowers costs for customers. Third, the Powerwall can aid in the significant development of distributed energy resources called for under Act 56, the Vermont Renewable Energy Standard ("RES") enacted in 2015. Specifically, dispatch control of the Powerwall can be used to help smooth grid impacts caused by a high penetration of solar energy, potentially avoiding more expensive, traditional grid upgrades. In similar fashion, dispatching the Powerwall in the Rutland area will contribute to improving the reliability of the Rutland 46kV subtransmission network during system contingencies. This dovetails neatly with GMP's *Rutland Reliability Plan* that was filed with the Vermont Public Service Board in April 2015.

Summary of Projected Costs and Revenues

Direct Sale – The costs and revenues shown in Appendix A are for 300 Powerwalls sold in year one. These figures assume that 225 of the 300 customers will allow GMP control of the Powerwalls. The monthly bill credit described above is factored into these projections.

Rider – The costs and revenues displayed in Appendix A is a ten-year projection for the 200 Powerwalls that GMP expects to deliver as part of the rate rider option. It reflects the ten-year useful life of the Powerwall. Initially, the expenses exceed the costs due to the fact that capital expenditures impact ratebase more significantly in the first few years; however, starting at year 6, the Powerwalls have depreciated to the point where the revenues exceed the total expenses. The table below assumes all 200 Powerwalls are installed halfway through the GMP fiscal year.

⁵ The typical reliability indices is 'SAIFI', however, because we are monitoring the impact of the Powerwall on the individual customer, we will be tracking 'CAIFI' for frequency reduction in addition to the duration reduction of the individual customer.

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Efficiency Vermont Non-Conflict Explanation and Collaboration Certification

By this filing, GMP certifies that the Tesla Pilot does not conflict with work being performed by Efficiency Vermont. GMP has discussed the scope and objectives of this pilot with Efficiency Vermont, and Efficiency Vermont is supportive of the Pilot.

Status Updates

GMP proposes to provide status updates to the Board regarding the Tesla Pilot's progress on a six month basis until the pilot expires in 18 months. In the event GMP decides to terminate the Pilot prior to the passage of 18 months, it will provide prompt notice to the Board, the Department, and Efficiency Vermont.

If you should have any questions, please contact me at 802-655-8754.

Very truly yours,

 / m6B
Josh Castonguay
Chief Innovation Officer

Enclosure

cc: Tim Duggan, Esq., Vermont Department of Public Service
Elizabeth Gamache, Efficiency Vermont

Appendix A

GMP Tesla Pricing captures the following components not shown in the table below:

- 6% Sales Tax
- 2% A&G (Rate Rider Option Only)

GMP includes the following additional expenses in the program as explained below:

- Other O&M
 - Captures an expected cost per unit in year one to roll out the pilot, and an estimated maintenance cost for an expected 5% of units each additional year
- Additional A&G
 - Captures a general GMP overhead cost including a 2% escalation for the duration of the pilot.

Year	1	2	3	4	5	6	7	8	9	10	11
Sold Units											
Total # Units Sold	300										
Mid-Year Convention	150										
Cumulative # Units Sold	150	300	300	300	300	300	300	300	300	300	300
# Units Under Direct Control, Mid-Year Convention	113	225	225	225	225	225	225	225	225	225	75
Sales Revenue	\$1,950,358	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Equipment Costs	(\$1,533,300)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Sales Tax	(\$110,398)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gross Revenue Tax	(\$19,701)										
Bill Credit for Control by GMP*	(\$40,500)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$81,000)	(\$27,000)
Power Supply/TBO benefit from control	\$40,500	\$81,000	\$81,000	\$81,000	\$81,000	\$81,000	\$81,000	\$81,000	\$81,000	\$81,000	\$27,000
Leased Units											
Total # Units Leased	200	200	200	200	200	200	200	200	200	200	200
Mid-Year Convention	100	200	200	200	200	200	200	200	200	200	100
Lease Revenue	\$45,618	\$91,236	\$91,236	\$91,236	\$91,236	\$91,236	\$91,236	\$91,236	\$91,236	\$91,236	\$45,618
Power Supply/TBO benefit from control	\$61,760	\$123,521	\$123,521	\$123,521	\$123,521	\$123,521	\$123,521	\$123,521	\$123,521	\$123,521	\$61,760
Depreciation	(\$68,429)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$136,858)	(\$68,429)
Return on Rate Base	(\$71,894)	(\$135,346)	(\$115,490)	(\$94,701)	(\$77,409)	(\$62,622)	(\$48,884)	(\$35,146)	(\$22,691)	(\$12,828)	(\$4,276)
Marketing	(\$5,000)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other O&M	-60,000	-5,000	-5,000	-5,000	-5,000	-5,000	-5,000	-5,000	-5,000	-5,000	-5,000
A&G	-3,125	-4,335	-4,422	-4,510	-4,600	-4,692	-4,786	-4,882	-4,980	-5,079	-3,352
Gross Revenue Tax	-461	-922	-922	-922	-922	-922	-922	-922	-922	-922	-461
Contribution to Cost of Service	\$185,429	(\$67,703)	(\$47,933)	(\$27,233)	(\$10,031)	\$4,663	\$18,307	\$31,950	\$44,308	\$64,071	\$25,861

Note: The above table is a half-year convention model, showing half of year 1 and half of year 11, for the full 10-year projection.