

**BEFORE THE STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION**

In the matter of:)
Liberty Utilities (Granite State Electric Corp.))
d/b/a Liberty Utilities)
Docket No. DE 17-189)
Petition to Approve Battery Storage Pilot Program)

Direct Prefiled Testimony

Of

Lon Huber

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Dated: **May 1, 2018**

1 **I. Introduction**

2 **Q. Please state your name, position, employer and address.**

3 A. Lon Huber. I am the Vice President and Head of Consulting at Strategen Consulting, LLC located
4 at 2150 Allston Way # 210, Berkeley, CA 94704.

5

6 **Q. Please state your educational background and work experience.**

7 A. My career in the energy industry began in 2007 when I started working at an energy focused
8 research institute housed within the University of Arizona. In 2010, I became the governmental affairs
9 staffer for TFS Solar, a solar PV integration company based in Tucson. I was hired by Suntech America in
10 2011 where I led the company’s regulatory and policy efforts in numerous US states. In 2013 I served as
11 a consultant for Arizona’s Consumer advocate office, RUCO, on energy related issues. I then joined
12 RUCO as a full-time employee. At RUCO I was the staff lead on high profile dockets around net metering,
13 resource procurement, and utility solar programs. I decided to join Strategen Consulting in March 2015
14 where I currently work on energy storage and distributed generation issues across the US. I obtained a
15 Bachelor of Science Public Administration degree in Public Policy and Management from the University
16 of Arizona in 2009. I also received a Master of Business Administration from the Eller College of
17 Management at the same university. A resume is attached in Appendix LH-1.

18

19 **Q. Please state the purpose of your testimony**

20 A. To provide Office of the Consumer Advocate (OCA)’s position and recommendation regarding
21 Liberty Utilities (Liberty) residential battery pilot proposal.

22

23 **Q. How is your testimony organized?**

24 A. I address the following topics in order through the testimony:

- 1 1. Summary
- 2 2. Customer Education, Outreach, and Marketing RFI
- 3 3. Investment Tax Credit Applicability
- 4 4. Pilot Program Benefit/Cost Analysis
- 5 5. NWA Proposal
- 6 6. Pilot Evaluation, Measurement, and Verification
- 7 7. BYOB Offering

8

9 **1. Summary**

10 **Q. Please summarize your high level assessment of the pilot.**

11 A. The OCA commends Liberty for proposing such an innovative and comprehensive offering. While
12 the OCA would recommend a handful of modifications to garner full backing, the OCA is generally
13 supportive of the overall program put forward by Ms. Tebbetts and Liberty Utilities. The pilot will likely
14 result in a positive cost benefit ratio, which is praiseworthy given the early stage of residential battery
15 storage and the very fact that is it a pilot. Further, Liberty incorporated non-wires alternatives (NWAs)
16 and Time of Use (TOU) rates to make for a wide-ranging package of valuable learnings and data
17 gathering.

18

19 **Q. Can you go into more detail about the benefits of this pilot?**

20 A. This pilot, with the OCA's recommendations incorporated, would be one of the leading
21 examples of residential storage deployment in the US. Not only is Liberty creating a TOU rate with very
22 strong peak reduction price signals, but the utility is also incorporating a distribution non-wires solution.
23 Just these two efforts by themselves place Liberty in a leadership position within New Hampshire.

1 However, by adding residential storage on top of these program features, the pilot becomes among the
2 most promising in the country.

3

4 **Q. How does this compare to Green Mountain Power’s residential storage program?**

5 A. What places Liberty’s pilot above and beyond Green Mountain Power’s is the ability for the
6 battery to perform rate arbitrage on a regular basis. This action is in addition to performing a non-wires
7 solution function and monthly peak hour avoidance. While this pilot uses distribution rates as the main
8 differentiator of pricing to arbitrage, the OCA expects that this distribution only price signal will
9 eventually be moderated once the Company can provide customers with an adequate time varying
10 supply rate. It is the OCA’s understanding that the lack of time varying supply rates is due to limited
11 supplier options available from the market at this time. The OCA’s suggestion is that Liberty require a
12 bid for TOU energy supply from prospective suppliers in their next standard offer solicitation. If
13 successful, distribution rates would not have to be the main driver of the off-peak to on-peak price
14 differential.

15

16 **Q. Isn’t Green Mountain Power’s program centered around backup services for the customer?**

17 A. Yes, and Liberty is also allowing customers to use the installed batteries as backup power
18 sources. This has the potential to reduce fossil generator use and improve household comfort during an
19 outage.

20

21 **Q. Which program offers more benefits to participating customers?**

1 A. Liberty's provides more benefit to participants because the customer is not only receiving a
2 form of backup power service like in the Green Mountain Power program, but they are also realizing bill
3 savings from the TOU energy shifting.¹ I detail these savings later in the testimony.
4

5 **Q. What modifications to Liberty's proposal do you recommend?**

6 A. First, the OCA recommends that Liberty issue a request for information (RFI) for third party
7 assistance with customer education and customer facing program support. Upon receiving RFI results
8 Liberty, Staff, and the OCA can determine jointly if the benefits justify the added expense of the third-
9 party services. Second, the OCA suggests that Liberty explore monetizing the Federal Investment Tax
10 Credit (ITC) for solar customers who plan to charge their storage with their solar photovoltaic (PV)
11 system. Third, Liberty should increase the up-front payment and monthly fee amount for prospective
12 participants. Fourth, Liberty should be required to solicit a time varying supply rate option in their next
13 default service solicitation. Fifth, Liberty should gain financial upside as well as be exposed to downside
14 risk tied to how well they dispatch the batteries for RNS/LNS cost reduction. Sixth, in the NWA pilot
15 area, Liberty should target energy efficiency upgrades on the 11L1 circuit, and consider targeting key
16 community centers for local resiliency benefits. Seventh, Liberty should be directed to evaluate the pilot
17 in a manner similar to how the Commission has directed evaluation of the energy efficiency programs.
18 Eighth, the Commission should open a generic statewide docket to design a third-party battery program
19 and tariff that leverages many of the benefits found in this pilot.
20

21 **2. Customer Education**

22 **Q. Do you feel that the proposed customer education, outreach and programmatic support is**
23 **adequate?**

¹ <https://greenmountainpower.com/help/products-services/will-participation-change-much-spend-electricity/>

1 A. It is too early to tell if the proposed support will be adequate; the customer outreach plan is still
2 being created along with education and marketing material.²

3

4 **Q. Does this concern the OCA?**

5 A. Partly. Though, it is common to develop these materials during or after regulatory approval.
6 However, given the unique nature of the pilot and all the moving pieces, Liberty Utilities and Liberty's
7 customers may benefit greatly from third party assistance. While the OCA recognizes that some first
8 adopters and technology enthusiasts can be highly informed on batteries and TOU rates, they are a
9 minority and customers beyond this group need careful education and dedicated support.

10

11 **Q. Why is third party assistance important to the OCA?**

12 A. The OCA wants this pilot to be a big success. The OCA believes that batteries, TOU rates, and
13 NWAs can bestow upon ratepayers a substantial amount of benefits in the years ahead. Customer
14 education and satisfaction is a core component to achieving sustained success in these endeavors.

15

16 **Q. What is your recommendation?**

17 A. The OCA recommends that Liberty issue a request for information (RFI) from third parties that
18 specialize in customer education, outreach, and support. The OCA and Staff shall be consulted on the
19 scope of the RFI prior to the public release. Upon gathering results; Liberty, the OCA, and Staff (if
20 amendable) shall review the submittals and determine if the benefits of hiring a third-party expert

² See, Appendix LH-4, Liberty Response to Staff Data Request 1-40 stating: "The [promotional and marketing] 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." See also, Appendix LH-5, Liberty Response to Staff Data Request 1-42 stating: "Liberty did not rely on 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."

1 justify the added expense to the pilot. We recommend that Liberty agree, or be directed, to consult with
2 the OCA and Staff prior to moving forward with the customer education component of the pilot.

3

4 **3. Investment Tax Credit (ITC) Applicability**

5 **Q. Does the proposed pilot allow participants with solar PV to engage in the program?**

6 A. Yes.³

7

8 **Q. Is it highly likely that if the battery is charged with solar, the battery will qualify for the 30**
9 **percent Federal Investment Tax Credit?**

10 A. I am not tax professional, but my assessment is that is highly likely. If perfectly tax efficient, this
11 could yield around \$3,000 off a \$10,000 battery install.

12

13 **Q. Does this pilot leverage the ITC?**

14 A. Not as proposed.

15

16 **Q. Does this leave money on the table?**

17 A. Perhaps, it depends on how many customers have solar or obtain solar then decide to charge
18 the battery exclusively, or near exclusively, from their PV system. This could be a small number of
19 customers.

20

³ Direct Testimony of Heather M. Tebbetts, Bates 20-21, stating “Customers with solar could choose to charge the batteries overnight via the grid, dispatch during the critical peak period, and export any solar generation to the grid to receive export credit towards their bill for the month. Customers may also choose to charge the battery during the on-peak period from the solar installation,” and “Customers with solar who wish to participate in the pilot program will need to take service under the alternative tariff that was effective September 1, 2017,” because of differences between the new tariff and the grandfathered tariff.

1 **Q. Do you recommend Liberty take advantage of the ITC in this pilot?**

2 A. Yes, if possible. The OCA is not going as far to suggest a requirement in this pilot. However,
3 Liberty should get experience especially if it plans to add more batteries deployments in the future. The
4 OCA is open to Liberty retaining a portion of the monetized ITC in this pilot as an incentive to explore
5 how this would work.

6
7 **Q. Are there any extra responsibilities regarding the ITC?**

8 A. Yes, 75 percent to 100 percent of the energy charging the battery must come from solar⁴. The
9 OCA is open to Liberty having the ability to place additional requirements for customers who plan to use
10 the batteries to store their solar for TOU rate arbitrage to ensure ITC capture.

11

12 **4. Pilot Program Benefit/Cost Analysis**

13 **Q. Liberty has presented several benefit-cost analyses in this docket: the first representing a**
14 **simple business case analysis on 2-9-18, a “worst case” scenario on 4-6-18, and a third on 4-16-18 in**
15 **response to Staff Data Request Tech 3-1 describing the benefits and costs under the Total Resource**
16 **Cost test. Which of these analyses should the Commission consider?**

17 A. In at least one previous docket where the Commission has approved investment in distributed
18 energy resources by a distribution utility under RSA 374-G, the standard for cost-benefit analysis was the
19 Total Resource Cost (TRC) test.⁵ Furthermore, in their June 2017 Order Adopting a New Alternative Net

⁴ See National Renewable Energy Laboratory. Federal Tax Incentives for Energy Storage Systems. Available at: <https://www.nrel.gov/docs/fy18osti/70384.pdf>; See also Internal Revenue Service. [PLR-118431-17](https://www.irs.gov/pub/irs-wd/201809003.pdf). In March 2018 the Internal Revenue Service released a private letter ruling indicating that residential storage systems charged entirely by a connected photovoltaic system could claim 30 percent Investment Tax Credit based on the cost of the system and related installation. It should be noted that private letter ruling are not precedent setting, but do indicate the position that would be consistently taken by the Service when presented with a particular set of facts. Available at: <https://www.irs.gov/pub/irs-wd/201809003.pdf>

⁵ See Docket No. DE 09-137, Order No. 25,111.

1 Metering Tariff, the Commission also directed that the TRC should be used to determine the value of
2 distributed energy resources in a manner “generally consistent with [the methodology] used to evaluate
3 energy efficiency resource standard program investments.”⁶ These previous Commission Orders appear
4 to indicate a preference for viewing these investments under the lens of the TRC.

5 The OCA agrees that under 374-G, the Commission should consider the costs and benefits of the
6 proposal under the lens of the TRC, but we do not believe it should do so in isolation. Specifically, we
7 believe consideration of the business case analysis—which looks more like the Utility Cost Test (UCT)—
8 would be an appropriate secondary test to help determine the portion of the investment that should be
9 contributed by a customer, and the portion that should be socialized across the company’s rate base.
10 We also believe that in reaching a decision to approve or disapprove the project, the Commission should
11 consider any qualitative benefits that could retrospectively be evaluated and verified, even if not
12 quantitatively measured up front.

13 However, after study of Liberty’s various benefit cost-analyses, I have identified several inputs in
14 need of revision and attached to my testimony a revised version of both a business case and TRC
15 analyses accounting for those revisions. For the reasons described below, the Commission should
16 consider my revised analyses in their review of this petition, rather than the cost-benefit analyses the
17 Company has submitted in the docket or during discovery.

18

19 **Q. As a threshold issue, do you believe that the Company needs to demonstrate a positive net**
20 **present value for ratepayers before the Commission can approve the project?**

21 A. No. For several reasons, the OCA believes that this pilot is unique and that a positive net
22 present value should not be a prerequisite for Commission approval, or for the Company to recover
23 their investments.

⁶ See Docket No. DE 16-576, Order No. 26,029, at 60-61.

1 First, RSA 374-G:5(II) requires the Commission to give balanced consideration and proportional
2 weight to nine different factors when evaluating whether an electric public utility's investment in
3 distributed energy resources is in the public interest, and therefore may be recovered from ratepayers.
4 The requirement that the Commission consider a cost benefit analysis of the investment stems from RSA
5 374-G:5(II)(h), which lists "whether the expected value of the economic benefits of the investment to
6 the utility's ratepayers over the life of the investment outweigh the economic costs to the utility's
7 ratepayers," as a factor to consider. However, there are several other factors to which the Commission
8 must give balanced consideration and proportional weight. We agree with the portrayal of these factors
9 presented in the Company's Supplemental Testimony, subject to update based on our revised cost
10 benefit analyses, and will avoid duplicate discussion here.⁷

11 Second, and most importantly, the Commission directed in Order No. 26,029 (June 23, 2016)
12 that the electric distribution utilities should develop pilot projects to evaluate the value of distributed
13 energy resources, including pilots examining the value of TOU rates and non-wire alternatives (NWA).
14 As the Company noted in its April 6 Technical Statement, while this pilot might not directly address the
15 value of net metered photovoltaics, it will provide significant data relative to the impact of TOU
16 distribution rates on customer usage, as well as provide the first New Hampshire use-case for
17 integrating NWAs into the distribution system planning process in a meaningful and cost-saving manner.
18 Moreover, the Commission explicitly directed in Order No. 26,125 (April 30, 2018) that in any NWA
19 pilots taking place pursuant to its July 2017 net metering Order "should consider implementing one or
20 more demonstration projects using DG plus storage to address distribution capacity upgrade avoidance
21 or deferral."⁸ Liberty's pilot can serve exactly this purpose, and several others.

⁷ Supplemental Testimony of Heather M. Tebbetts, Bates 7-17.

⁸ See Docket No. DE 16-576, Order No. 26,125 at 16.

1 The OCA strongly believes that broader embrace of NWAs and TOU rates have the potential to
2 provide significant ratepayer benefits moving forward. In this context, the OCA considers the indirect
3 benefits that will flow from this project in the form of data and shared learnings, for both regulators and
4 the regulated, to also be significant. We also take this opportunity to remind the Commission of their
5 statement in Order No. 26,029 that the data resulting from net metering pilots “may also be useful in
6 other relevant contexts, such as the development of projects or initiatives in connection with the Grid
7 Mod Docket,” and that “utilities should have the opportunity to recover their prudently incurred costs of
8 development and implementation of all approved pilot programs.”⁹

9 Notwithstanding the OCA’s position on whether a positive net present value is a prerequisite for
10 Commission pre-approval of the project, we note that both the TRC analyses and revised business case
11 presented as Appendices LH-2 and LH-3 of my testimony demonstrate a positive net present value and
12 overall net benefits for the Company’s ratepayers.

13

14 **Q. Would the Commission’s pre-approval of the project, particularly if a negative net present**
15 **value is presented, alter the Company’s incentive to efficiently manage the project to maximize**
16 **ratepayer benefits?**

17 A. No. Pre-approval of this project would not preclude a retrospective prudence review that
18 examines how the project was managed. It simply provides the Company, its shareholders, and most
19 importantly ratepayers, with greater certainty regarding the scope of the project, recovery of the
20 investment, expectations regarding performance, and potential benefits. More importantly, pre-
21 approval also allows Staff, the OCA, and other interested stakeholders to suggest revisions and
22 conditions that might otherwise not have been considered by the Company. Even if a negative net
23 present value is presented in one of the cost-benefit analyses and the Commission approves the pilot

⁹ Supra, at Note 6.

1 anyway, the retrospective prudence review provides Liberty with an incentive to limit any further cost-
2 benefit erosion to the extent possible.

3

4 **Q. Do you have any concerns about the cost-benefit analyses presented by the Company?**

5 A. Yes. I believe that both the business case analysis and the TRC analysis fail to accurately portray
6 the true costs and benefits of the proposal relative to peak forecasting, discount rate, avoided costs, and
7 the customer contribution.

8

9 **Q. Please describe your concerns regarding peak load forecasting assumptions included in the**
10 **benefit-cost analyses prepared by the Company.**

11 A. Both analyses assume that the Company will be able predict the monthly peak hour and
12 distribution system peaks with 100 percent accuracy. This is concerning because peak forecasting is not
13 an exact science due to the impact of a wide range of variables (weather, dew point, precipitation,
14 humidity index, etc.) that can be hard to predict down to the hour with 100 percent accuracy. Green
15 Mountain Power (GMP) a neighboring utility which has had experience with battery dispatch, assumes
16 they will accurately forecast monthly system peak hours only 75 percent of the time.¹⁰ The New York
17 State Energy Research and Development Authority (NYSERDA) has suggested a similar assumption.¹¹
18 Liberty suggests it plans to utilize an algorithm to determine when to dispatch the batteries to best
19 reduce their peaks demands, but that this algorithm remains under development.¹²

20

¹⁰ Sandia National Laboratories. Green Mountain Power (GMP): Significant Revenues from Energy Storage. Page 28. Available at: <http://www.sandia.gov/ess/publications/SAND2017-6164.pdf>

¹¹ New York State Energy Research and Development Authority. Behind-the-Meter Storage: Technical and Market Assessment Final Report. Page 97. Available at: <https://www.nyserdera.ny.gov/-/media/Files/Publications/Research/Electric-Power-Delivery/Behind-Meter-Battery-Storage.pdf>

¹² See Appendix LH-6, Company Response to Staff Tech 4-17 through Staff Tech 4-19.

1 **Q. Can you suggest any strategies to resolve those concerns regarding peak load forecasting?**

2 A. Yes, I can suggest two strategies to resolve those concerns.

3 First, in light of the uncertainty associated with Liberty not having yet developed an algorithm to
4 forecast system peaks, and the presence of a “margin-of-error” assumption on other storage dispatch
5 analyses we have reviewed, we believe the cost-benefit analyses for Liberty’s storage project should
6 assume that the Company will achieve 75 percent of nameplate reduction on system peak hours. When
7 viewed in isolation, this revision results in a sizable reduction in the overall net present value/cost
8 benefit ratio. It is important to note that this calculation does not include savings from TOU rate
9 response. According to a large national study by the Department of Energy, savings from a TOU rate
10 such as the one Liberty is proposing can conservatively lead to a 10 percent reduction in peak demand.¹³

11 Second, we also believe that the uncertainty associated with the likelihood of being able to
12 forecast system peaks down to the hour should be further mitigated by establishing a performance
13 incentive tied to the net economic benefits attributable to those forecasts. Using the RNS and LNS
14 benefits projected by the Company’s forecasting of system peak hours at 75 percent of nameplate
15 accuracy as a baseline, we believe that Company shareholders and ratepayers should share equally in
16 the costs and benefits associated with any variation above or below that 75 percent baseline. RSA 374-
17 G:5(IV) suggests the Commission may adjust the return on equity component of the project as it deems
18 appropriate. We believe a basis point adjustment of the Company’s return on equity for the project
19 equal to 50 percent of the net economic benefits or costs attributable to any variation from the 75
20 percent baseline would be appropriate in this context.¹⁴ This basis point adjustment would provide the

¹³ US Department of Energy. Customer Acceptance, Retention, and Response to Time-Based Rates from the Consumer Behavior Studies. (November 2016) Page 63.
https://www.energy.gov/sites/prod/files/2016/12/f34/CBS_Final_Program_Impact_Report_Draft_20161101_0.pdf

¹⁴ Liberty Utilities has previously agreed to risk sharing mechanisms in instances where a degree of uncertainty exists regarding the Company’s future performance. See Docket No. DG 16-852 Settlement Agreement. Available

1 Company with an incentive to invest in strategies to maximize the economic benefit of the project while
2 providing a degree of protection to ratepayers if the Company's portrayal of economic benefits
3 attributable to peak demand reduction was overly optimistic.
4

5 **Q. Please describe your concerns regarding the discount rate assumed in the benefit cost
6 analyses prepared by the Company.**

7 A. The discount rate the company applied in each of its benefit-cost analyses was based on their
8 *pre-tax* weighted average cost of capital (WAAC). As the company acknowledged in response to OCA
9 Tech 3-4, that is inconsistent with the Commission's direction in Order No. 25,111 (June 11, 2010) that
10 the discount rate for utility investments in 374-G projects should be the *after-tax* WAAC.¹⁵
11

12 **Q. Can you suggest any strategies to resolve those concerns regarding discount rate?**

13 A. My revised cost benefit analyses exchanges the after-tax WAAC for the pre-tax WAAC the
14 Company used. Further, the Commission also directed that "There may be times when it [is]
15 appropriate to use other discount rates as part of a secondary analysis for sensitivity or because the
16 proposed project is primarily to be expenses and is funded from working capital with a significantly
17 different cost of capital."¹⁶ In the present petition, a portion of the capital for the pilot is derived from a
18 customer contribution. Therefore, in my revised benefit-cost analysis I have used a societal discount
19 rate of 4 percent (discount rate used in SBC-funded energy efficiency programs), on the customer
20 contribution portion of the revenue requirement in the TRC.¹⁷

at: https://puc.nh.gov/Regulatory/Docketbk/2016/16-852/LETTERS-MEMOS-TARIFFS/16-852_2017-09-01_ENGI_SETTLEMENT_AGREEMENT.PDF

¹⁵ Order No. 25,111, at 33.

¹⁶ *id.*

¹⁷ The Company's most recently approved WAAC is 7.64 percent and available at page 1 here:

http://www.puc.state.nh.us/Regulatory/Docketbk/2016/16-383/LETTERS-MEMOS-TARIFFS/16-383_2017-03-

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Q. Please describe your concerns regarding the avoided costs assumed in the benefit cost analyses prepared by the Company.

A. The TRC analysis double counted some benefits and left out others. For instance, Liberty included customer bill savings and customer contributions as benefits. These are not typically included in a TRC test in this manner. Liberty did not include energy shift value from moving energy from off-peak to on-peak, or capacity Demand Reduction Induced Pricing Effect (DRIPE) values. I added this energy shift value for New Hampshire, plus losses, as well as yearly avoided capacity costs and intrastate DRIPE from the AESC 2018 report. Next, I discounted capacity related savings in the same way as transmission. Importantly, the TRC prepared by Liberty did not include any savings from TOU rate response both in relation to avoided costs and RNS or LNS reduction. I did not include this value for the time being, but I am open to it. As for the business case analysis, I increased the customer contribution (as described below) and lowered the savings from capacity, RNS and LNS avoidance. Liberty also assumes a full year of cost and benefits starting in 2019. Due to time constraints, I did not adjust the costs and benefits to align with the planned rollout of installations and customer payments. Finally, in both cases I also lowered Liberty’s discount rate to 7.64 percent,¹⁸ and corrected an issue of double counting a \$100,000 customer contribution benefit while not factoring in the correct time value of money.

Q. What is Liberty proposing for the participants to invest for each battery in this pilot?

A. Liberty proposes \$1,000 down payment or a \$10 per month fee.

[15_GSEC_ATT_STIP_SETTLEMENT.PDF](#); The discount rate approved in the 2018-20 energy efficiency program plan is 4% and is available at Bates 139 here: https://puc.nh.gov/Regulatory/Docketbk/2017/17-136/INITIAL%20FILING%20-%20PETITION/17-136_2017-09-01_NHUTILITIES_EE_PLAN.PDF

¹⁸ Docket No. DE 16-383 Settlement Agreement Attachment 1, Page 1. Available at: http://www.puc.state.nh.us/Regulatory/Docketbk/2016/16-383/LETTERS-MEMOS-TARIFFS/16-383_2017-03-15_GSEC_ATT_STIP_SETTLEMENT.PDF

1

2 **Q. Will a customer benefit from this pilot from the battery performing rate arbitrage?**

3 A. Yes. Roughly speaking, customers should see a 1.6-year payback using the battery daily, five
4 days a week.

5

6 **Q. How did you calculate this?**

7 A. I modeled one Tesla Powerwall on Liberty's new rate performing energy arbitrage five days a
8 week. I assumed a 4 percent discount rate, 89 percent roundtrip efficiency, and a 3 percent annual
9 degrade. My model also assumes that there is always enough load during the on-peak period to offset
10 with the battery. The analysis was not meant to be very involved but rather serve as benchmark for the
11 different options a customer could choose.

12

13 **Q. Did you examine the \$1,000 upfront option or the zero-down option?**

14 I examined both and, as proposed, the zero-down option appears to create instantaneous savings for
15 the customer in relation to the additional \$10/month fee. Liberty's calculations seem to confirm this
16 where even the smallest customer would have a savings.

17

18 **Q. Is this a good deal for the participating customer?**

19 A. Yes, it is a very good deal. For perspective, a residential customer that installs rooftop PV solar
20 today would see a 11.7 year payback assuming no rate increases, no REC payments, and a \$2.80/Watt
21 system.

22

23 **Q. What if the customer has solar or adds solar to this pilot?**

1 A. By my estimates, a customer who uses solar on the pilot's TOU rate will experience roughly the
2 same payback as a PV system on standard rates today. If a customer charges the battery with solar she
3 will likely receive slightly better payback (10.6 years vs. 11.7 years) than under standard rates with solar
4 only.

5

6 **Q. Could you see this program becoming very popular?**

7 A. Given a 1.6-year payback, yes. And the customer may also see benefits related to backup
8 services as mentioned earlier. Given sign-ups for GMP's program, this could be worth a total of \$1,500
9 by itself.¹⁹ Ultimately every customer may place a different value on this feature, so I did not include it in
10 the payback calculation.

11

12 **Q. Given the very generous payback, what is the OCA proposing?**

13 A. I propose increasing the upfront payment to \$2,950. This amount is half the hardware cost of a
14 Powerwall if the customer purchased one themselves, not to mention the costs to actually install a
15 unit.²⁰ I also propose increasing the monthly program fee from \$10 to \$37 a month.

16

17 **Q. How does this pricing increase impact a customer's payback?**

18 A. This change moves the investment to a 5.5 year payback. Again, this is a rough calculation and it
19 assumes optimal operating conditions, full capacity less degrade, and ideal dispatch. It also assumes that
20 the supply rates stay static. In terms of the zero-down option, average savings for a medium low use to
21 medium high use customer come to around \$28 - \$49 according to first year numbers I adjusted from

¹⁹ The one-time payment for Powerwall in GMP's program:

<https://greenmountainpower.com/product/powerwall/>

²⁰ Spector, J. GreenTechMedia. "Tesla Quietly Raised the Price of the Powerwall." (April 2018) Available at:
<https://www.greentechmedia.com/articles/read/tesla-quietly-raised-the-price-of-the-powerwall#gs.CR6dreI>

1 Liberty's calculations in their TRC test workbook. My high-level calculations show a ~ \$46 per month
2 savings on average over 10 years.

3

4 **Q. Please summarize the results of the benefit-cost analyses you have attached to this testimony.**

5 A. I found a positive net present value for both the business case and the TRC test as follows:

6 • Business case: Net Present Value of Option 2 (cellular-based metering) - \$34,598

7 • TRC Test: Net Present Value TRC Model 2 (cellular-based metering) - \$29,107

8 Please note that the business case results are likely conservative because I did not retain depreciation
9 on the original \$7.3 million capital expenditure. I applied depreciation on the net capital outlay after
10 upfront customer contributions. I am opening to changing my method which I had selected due to time
11 constraints.

12

13 **Q. Are there any additional indirect benefits that you have not included in your analysis, but that
14 you believe the Commission should consider qualitatively during their evaluation of the pilot
15 proposal?**

16 A. Yes. The Commission has previously considered non-embedded CO2 emission reduction
17 benefits (as captured in the Avoided Energy Supply Cost in New England Study) as part of the 374-G
18 cost-benefit analysis.²¹ Calculation of emission reductions attributable to load shifting behind-the-meter
19 batteries would require complex calculations utilizing a multitude of projected assumptions, many of
20 which may or may not come to fruition. As such, we do not suggest non-embedded CO2 emission
21 reductions should be counted as a benefit within the pilot's cost-benefit analyses. However, in the
22 context of the present petition, where the batteries will be used as backup power in the event of a grid

²¹ In Order No. 25,111, the Commission suggested "In situations where projects, or a package of related proposed projects, may be marginally uneconomic based on direct benefits alone, we will allow reasonable estimates of indirect benefits to be considered and, if appropriate, to support a public interest finding."

1 outage, it is not an unreasonable assumption that the batteries will displace energy that would have
2 been created through the use of a gasoline-powered generator.

3 In any process or impact evaluation associated with this pilot, the Company should consider
4 whether their battery offering has displaced an investment in, or the usage of, a gasoline powered
5 generator, and attempt to quantify the fuel savings and incremental avoided CO2 emissions attributable
6 to that displacement.

7

8 **5. NWA Proposal**

9 **Q. Please state the OCA's general position regarding the NWA proposal.**

10 A. The OCA is extremely supportive of the Company's NWA proposal because it sees incorporation
11 of NWAs into the electric distribution planning process in New Hampshire as an untapped source of
12 savings for ratepayers. The Company's proposal is the first of its kind in New Hampshire, and while the
13 OCA still views it with the same healthy skepticism with which it analyzes any utility petition, we suggest
14 the Commission recognize the significance of this aspect of the proposal when it considers the project as
15 a whole.

16

17 **Q. Are you concerned that the circuit in question is already in violation of the Company's**
18 **distribution planning criteria?**

19 A. No. While the OCA could understand concerns of the parties regarding the recent distribution
20 system planning criteria violations, we think the context of those violations is important to consider.
21 The Company's criteria for evaluating when a distribution system component is in need of upgrade was
22 recently changed from 100 percent of a piece of equipment's rated capacity to 75 percent of a piece of

1 equipment's rated capacity.²² In contrast, Eversource and Unitil's criteria for evaluating when a
2 distribution system component is in need of upgrade are 85 percent and 90 percent, respectively.²³
3 When these facts are viewed in combination with the full context of the Company's battery storage
4 proposal, with the Company's response that power factor corrections at a large C&I customer on the
5 circuit were undertaken in 2016,²⁴ and our suggestion below that the Company target energy efficiency
6 investments on that circuit, the OCA is confident in the Company's ability to maintain safe and reliable
7 service on that circuit in the future.

8

9 **Q. In the past the OCA has advocated for technology-neutral NWA solicitations on the basis that**
10 **the technology-neutral aspect would enable deployment of the most cost-effective resources**
11 **available to satisfy a distribution system need. Are you concerned that this NWA is not technology**
12 **neutral?**

²² See Appendix LH-7, Company Response to OCA Tech 3-1 (Stating "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.")

²³ Public Service Company of New Hampshire. 2015 Least Cost Integrated Resource Plan. Page 53. Available at: <http://www.puc.state.nh.us/Regulatory/Docketbk/2015/15-248/INITIAL%20FILING%20-%20PETITION/15-248%202015-06-19%20PSNH%20DBA%20EVERSOURCE%202015%20LCIRP.PDF>; Unitil Energy Systems. 2016 Least Cost Integrated Resource Plan Appendix E. Page 204. Available at: <http://www.puc.state.nh.us/Regulatory/Docketbk/2016/16-463/INITIAL%20FILING%20-%20PETITION/16-463%202016-04-19%20UES%20ATT%202016%20LEAST%20COST%20INTEGRATED%20RESOURCE%20PLAN.PDF>

²⁴ See Appendix LH-8, Company Response to Staff Tech 4-10 (Stating "In 2017, the customer performed power factor correction, which increased the power factor to 94%. Prior to 2017, the customer had issues with its capacitor bank, resulting in the lower power factors shown in the table," and "Power factor correction and phase balancing are alternatives to reduce feeder load.")

1 A. The OCA has previously advocated for technology-neutral NWA solicitations.²⁵ However, in a
2 proposal such as this, where the project serves non-economic purposes including pilot data collection,
3 informing the value of DER, understanding battery dispatch, and building institutional capacity regarding
4 deployment of NWA projects for regulators/the regulated, the OCA believes an exception to the general
5 rule of technology neutral solicitations should be made. We do suggest however, that the Company
6 should also be required to deploy targeted energy efficiency investments on that same circuit.
7

8 **Q. Please explain the basis for requiring the NWA portion of the pilot to also embrace targeted**
9 **investments in energy efficiency improvements.**

10 Our reasons for requiring the Company to engage in targeted investments in energy efficiency
11 under the pilot are threefold. First, to the extent that any party is concerned about the performance of
12 the batteries and their ability to defer or eliminate the need to update the NWA circuit in light of the
13 current criteria violation, diversifying the NWA portfolio through adoption of targeted energy efficiency
14 investments will hedge against that concern.²⁶ Second, targeted energy efficiency investments are often
15 the most cost-effective part of an NWA project.²⁷ If the battery storage investment on the NWA circuit
16 and the energy efficiency investments on the NWA circuit were judged as a portfolio, then the overall
17 cost-benefit analysis of the NWA project would likely also improve. Third, if targeted energy efficiency
18 investments can reduce substantially the noncompliance hours associated with the NWA circuit, it

²⁵ See generally, Comments of the Office of the Consumer Advocate on the Commission’s Request for Comment on Certain Matters Relating to the Non-Wires Alternative Pilot Programs. Docket No. DE 16-576. (December 2017) Available at: https://www.puc.nh.gov/Regulatory/Docketbk/2016/16-576/LETTERS-MEMOS-TARIFFS/16-576_2017-12-08_OCA_COMMENTS.PDF

²⁶ See Appendix LH-9, Company Response to Staff Tech 4-24, which suggests that having failed one of the NWA criteria for screening adds some degree of risk to the project.

²⁷ See Munoz-Alvarez, D. (GTM Research), “Non-Wires Alternatives Projects. Emerging Utility Revenue Sources for the Distributed Energy Market” at slide 8 (stating “implemented and ongoing NWA projects suggest that energy efficiency is the most cost-effective DER utilized in NWA projects.” Available at: [https://www.vermontspc.com/library/document/download/5936/GTMR - NonWires Alternatives Projects.pdf](https://www.vermontspc.com/library/document/download/5936/GTMR_-_NonWires_Alternatives_Projects.pdf)

1 would free up substantial amounts of the capacity associated with the 300 batteries in the NWA
2 footprint to instead primarily target transmission peaks.²⁸

3 In Response to Staff Tech 4-20, the Company indicates that “An analysis concerning targeted
4 energy efficiency or other NWAs has not been performed on the 11L1 feeder. It is possible that energy
5 efficiency could have an impact on this feeder; however, a study would need to be performed to better
6 understand to what degree and what particular measures would be most effective.” While the term
7 “study” as used in this response is admittedly ambiguous, we below elaborate on what might be
8 required to determine the potential for targeted energy efficiency as part of the pilot’s NWA portfolio,
9 suggesting a “study” implies a level of resources that is unnecessary in light of the capabilities of the
10 Company’s energy efficiency program managers and their contractors.

11 A simple review of the 11L1 feeder circuit footprint reveals has a number of reasonably large
12 C&I customers, including several box stores who could be approached to gauge their interest in
13 participating in energy efficiency upgrades. We recommend the Company embraces C&I lighting
14 projects as the basis for most of said targeted energy efficiency projects because of: the timing profile
15 associated with the current feeder compliance violations,²⁹ the overall cost-effectiveness and ease of
16 EM&V surrounding C&I lighting projects, and ease of performing a walk-through audit, which could be
17 accomplished in a matter of hours.³⁰ The Company’s Response to Staff Tech 4-10 also indicates that
18 during the previous peak on 11L1, which occurred on August 12, 2016, the highest hour of peak load
19 was approximately 300kW above the company’s planning criteria. For some context, Timken, a single

²⁸ See Appendix LH-10, Company Response to Staff Tech 4-12(a) (Stating “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 11L2 feeder peak load, and the primary goal of the remaining system batteries will be to reduce transmission costs.”)

²⁹ See Appendix LH-8, Company Response to Staff Tech 4-10 (describing the criteria violations in 2016 as occurring between 11am and 5pm, normal business hours during which C&I customers often utilize their lighting equipment.)

³⁰ Given the seasonal timing of criteria violations, investments in HVAC upgrades may be another cost-effective strategy for targeted energy efficiency in these circumstances.

1 C&I customer located on 11L1 completed a lighting upgrade supported by the Company’s energy
2 efficiency programs that reduced their demand by 190kW.³¹

3 In summary, we believe Liberty—as a Company that already has the institutional capacity, SBC-
4 funded budgets, and know-how to land customers—should be able to quickly analyze opportunities and
5 deploy efficiency upgrades on 11L1.

6
7 **Q. Are there any additional benefits specific to the NWA circuit that you have not included in**
8 **your analysis, but that you believe the Commission should consider qualitatively during their**
9 **evaluation of the pilot proposal?**

10 A. Yes. While the Company does not currently plan to offer the batteries to commercial customers
11 the OCA believes that, within the footprint of the NWA circuit, Commission should provide Liberty with
12 the flexibility to consider deployment in strategic locations such as a small hospital, police station, high
13 school, or city hall; these are all areas where community members might gather in times power outage
14 or emergency. For example, a simple google search reveals that Alice Peck Memorial Hospital, the
15 Lebanon Policy Department, and City Hall appear to be on or directly next to the NWA circuit. While
16 quantifying the benefits associated community resiliency would be difficult, the OCA suggests they are
17 not \$0.³² Further, the OCA suggests that any retrospective evaluation of the pilot could compare the
18 average number of avoided outage minutes against the Company’s last five years of VMP/REP costs and

³¹ National Association of Manufacturers. *Energy Efficiency Toolkit for Manufacturers: Eight Proven Ways to Reduce Your Costs*. Page 9. (Describing Timken’s savings of 190kW as attributable to having upgraded from metal halide lighting fixtures to T5 fluorescent lighting) Available at: <http://www.cleanerandgreener.org/download/energyguide.pdf?phpMyAdmin=336c4dffa165t295a9722&phpMyAdmin=48c4e24a80dt72aa208>

³² The fact that some customers are participating in Green Mountain Power’s pilot program, which is exclusively offered to customers for its backup power, suggests the customer benefits attributable to availability of backup power associated with one PowerWall 2 is likely at least \$15 per month. In Order No. 25,111, the Commission suggested “In situations where projects, or a package of related proposed projects, may be marginally uneconomic based on direct benefits alone, we will allow reasonable estimates of indirect benefits to be considered and, if appropriate, to support a public interest finding.”

1 associated annual average SAID/SAIFI improvements during that timeframe. Such an analysis might be
2 able to determine a rough equivalent value of the resiliency benefit to communities.

3

4 **6. Pilot Evaluation, Measurement, and Verification**

5 **Q. Do you have any recommendations regarding reporting requirements or evaluation,**
6 **measurement, and verification of the project?**

7 A. Yes. In the testimony above, retrospective pilot evaluations are mentioned more than once.
8 However, in response to Staff 4-15- liberty states “The Company has not identified additional pilot-
9 related costs, including consultant costs, necessary to analyze the pilot at this time.”³³ The Office of the
10 Consumer Advocate firmly believes that process and impact evaluations associated with the battery
11 storage pilot, including the NWA portion, would provide a major source of indirect benefits by helping to
12 build institutional capacity and understanding regarding both NWAs and Battery Storage Dispatch for
13 both the regulators and the regulated community in the state of New Hampshire.³⁴ To be clear though,
14 we believe that costs associated with EM&V of this pilot should be recovered via the Company’s base
15 rates and not included within the project’s cost benefit analysis.³⁵

16 In conformance with the direction provided by the Commission’s Order directing TOU and NWA
17 pilots, the Commission should direct Liberty to work with the Staff, the OCA, and other interested
18 parties to develop an EM&V Plan that embraces a framework similar to that developed in the most

³³ See Appendix LH-11, Company Response to Staff Tech 4-15.

³⁴ For an example of how such an evaluation might be structured, See Navigant. National Grid Smart Energy Solutions Pilot: Final Evaluation Report. Mass. Dept. of Public Utilities. Docket No. 10-82. (May 2017) Available at: http://170.63.40.34/DPU/FileRoomAPI/api/Attachments/Get/?path=10-82%2fSES_Final_Evaluatio_Report_Cus.pdf

³⁵ See Order No. 25,111 at 34 (stating “to the extent that evaluation of DER options are incorporated into regular system planning as part of an integrated strategy for minimizing T&D costs, such cost might reasonably be included in the regular distribution rate base.”); See also, Order No. 26,029 at 64-65 (stating that the data resulting from such pilots “[M]ay also be useful in other relevant contexts, such as the development of projects or initiatives in connection with the Grid Mod Docket,” and that “utilities should have the opportunity to recover their prudently incurred costs of development and implementation of all approved pilot programs.”)

1 recent energy efficiency program plan where an independent third party evaluator is managed by a
2 working group consisting of representatives of the Commission Staff, the OCA, the Company, and a
3 technical consultant.

4

5 **7. BYOB Offer**

6 **Q. Can third parties other than Tesla deploy storage on this rate and market to customers?**

7 A. No³⁶

8

9 **Q. Does this present a flaw in the program?**

10 A. Since this is the first step to Liberty understanding how to integrate batteries and dispatch
11 them, no. Especially when one considers that Liberty is introducing TOU and NWA program elements
12 which only adds complexity (and value to ratepayers). However, there can be different, but equally as
13 high benefits under a third-party battery program.

14

15 **Q. What is a key benefit third parties can capture?**

16 A. Third parties may be able to capture capacity reductions for their customers and the 30 percent
17 ITC for solar plus storage customers. Currently Liberty is not able to directly reduce capacity related
18 costs which could be significant. A third party could partner with a supplier that provides this type of
19 demand-based pricing.

20

21 **Q. What is the OCA proposing?**

³⁶ See Appendix LH-12, Company Response to Sunrun Data Request 1-11, stating: "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.

1 A. The OCA strongly recommends a generic statewide investigatory docket with a firm timeline to
2 create a rate mechanism for residential and commercial customers that allows batteries to respond to
3 system cost drivers. This concept is entitled “Bring your own Battery” or BYOB. The goal would be to
4 encourage BYOB devolvement in a way that is linked to the cost to serve from a capacity, transmission,
5 and distribution perspective. For transmission and distribution specifically, an open communication
6 platform between Liberty and third party providers and aggregators may need to be setup.
7

8 **Q. Are other utilities looking to offer a type of BYOB program?**

9 A. To my knowledge San Diego Gas and Electric was the first to propose such a program.³⁷ So far
10 that proposal has yet to materialize. New York’s Smart home Pilot would be next, with a good example
11 being Con Edison’s Smart Home Rate RFI exploring Implementation of Price-Responsive Battery Storage
12 Systems.³⁸ However, Green Mountain Power may be the furthest down the road.³⁹
13

14 **Q. Do you envision a program structure similar to Green Mountain Power’s?**

15 A. Not at this time. The OCA envisions creating a rate to send accurate price signals rather than
16 heavy utility-controlled dispatch. The third parties would be synced with the utility on peak days;
17 however, the utility would not have to dispatch the battery (at least for the time being). The rate design
18 would guide the dispatch and if there is a non-wires use case, then the utility could send signals to
19 aggregators rather than direct control.

³⁷ St. John, J. GreenTechMedia “SDG&E Proposes a Bring-Your-Own-Battery Tariff.” (July 2015) Available at:
<https://www.greentechmedia.com/articles/read/sdges-proposes-a-bring-your-own-battery-tariff#gs.ZFEPym4>

³⁸ Consolidated Edison and Orange and Rockland, Inc.. Smart Home Rate Request for Information. Track 2:
Implementation of Price-Responsive Battery Storage Systems. (July 2017) Available at: <https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/smart-home/rev-demo---smart-home-rate-rfi-track-2.pdf?la=en>

³⁹ See Appendix LH-13, Green Mountain Power. Bring Your Own Device Pilot Filing. (February 2018) Available at:
<https://drive.google.com/file/d/1-buAppBalxpIL5kS1--DrJ-XToGapfs4/view?usp=sharing>

1

2 **Q. Does this conclude your testimony?**

3 **A.** Yes, it does.