



Lon Huber

Vice President

Experience

Lon Huber leads Strategen’s private sector consulting practice. In this capacity, Mr. Huber provides independent analysis, strategy and policy solutions to solve some of the energy sector’s most pressing issues. He serves as an expert witness, mainly on behalf of consumer advocates, and is involved in numerous public proceedings across the U.S. Mr. Huber is frequently cited in trade press and speaks regularly at conferences across the country, including NARUC and NASUCA events. His experience spans the public and private sectors, as well as academia. Prior to joining Strategen, Mr. Huber worked for the consumer advocate office in Arizona, for energy-related technology firms and for an energy-focused research institute. He has received a congressional recognition award for his work involving solar energy, and has been recognized as a “40 Under 40” winner for leadership, community impact and professional accomplishment. Mr. Huber holds a Bachelor of Science in Public Policy and Management, and a Masters of Business Administration from the Eller College of Management at the University of Arizona

Vice President

MAR 2015 – Present
Strategen Consulting – Berkeley, CA

Advisor to the Director

APR 2013 – MAR 2015
Arizona’s Residential Utility Consumer Office (RUCO) – Phoenix, AZ

Vice President

2011 – DEC 2015
Arbsource – Tempe, AZ

Founder

FEB 2010 – 2014
Next Phase Energy – Tucson, AZ

Manager

SEP 2011 – DEC 2012
Suntech America – San Francisco, CA

Finance Development Coordinator

SEP 2010 – SEP 2011
TFS Solar – Tucson, AZ

Policy Program Associate

AUG 2007 – SEP 2010
Univ. Arizona, Arizona
Research Institute for Solar Energy – Tucson, AZ

Congressional Energy Fellow

EDUCATION

Masters of Business Administration
Eller College of Management, 2011

BS, Public Policy and Management,
University of Arizona, 2009

REGISTRATIONS/CERTIFICATIONS

Microsoft Office Excel Specialist

NARUC Utility Rate School

EXPERIENCE

Strategic Consulting

Rate Design

Tech-to-Market Strategy

Energy Policy & Regulatory Strategy

Energy Product Development

Stakeholder Engagement

2017 PUBLICATIONS

- 2017 REN21 Global Status Report – Author of the [energy storage chapter](#).
- [New York City’s Aging Power Plants: Risks, Replacement Options, and the Role of Energy Storage](#)

JAN 2009 – MAY 2009
Washington DC

Selection of Relevant or Current Projects and Cases

Lead Consultant, Maine Office of the Public Advocate – Aggregated DER in New England ISO (2015-2017)

Lon Huber collaborated with the Maine Public Advocate to put forward a new policy framework to cost effectively scale distributed solar energy. This policy attempts to provide an alternative to net metering by using market-based auctions and a centralized aggregator. The policy is specifically designed to maximize benefits for all ratepayers, allocate costs and benefits transparently, and encourage technological innovation.

Sub-Consultant, Massachusetts Clean Energy Center and Department of Energy Resources, “State of Charge” report on Energy Storage potential (2016)

Lon Huber and Strategen were a part of a larger team that provided technical support, managed the stakeholder process, and aided the CEC in drafting this landmark report on the value of deploying energy storage on the Massachusetts electric system.

Project Consultant, Xcel Energy – Time-of-use Rate Pilot (April 2017 – present)

Lon Huber was tasked with designing a sophisticated time-of-use rate for Xcel Energy as well as crafting key programmatic elements of the pilot. This high-profile case for Northern States Power will help inform residential rate design for Minnesota moving forward.

Consultant, Hawaii Public Utilities Commission – Community Solar (2015 – present)

Lon Huber is a consultant to the Hawaii Public Utilities Commission. He works the creation of cost-conscience policy that benefits all ratepayers. Specifically, he helped form a solar and solar plus storage community solar program.

Expert Witness and General Consultant, Arizona’s Residential Utility Consumer Office (2015 – Present)

Lon Huber helps RUCO develop consumer friendly policies and programs for residential ratepayers in Arizona. Strategen performs many of the office’s analytical assessments and works with stakeholders to advance consumer oriented policy, including rate design, resource procurement/planning, and consumer protection policy. Lon has submitted testimony in numerous dockets on behalf of RUCO and recently wrote a whitepaper introducing a new concept called “Clean Peak Standard”.

Consultant, Maryland Office of People’s Counsel – Grid modernization PC44 and community solar (2015 – Present)

Lon Huber aids the Maryland Office of People’s Counsel on community solar policy and many of the topics associated with the large PC44 grid modernization effort. Topics include electric vehicles, energy storage, distribution grid planning, and interconnection.

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities
Total Resource Cost Model
Option 2 - Cellular Based Metering

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
1 Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
2 Units Installed	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3 #Units with Upfront Contribution	500															
4 #Units with Monthly Contribution	500	500	500	500	500	500	500	500	500	900						
Benefits																
5 Regional Network System (RNS) Charges	\$480,000	\$483,788	\$483,387	\$473,575	\$459,367	\$445,586	\$432,219	\$419,252	\$406,675	\$394,474	\$378,908	\$363,341	\$347,775	\$332,208	\$316,641	\$6,217,196
6 Local Network System (LNS) Charges	\$94,713	\$98,312	\$98,138	\$96,128	\$93,242	\$90,461	\$87,744	\$85,110	\$82,561	\$80,075	\$76,915	\$73,755	\$70,595	\$67,435	\$64,275	\$1,259,460
7 Distribution Circuit Upgrades (Rev Req)	\$0	\$96,101	\$92,889	\$89,797	\$86,815	\$83,934	\$81,148	\$78,450	\$75,831	\$73,226	\$70,622	\$68,017	\$65,412	\$62,807	\$60,202	\$1,085,251
8 Avoided Costs	\$283,820	\$248,070	\$143,477	\$130,525	\$172,065	\$204,961	\$394,743	\$491,265	\$549,686	\$550,015	\$501,212	\$397,624	\$338,501	\$318,290	\$293,069	\$5,017,322
9 Customer Savings																\$0
10 Customer Contribution (from 7.64% to 4%)																\$334,447.11
11 Total Benefits	\$858,532	\$926,270	\$817,892	\$790,025	\$811,489	\$824,943	\$995,854	\$1,074,077	\$1,114,753	\$1,097,791	\$1,027,657	\$902,736	\$822,282	\$780,740	\$734,187	\$13,913,675
Costs																
12 Revenue Requirement - Batteries	(\$1,543,180)	(\$1,415,504)	(\$1,305,285)	(\$1,207,533)	(\$1,118,660)	(\$1,029,811)	(\$940,937)	(\$863,210)	(\$796,605)	(\$730,000)	\$0	\$0	\$0	\$0	\$0	(\$10,950,725)
13 Revenue Requirement - Cell Based Meters	(\$43,873)	(\$42,023)	(\$40,220)	(\$38,461)	(\$36,743)	(\$35,062)	(\$33,415)	(\$31,801)	(\$30,191)	(\$28,582)	(\$26,973)	(\$25,364)	(\$23,755)	(\$22,145)	(\$20,536)	(\$479,144)
14 Monthly Cellular Reading Cost	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$36,000)	(\$540,000)
15 Cogsdale Programming Costs	(\$92,290)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$92,290)
16 Meter MV-90 Programming Costs	(\$80,000)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$80,000)
17 Total Costs	(\$1,795,343)	(\$1,493,527)	(\$1,381,505)	(\$1,281,995)	(\$1,191,402)	(\$1,100,872)	(\$1,010,352)	(\$931,011)	(\$862,796)	(\$794,582)	(\$62,973)	(\$61,364)	(\$59,755)	(\$58,145)	(\$56,536)	(\$12,142,159)
18 Net Benefit to All Customers	(\$936,811)	(\$567,257)	(\$563,613)	(\$491,970)	(\$379,914)	(\$275,929)	(\$14,499)	\$143,066	\$251,957	\$303,209	\$964,684	\$841,373	\$762,528	\$722,594	\$677,651	\$1,771,516
Net Present Value Calculation																
19 Required Rate of Return		7.64%														
20 Net Present Value		(\$720,596)														
21 Net Present Value with Energy Shift		\$29,107														
1 Year of installation																
2 Total units in pilot																
3 Based on Green Mountain Power's experience of 10% paying upfront																
4 (2) - (3)																
5 Calculation in Business case; Includes 3% degradation per year																
6 Calculation in Business case;																
7 Page 7																
8 Calculated using the most recent Avoided Energy Supply Components in New England: 2018 Report																
9 Savings Calc TRC 2																
10 Time value of money adjustment on customer contribution of \$2950 upfront (500) plus \$37 per month (500)					\$1,697,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$222,000	\$0
11 Sum of lines 5-8																
12 Page 3																
13 Page 5																
14 Verizon monthly cell data charges																
15 Estimated programming costs associated with billing TOU rates																
16 Estimated programming costs associated with reading cellular meters																
17 Sum of lines 10-14																
18 Sum of lines 9+15																
19 Page 3																
20 Net Present Value calculation of net benefits																
21 NPV of Energy shift from AESC 2018 plus 6.9% losses		\$388,453.24	\$26,803.27													

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Data Requests - Set 1

Date Request Received: 2/16/18
Request No. Staff 1-40

Date of Response: 3/9/18
Respondent: Heather Tebbetts

REQUEST:

Refer to the pre-filed Supplemental Testimony of Heather M. Tebbetts, page 14, lines 18-20, and please state whether Liberty has developed pilot program promotional and educational materials, documents, and communications directed toward customers located on the two circuits in West Lebanon that are targeted for at least 300 battery installations. If so, please provide copies of such materials and documents. If not, please describe in detail what those materials, documents, and communications will cover.

RESPONSE:

The materials described above have not yet been developed. These materials will likely include technical information about the batteries, description of TOU rates, and contact information for questions.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Data Requests - Set 1

Date Request Received: 2/16/18
Request No. Staff 1-42

Date of Response: 3/9/18
Respondent: Heather Tebbetts

REQUEST:

Refer to the pre-filed Supplemental Testimony of Heather M. Tebbetts, page 15, lines 10-15, and please provide copies of the 2017 Green Mountain Power press release referenced and of all other documents and information regarding the Green Mountain Power battery program researched and relied upon by Liberty in determining “how [Liberty] will market the battery storage pilot to [its] customers.”

RESPONSE:

Please see the response to Staff 1-19. Liberty did not rely on any information about marketing to customers from Green Mountain Power because GMP confirmed it did not need to market its program. Customers called to sign up as soon as GMP announced the program. This information was provided by Betsy Bloomer, the Director of GMP’s Energy Innovation Center, during a phone call.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-17

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Please explain the following related to estimating the 11L1 criteria violation:

- a. The data that will be analyzed;
- b. How this data is collected and how frequently;
- c. Any additional technology or equipment or systems that will be required to collect this data;
- d. How will the violation be identified?
- e. The algorithm that will be used; and
- f. Who will develop the algorithm and estimated costs to develop.

RESPONSE:

- a. The strategy or algorithm to estimate the 11L1 criteria violation is currently being developed based on historical data. The following data variables are currently being considered:
 - Temperature;
 - Dew Point;
 - Precipitation;
 - Total Humidity Index, which is a product of the temperature and the dew point;
 - Weighted Total Humidity Index, which is a product of the temperature and the dew point for the previous two days;
 - Feeder load curves for recent previous days and for similar temperature and/or date profiles;
 - Weekday; and
 - Industrial Customer Demand
- b. This data is being collected hourly. The 11L1 load data will be collected from the Company's SCADA system. The weather data will be collected from the Lebanon airport weather station.
- c. Additional technology or equipment is not planned at this time.

Docket No. DE 17-189 Request No. Staff Tech 4-17

- d. In summary, the Company will forecast hourly amps based on identified variables. By using these variables, such as expected weather, an hourly temperature term will be developed so that the model coefficients can be used to predict hourly amps. The peak predicted hourly amps will determine the discharge schedule and rate that will be used to reduce the feeder peak load below the violation threshold.
- e. See the response to part a.
- f. The Engineering department with the assistance of the Company's forecasting consultant will develop the algorithm to be used. The cost to develop the algorithm is unknown at this time.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-18

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Please explain the following related to estimating the distribution system peak:

- a. The data that will be analyzed;
- b. How this data is collected and how frequently;
- c. Any additional technology or equipment or systems that will be required to collect this data;
- d. The algorithm that will be used; and
- e. Who will develop the algorithm and estimated costs to develop.

RESPONSE:

- a. The Company does not anticipate a need to estimate the distribution system peak as part of the battery pilot. The primary goals of the battery pilot are to reduce Granite State's coincident peak (with the ISO-New England system peak) and to provide a non-wires alternative to reduce the 11L1 feeder peak load.
- b. See the response to part a.
- c. See the response to part a.
- d. See the response to part a.
- e. See the response to part a.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-19

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Please explain the following related to estimating the ISO-NE system peak:

- a. The data that will be analyzed;
- b. How this data is collected and how frequently;
- c. Any additional technology or equipment or systems that will be required to collect this data;
- d. The algorithm that will be used; and
- e. Who will develop the algorithm and estimated costs to develop.

RESPONSE:

- a. The strategy or algorithm to estimate the timing of the ISO-NE system peak is currently being developed and is not available at this time. It is anticipated that the forecasts that are already developed by ISO-NE will play a major role in estimating the timing of the ISO-NE peak.
- b. See the response to part a.
- c. See the response to part a.
- d. See the response to part a.
- e. The Engineering department with the assistance of the Company's forecasting consultant will develop the algorithm to be used. The cost to develop the algorithm is unknown at this time.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

OCA Technical Session Data Requests - Set 3

Date Request Received: 4/17/18
Request No. OCA Tech 3-1

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Reference response to Staff Tech, 1-1, 2-1, the Company's recently approved 2016 Least-Cost Integrated Resource Plan (LCIRP) pages 35-36, and LCIRP Appendix C:

- a. Please clarify the Company's reasoning for moving from the previous distribution planning criteria to the new distribution planning criteria, moving the violation threshold from 100 percent of normal equipment rating, to 75 percent of normal equipment rating?
- b. Prior to the Commission-approved criteria change, had the Company occasionally experienced hours in excess of the 100 percent threshold assigned to distribution circuit equipment? Please provide an approximation for how often such events occurred throughout the system on an hours-per-year basis.
- c. Please describe the equipment investments which became necessary as a result of that criteria change, in terms of number/type of projects, as well as their aggregate cost.
- d. Has the Company developed a phased approach for prioritizing which assets require replacement due to the criteria change, so as to avoid a significant immediate increase in equipment replacements and upgrades? If so, please describe this phased approach and where the Craft Hill equipment would have fallen within this prioritization order.

RESPONSE:

- a. Liberty reviewed and refined as part of the Least Cost Integrated Resource Planning its planning criteria since the transition from National Grid. The refined planning criteria are summarized in Figure 4.3 on Bates 036 of the Company's Least Cost Integrated Resource Plan in Docket No. DE 16-097. The planning criteria refinements, such as lowering the equipment rating "take action" limit from 100% to 75% on transformers and feeders, reflect Liberty's philosophy to strategically plan well ahead of system upgrade need dates. Additionally, these refinements better reflect Liberty's smaller equipment, facilities, and resource base, as well as increased customer focus. Liberty's distribution feeder criteria limits loading on feeders to 75% of their summer normal rating. This loading level provides reserve capacity that can be used to carry the load of adjacent feeders during first contingency N-1 conditions and/or provides capacity to serve new business or commercial applications in a timely manner. After 75% loading is reached,

unacceptable voltage levels often will be experienced on tap lines and at the end of the feeder.

- b. Prior to the criteria change, there were no specific projects to address overloads in excess of the 100% threshold on equipment during normal operation. Occasionally, undersized bare conductors would be addressed as part of the bare conductor replacement program.
- c. See the response to part b.
- d. System deficiencies are evaluated and prioritized based on two criteria: (1) the impact of the system deficiency (including the number of customers and demand impacted by the deficiency), the loading (or percent of rated capacity) on the distribution facilities, and the safety and environmental impact; and (2) the likelihood that such impacts will occur. Projects that are growth driven or those that are mandatory are given a maximum Risk Score of 50. Liberty's prioritization of the planning criteria projects is provided below. The higher the risk score indicates a higher priority. Liberty anticipated that these projects would be mitigated within the 15 year planning horizon.
 - Golden Rock Phase 1 Project – Risk Score 50
 - New Rockingham Substation – Risk Score 50
 - New Michael Ave 40L3 Phase 2 – Risk Score 39
 - New Pelham 14L5 Feeder – Risk Score 34
 - New Slayton Hill 39L4 Feeder – Risk Score 31 (new feeder required to address Craft Hill condition)

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-10

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Regarding the NWA benefits of the proposed pilot, please provide the following:

- a. The time periods for which the utility will take control of the battery to meet the NWA based on 2016 and 2017 and projected 2018 loads;
- b. How long the utility will take control of the battery;
- c. The time periods when the battery would be discharged and at what rate (in kwh/hour);
- d. The time periods when the battery will be charged, at what rate it will charge (in kWh/hour) and how long it will take to charge the battery for each (in hours/kw and hours/kWh) over time taking into account the degradation factor;
- e. The maximum number of times per month that the Utility can take control of the battery?
- f. The maximum number of times per year that the Utility can take control of the battery?
- g. The sample of the discharge schedule of batteries where the NWA violation begins prior to 11am
- h. Providing the discharge rate, duration, and number of batteries deployed, please provide the estimated phase (circuit phase) deployment of batteries and discharge strategy as it relates to g. above
- i. Please provide the circuit upgrade deferral estimate (number of years deferred) based on this deployment and discharge with 300 batteries

RESPONSE:

- a. Based on 2016 and 2017 loading, the following time periods shown in the table below exceeded the summer normal loading threshold on feeder 11L1. Using this sample period, Liberty would have taken control of the batteries to reduce the peak loading on the feeder at those times. As part of the battery pilot program, Liberty will perform phase balancing and thus average amps is used to determine the times below.

Date	Hour
7/6/2016	13:00
7/15/2016	12:00
7/22/2016	15:00
7/26/2016	12:00
7/27/2016	14:00
7/28/2016	12:00
8/11/2016	12:00
8/11/2016	13:00
8/12/2016	11:00
8/12/2016	12:00
8/12/2016	13:00
8/12/2016	14:00
8/12/2016	15:00
8/12/2016	16:00
8/12/2016	17:00
8/24/2016	14:00
8/22/2017	16:00

- b. Liberty has not determined how long it will take control of the batteries, but believes that control of the batteries would last between 12-24 hours, assuming that the forecasted violation would be for a single day. Previous to a discharge event, Liberty would charge the batteries the night before and, once charged, would place the batteries in idle mode in anticipation of the discharge event. Once the discharge event is completed the batteries would be charged during off-peak hours.
- c. See the response to part a. for a list of time periods that the 11L1 exceeded the summer normal loading threshold in 2016 and 2017. The rate that the batteries would be discharged is dependent on the number of batteries that will be installed on the 11L1 as part of the battery pilot program. The Company is setting an initial target of 300 batteries for the 11L1 feeder.
- d. The batteries will be charged during off-peak hours. The maximum continuous real power that the batteries charge and discharge is 5kW. At this rate it will take approximately 2 hours for the batteries to charge. See table below for charge and discharge durations with degradation rates taken into account. This table is based on the 11L1 most recent summer peak load (2017).

YEAR	BATTERY AVAILABLE KWH WITH 20% RESERVE AND 3% DEGRADATION	BATTERY TOTAL DISCHARGE TIME AT 3KW	BATTERY TOTAL CHARGE TIME AT 5KW	11L1 PEAK LOAD ASSUMING 0.7% GROWTH	11L1 AMPS ABOVE 357A CRITERIA	11L1 KW ABOVE 357A CRITERIA @ .8SPF	BATTERIES NEEDED ASSUMING 3KW DISCHARGE RATE
2017				357	0	0	0
2018	10.8	3.6	2.2	359	2	49	16
2019	10.5	3.5	2.1	362	5	97	32
2020	10.2	3.4	2.0	365	8	147	49
2021	9.9	3.3	2.0	367	10	196	65
2022	9.6	3.2	1.9	370	13	246	82
2023	9.3	3.1	1.9	372	15	297	99
2024	9.0	3.0	1.8	375	18	347	116
2025	8.7	2.9	1.7	377	20	398	133
2026	8.5	2.8	1.7	380	23	450	150
2027	8.2	2.7	1.6	383	26	501	167
2028	8.0	2.7	1.6	385	28	553	184

- e. The Company has not determined a maximum number of times per month that it can take control of the batteries. The Company does not anticipate taking control of the batteries during a storm or during weekends.
- f. The Company has not determined a maximum number of times per year that it can take control of the batteries. The Company does not anticipate taking control of the batteries during non-summer months unless a critical peak is forecasted to occur.
- g. See the response to part a. The only date where a discharge time prior to 11AM would have occurred was on August 12, 2016. This day resulted in the 2016 peak demand day for Liberty. On this date, the loading on the 11L1 feeder exceeded the summer normal threshold between the hours of 11AM and 5PM and reached a peak load of 372A. This would have required the batteries to reduce the peak by at least 343kVA for 6-7 hours. In order to achieve a peak reduction that lasts 6-7 hours, the batteries would be required to discharge at a rate of about 1.5 kW/hr. The installation of 300 batteries on the 11L1 feeder would result in a peak reduction of about 450kW for 7 hours which would have reduced the peak load on the 11L1 feeder to below the criteria loading threshold.
- h. See table below for a sample discharge schedule under this scenario.

Docket No. DE 17-189 Request No. Staff Tech 4-10

PEAK DAY 8/12/2016	11L1 PEAK LOAD AMPS	11L1 AMPS ABOVE 357A CRITERIA	11L1 KW ABOVE 357A CRITERIA @ .85PF	TOTAL PEAK DEMAND REDUCTION (KW) WITH 300 BATTERIES @ 1.5KW/HR	TOTAL PEAK DEMAND REDUCTION (AMPS) WITH 300 BATTERIES @ 1.5KW/HR & .85PF	11L1 FORECASTED PEAK LOAD WITH BATTERY DISCHARGE
10:00 AM	355	0	0	0	0	355
11:00 AM	372	15	295	450	23	349
12:00 PM	367	10	185	450	23	343
1:00 PM	362	5	95	450	23	339
2:00 PM	368	11	205	450	23	344
3:00 PM	360	3	55	450	23	337
4:00 PM	363	6	114	450	23	340
5:00 PM	362	5	91	450	23	339
6:00 PM	354	0	0	0	0	354

- i. See the response to part d. Based on the peak loads and forecasted load growth, the installation of 300 batteries will defer the Slayton Hill 39L4 feeder by least 10 years.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-24

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

Please refer to Liberty Utilities LCIRP dated January 15, 2016. Part of the NWA criteria is “Wires solution will likely start construction at least 24 months in the future, providing sufficient time to evaluate and implement a NWA solution”. In addition, “Distribution deficiency needs to be addressed in no less than two years, allowing for development of a NWA solution”. The NWA criteria are based on the issue of a future violation with time to implement a NWA to evaluate. In some cases the NWA will involve a DER which will need to be proved out as effective.

Please provide the detail and explanation of the 11L1 selection process where these criteria are met.

RESPONSE:

The two criteria mentioned in the request are:

1. Deficiency needs to be addressed in no less than two years.
2. Wire construction will likely start at least two years in the future.

These are two of five criteria that are used as an initial analysis of candidates for non-wires alternatives. Failure of any screen does not automatically eliminate a project from being considered for a non-wires alternative. The fact that it fails a particular screen adds a higher level of risk for success in implementation of the non-wires alternative.

Although the 11L1 project is needed to address an existing deficiency, in this particular case the Company considers this screen as a low risk given that this deficiency came about after the change to the planning criteria. Prior to the change this feeder was loaded to within its thermal ratings. Instead of implementing an immediate wires project to resolve this deficiency, the Company has decided to allow sufficient time to evaluate a NWA solution.

The 11L1 project passes screen #2 above in that the wire construction would be slated for 2021, thus allowing sufficient time to evaluate and implement a NWA.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-12

Date of Response: 4/24/18
Respondent: Joel Rivera

REQUEST:

On a day when Liberty takes control of the battery to reduce the system peak and the address the NWA violations, please provide the following:

- a. The time periods for which the utility will take control of the battery to meet both the system peak and NWA;
- b. How long the utility will take control of the battery;
- c. The time periods when the battery would be discharged and at what rate (in kwh/hour);
- d. The time periods when the battery will be charged, at what rate it will charge (in kWh/hour) and how long it will take to charge the battery for each (in hours/kw and hours/kWh) over time taking into account the degradation factor;
- e. The maximum number of times per month that the Utility can take control of the battery?
- f. The maximum number of times per year that the Utility can take control of the battery?
- g. The sample of the discharge schedule of batteries for both system peak and the NWA violation begins prior to 12pm and system peak occurring between 2pm and 6pm.

RESPONSE:

- a. It is anticipated that the NWA batteries will be programmed on a different schedule than the remaining system batteries. The primary goal of the NWA batteries will be to reduce the 11L1 feeder peak load, and the primary goal of the remaining system batteries will be to reduce the transmission costs. For the time periods for which the utility will take control of the NWA batteries, see the response to Staff Tech 4-10. For the time periods for which the utility will take control of the system batteries, see the response to Staff Tech 4-11.
- b. See the response to Staff Tech 4-10 for NWA batteries and Staff Tech 4-11 for the remaining system batteries.
- c. See the response to Staff Tech 4-10 for NWA batteries and Staff Tech 4-11 for the remaining system batteries.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Staff Technical Session Data Requests - Set 4

Date Request Received: 4/17/18
Request No. Staff Tech 4-15

Date of Response: 4/24/18
Respondent: Heather Tebbetts

REQUEST:

- a. Please provide all of the objectives of the pilot.
- b. Please describe what data Liberty Utilities will collect to analyze each of these objectives.
- c. What additional equipment, associated systems and the associated costs, including any consultant costs will be required to analyze the pilot? If no consultant costs are included, please explain why.
- d. Please provide the purpose of each aspect of the pilot including the time of use rates, non-wires alternative, reduction of system peak, battery storage, solar and non-solar participants.

RESPONSE:

- a. The objectives of the pilot were described in Direct Testimony, Supplemental Testimony, and the Technical Statement filed in this docket.
- b. The Company has noted in the above filings that it will collect data to analyze the objectives through surveys and through the meter in the battery, as described in the response to OCA 1-30.
- c. The Company has not identified additional pilot-related costs, including consultant costs, necessary to analyze the pilot at this time.
- d. This information has already been provided in Direct Testimony, Supplemental Testimony, and the Technical Statement filed in this docket.

Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

DE 17-189

Petition to Approve Battery Storage Pilot Program

Sunrun Inc. Data Requests - Set 1

Date Request Received: 2/16/18
Request No. Sunrun 1-11

Date of Response: 3/9/18
Respondent: Heather Tebbetts

REQUEST:

Please indicate whether the Company is open to testing the achievement of Pilot goals via behind the meter batteries owned by customers or third parties and operated or controlled by third parties, such that they enable equivalent operation to support Pilot goals as compared to Company-owned batteries. Please describe why or why not.

RESPONSE:

This pilot does not anticipate and is not designed to allow customers to “bring their own batteries.” As designed, the pilot will serve as the Company’s introduction to analyzing battery storage and provide a solid baseline for examining how battery storage may affect the distribution system. Allowing customers to “bring their own batteries” and introducing a wide range of variables would complicate the analysis and the determination of any conclusions.



CRAIG FERREIRA
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Electronic and Hand Delivery

February 23, 2018

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

Re: Green Mountain Power – Bring Your Own Device “BYOD” Innovative Pilot

Dear Mrs. Whitney:

Please accept this as Green Mountain Power’s (“GMP”) notice of the Bring Your Own Device (“BYOD”) Pilot (the “Pilot”). Green Mountain Power plans to start offering customers the opportunity to participate in the Pilot after March 10, 2018.

Executive Summary

Green Mountain Power is focused on a new energy future, that is home-, business-, and community-based and leverages the latest innovations in grid modernization to drive down costs and provide value for all customers. Battery storage is a meaningful part of that energy future. The BYOD Pilot opens GMP’s distributed energy resource (“DER”) platform to customers who purchase and install compatible batteries in their home or business. Customers will have the opportunity to earn a GMP bill credit by allowing GMP shared access to the battery to maximize its value for all GMP customers by reducing costs at “peak” times, and exploring the ability to charge and discharge systems to achieve other forms of wholesale power market value. The BYOD pilot allows customers to find new ways to obtain backup power in a cost-competitive way, while participating in GMP’s grid transformation efforts with their own storage solution and receiving credits for doing so, while also helping to drive down costs for all GMP customers.

Current or likely to be compatible battery systems include the following¹:

1. Sonnen Battery

¹ The official list of currently approved battery systems will be located on GMP’s website.

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2. Sunverge Battery
3. Solar Edge StorEdge Compatible Battery Systems
4. PowerWall 2.0

This is the current range of mainstream battery storage market offerings, and thus integrate with GMP's software. We are open to exploring the integration of other battery technologies upon request.

Customers participating in the Pilot will install a compatible battery system. Once installed, they will follow enrollment instructions to enter into the Pilot. The enrollment will include a verification process that enables their device to be utilized within the GMP energy platform². Once integration into the GMP energy platform is confirmed, the participating customer will begin receiving a credit on their electric bill in exchange for allowing GMP shared access to their device to generate value to all GMP customers. This means the battery system needs to be available to charge and discharge in accordance with GMP instructions, so that the output can be used for peak shaving and other grid services. The battery system cannot be utilized for any other controls by the customer, other than providing backup power for the customer's premises. As we look beyond this pilot, we plan to explore options that allow customers to participate on different levels and essentially 'pay for performance' when they do provide outcomes that benefit all customers and the GMP system.

To be part of this pilot and GMP's energy platform, customers will sign an agreement allowing shared access to their device to be used for grid services such as peak reduction and other ancillary services. Some of the details that will be identified in the agreement are:

- A "Peak Event" is defined as a period of time in which GMP will make adjustments to the device such as charging or discharging a battery at a specific rate.
- Peak Events are anticipated to occur an average of 5 to 8 times per month for an average of 3 to 6 hours at a time.
- Customers will be sent notification of a Peak Event, via a smart phone app or other electronic method, at least 4 hours in advance.
- GMP will ensure that batteries are available to perform backup power for the customer as quickly after the peak event as possible.
- GMP will also make adjustments when possible to avoid completely discharging a battery for the purpose of achieving grid benefits during or prior to a pending weather event that could create outages. While we cannot guarantee that the participating customer's battery system will be charged to a minimum level at all times, we will work to minimize these impacts to make sure the customer has back up power.

² The platform is a system that enables GMP to monitor and control the output of many distributed devices such as battery storage systems, for the benefit of GMP's system and customers as a whole.

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- GMP will continually explore other value opportunities to generate value for all customers through mechanisms, such as ancillary market revenues, energy arbitrage, etc., and if feasible, we will amend this pilot to include a feature to share those benefits.

The participating customer’s bill credit amount will be effective for the duration of the agreement with GMP. The agreement term will not exceed 10 years. Customers will have the option to opt-out of the Pilot at any time and discontinue GMP shared access to their device. The GMP bill credit will also terminate at this time. Customers are allowed to opt back into the Pilot, but will be assessed a \$15 reconnection fee on their next GMP bill and can only opt back in once annually. The 10-year term will continue from the date of the original activation.

Value of Energy Storage Systems

Energy Storage

The agreement between GMP and the customer will yield a monthly bill credit³ based on assumed value for each kW of storage capacity contractually available to GMP for a minimum duration of 3 hours at the full capacity rating. The minimum offer amount must be 2kW or greater with the maximum aggregate offer being 10kW behind an individual meter. If batteries are paired to get a full 10kW/30kWh the bill credit would be two times the 5kW bill credit rate.

Duration (Hours)	Power (kW) Available to GMP	Energy (kWh) Available to GMP	Monthly Bill Credit*
3	2-2.9	6-8.7	\$14.50
	3-3.9	9-11.7	\$22.00
	4-4.9	12-14.7	\$29.00
	5-5.9	15-17.7	\$36.00

* Bill credit based on an assumption that GMP will be able to use participating battery systems to reduce 8 out of 12 monthly Vermont peaks per year for RNS transmission savings, and assumes that the systems will be 75% effective at reducing the annual ISO-NE peak that determines GMP’s Forward Capacity Market obligations.

- GMP reserves the right to omit or reduce the participating customer’s monthly bill credit if the contracted energy storage is not available due to:
 1. Lack of capacity to deliver a 3-hour discharge at full output; or
 2. Lack of communication with the device during a peak event.
- The monthly bill credit amount is locked in for a period of 10 years or until the customer opts out or the contract is terminated.
- The monthly bill credit can be used to offset all chargers on the bill, including those not covered by solar, i.e. ‘non-bypassable’.
- An integration and communication fee of \$2.50 per month will be added to each bill to cover the costs of the ongoing communications and software platform fee.

³ Participating customers receive 70% of the estimated value that the battery system will provide to GMP, with remaining 30% of value flowing to non-participating customers through reduced retail rates.

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Customer Obligation

1. The customer is required to maintain the internet connection with the battery storage system at all times. In the event GMP loses connectivity with the battery system, the customer will be notified and will have 30 days to remedy. If not resolved in this time frame, the customer will be removed from the Pilot and no longer receive the bill credit. If the issue is resolved at a future date, the customer may opt back in with a \$15 reconnection fee. The monthly bill credit will be resumed in the amount specified at the initial activation.
2. If a customer is a net-metered customer, the credits generated from the battery storage system will be tracked separately from any solar credits generated. All rules and expiration requirements for solar credits will still apply.
3. Monthly bill credits will be allowed to accrue, and are able to be used to pay all charges on the GMP bill. At any time, but no more frequent than once annually, if a customer has excess bill credits, they are able to request an Energy Transformation Rebate in the amount of the excess bill credit with proof of purchase any product that meets the requirements of the Renewable Energy Standard under Tier 3, such as:
 - i. Smart Thermostat
 - ii. Heat Pump
 - iii. Heat Pump Water Heater
 - iv. Qualified Electric Vehicle
4. GMP will measure performance of the system during the peak events. If the battery system fails to perform within 10% of the contracted capacity, the customer will have 30 days to resolve the issue. Upon resolution, the customer will request GMP to test and verify performance has been restored. If not resolved within 30 days, the customer may be removed from the Pilot with the agreement voided and the bill credit ceased, or the monthly bill credit amount may be lowered to reflect the new available power and capacity.
5. GMP may remove a customer from the Pilot for any reason, including, but not limited to repeat issues with connectivity or performance of the system as that is how value is delivered to all customers.

Measurement & Verification

Measurement and verification is a key component of this Pilot to test the assumptions made regarding benefits to the grid and savings to all GMP customers – both those participating in the Pilot and those not participating. To that end, GMP's Energy Platform will report the available capacity for grid services, monitor which resources are sent dispatch signals, and most importantly, provide the total capacity and energy of the DERs for each peak event that is called. The energy platform will provide us with the performance information for each system, which will determine the systems are remaining in compliance with their requirements. GMP will be using data provided by Virtual Peaker to determine the overall effectiveness of the Pilot to reducing GMP peak demands.

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GMP will also send out a brief survey to each customer 6 months into their agreement to gain feedback from Pilot participants. GMP will look to learn if customers are satisfied with their involvement in the Pilot, the notification process, and value of the monthly bill credit.

Timing & Scope

Beginning in March the BYOD Pilot will be available to all residential customers and small commercial customers not currently on a Time-Of-Use retail electric rate. The initial Pilot will last for 18 months and will be available to a maximum of up to 2MW/6MWh of battery storage systems.

To reach 2MW/6MWh, GMP is expecting a mix of system sizes will be installed by participating customers. Currently, the most commonly sized system is around 9kWh, and other common sizes range from 6kWh to 15kWh. With this in mind, GMP anticipates the breakdown of 2MW/6MWh will be close to the following:

Battery kW Size	Quantity Installed
2	50
3	550
4	45
5	15

The Pilot Advances State Energy Goals

The BYOD offering will help advance state energy goals. First, the promotion and use of energy storage provides a clean alternative backup power solution for customers that would otherwise rely on a fossil-fuel generator, or not have a backup power source. Second, energy storage can be a tool to manage the grid with the development of distributed energy resources called for under Act 56, the Vermont Renewable Energy Standard (“RES”) enacted in 2015. Specifically, dispatch control of energy storage can be used to help smooth grid impacts caused by a high penetration of distributed solar energy, potentially avoiding more expensive, traditional grid upgrades⁴. Additionally, these resources are anticipated to provide a small amount of value towards the Tier 3 targets under the RES. Finally, these DERs represent innovative, dispatchable resources that can be used during peak periods to help reduce GMP’s power supply costs, lowering costs for customers.

Summary of Projected Costs & Revenues

There is an ongoing software cost to enable this Pilot that is partially offset by the monthly communication fee. This Pilot will provide value to non-participating customers through power supply cost reductions. Based on GMP Power Supply projections, GMP assumes

⁴ The BYOD Pilot will begin by primarily focusing on peak shaving, however GMP will continue to work and build the framework to utilize batteries for this purpose.

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a levelized per kW value of approximately \$10.30 per month. Participating customers will receive 70% of this value, while the remaining 30% will benefit all GMP customers. GMP expects a mix of battery sizes to be deployed by participating customers. Table 1 shows the expected benefits to all GMP customers based on an anticipated mix of battery size deployments.

	Year	1	2	3	4	5	6	7	8	9	10
Revenue											
Communication & Integration Fees		\$19,800	\$19,800	\$19,800	\$19,800	\$19,800	\$19,800	\$19,800	\$19,800	\$19,800	\$19,800
Power Supply Benefit		\$150,521	\$251,251	\$316,532	\$325,119	\$334,653	\$350,465	\$372,873	\$397,496	\$423,057	\$449,713
Total Revenue		\$170,321	\$271,051	\$336,332	\$344,919	\$354,453	\$370,265	\$392,673	\$417,296	\$442,857	\$469,513
Costs											
GMP Grid Platform		(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)
Battery Bill Credit		(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)	(\$176,040)
Total Costs		(\$206,040)									
Net Benefit to GMP Customers		(\$36,080)	\$65,667	\$131,608	\$140,282	\$149,912	\$165,884	\$188,518	\$213,390	\$239,209	\$266,134

Table 1

Efficiency Vermont Non-Conflict and Collaboration Certification

By this filing, GMP certifies that the BYOD 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 this pilot.

Status Updates

GMP proposes to provide status updates to the Commission regarding the BYOD 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, we will provide prompt notice to the Commission and the Department.

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

Sincerely,



Craig Ferreira

cc: Stephanie Hoffman, Vermont Department of Public Service
Karen Glitman, Efficiency Vermont
Barry Murphy, Vermont Department of Public Service