THE STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION

LIBERTY UTILITIES (GRANITE STATE ELECTRIC) CORP. d/b/a LIBERTY UTILITIES
PETITION TO APPROVE BATTERY STORAGE PILOT PROGRAM

Docket No. DE 17-189

SETTLEMENT AGREEMENT

This Settlement Agreement is entered into this 19th day of November, 2018, by and among Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities ("Liberty" or "Company"), the City of Lebanon ("Lebanon"), the New Hampshire Sustainable Energy Association ("NHSEA"), the Conservation Law Foundation ("CLF"), the Acadia Center ("Acadia"), the Office of the Consumer Advocate ("OCA"), and the Staff of the New Hampshire Public Utilities Commission ("Staff") (collectively, the "Settling Parties"), and is intended to resolve all outstanding issues in the above-captioned docket by setting forth terms and conditions under which Liberty may conduct a pilot program in which it will buy and install batteries on the premises of certain customers while applying experimental Time-of-Use ("TOU") rates to those customers.

I. INTRODUCTION AND PROCEDURAL HISTORY

On December 1, 2017, Liberty filed with the New Hampshire Public Utilities Commission ("Commission") a petition requesting Commission approval of a pilot program in which Liberty would buy and install batteries and related equipment for up to 1,000 residential customers with the goal of reducing transmission costs and studying other potential system benefits. Specifically, the Petition sought Commission approval for (a) the purchase of the

batteries and related equipment, to be installed at the homes of customers, (b) a monthly or up-front charge to participating customers to defray some of the costs of the battery storage systems, (c) the inclusion of the associated investments in Liberty's rate base in the Company's next rate case filing, (d) a TOU rate for customers participating in the pilot, and (e) any other approvals necessary to allow Liberty to implement the pilot. Appended to the petition were the prefiled direct testimony of Heather M. Tebbetts, a senior analyst with Liberty, along with a motion for confidential treatment of certain aspects of Ms. Tebbetts' testimony.

By letter filed on December 4, 2017, the OCA entered an appearance on behalf of residential utility customers pursuant to RSA 363:28. The Commission issued an Order of Notice on December 13, 2017, scheduling a prehearing conference for January 4, 2018 and establishing January 2, 2018 as the deadline for the submission of intervention requests. Timely requests were filed by Lebanon, ReVision, NHSEA, and CLF. Acadia submitted an intervention petition on January 4, 2018.

The prehearing conference took place as scheduled, with the participation of Liberty, the OCA, Staff, Lebanon, ReVision, Acadia, and an additional potential intervenor, Sunrun, which filed an intervention petition on January 8, 2018. By secretarial letter issued on January 9, 2018, the Commission granted intervenor status to Lebanon, ReVision, NHSEA, CLF, Acadia, and Sunrun. The Commission granted Liberty's confidentiality motion, subject to a directive that Liberty attempt to reduce the scope of the information designated as confidential in Appendix 1 to the prefiled testimony of Ms. Tebbetts. Finally, the Commission approved a procedural schedule, agreed upon by the parties, calling for the submission of supplemental testimony by Liberty, discovery, the submission of prefiled direct testimony by Staff and parties other than

Liberty, a deadline for the submission of a settlement agreement, and two days of hearings in late May 2018.

Events in the docket proceeded according to the Commission-approved schedule, as subsequently amended. Liberty filed supplemental testimony of Ms. Tebbetts and direct testimony of Vikram Singh, with Attachments, as well as a motion for confidential treatment of Attachment C, on February 9, 2018. Liberty filed a technical statement of Ms. Tebbetts on April 9, 2018 updating the cost-benefit analysis submitted with her supplemental testimony. The OCA filed the direct prefiled testimony of Lon Huber on May 1, 2018. Lebanon filed the direct prefiled testimony of Clifton Below, a member of the Lebanon City Council, on May 2, 2018. Staff filed the direct prefiled testimony of Elizabeth R. Nixon and Kurt Demmer on May 3, 2018. Sunrun and Revision jointly filed the direct prefiled testimony of Justin R. Barnes on May 3, 2018. NHSEA filed the direct prefiled testimony of Kate Bashford Epsen on May 9, 2018. In lieu of formal testimony, CLF and Acadia filed comments on May 2 and May 3, 2018, respectively. Certain parties advocated the establishment of a competitive, non-utility-owned battery storage program to supplement, and serve as a comparator to, the pilot program as originally proposed by Liberty.

Settlement conferences took place on July 9, 10, and 23, 2018, and on August 1 and 14, 2018. Those confidential discussions resulted in settlement terms agreeable to all parties and Staff, as memorialized herein.

II. TERMS OF AGREEMENT

A. Legal Authority

The Settling Parties stipulate and agree, subject to the specific terms and conditions set forth herein, that the Commission should approve the petition of Liberty to conduct its proposed battery storage pilot program as consistent with, and authorized by, RSA 374-G:5.

Paragraph I of Section 5 of RSA 374-G provides that a New Hampshire public utility may seek rate recovery for investments in "distributed energy resources" by making an appropriate rate filing. See also RSA 374-G:2, I(b) (defining "distributed energy resources" to include "energy storage" and "technologies or devices located on or interconnected to the local electric distribution system for purposes including but not limited to . . . peak load shaving, as part of a strategy for minimizing transmission and distribution costs"). RSA 374-G:5, II requires the Commission, prior to authorizing a utility to recover investments in distributed energy resources, to determine that the investment and resulting rate recovery are "in the public interest." This, in turn, requires the Commission to undertake a "balanced consideration and [give] proportional weight" to nine specific factors:

(a) The effect on the reliability, safety, and efficiency of electric service;

(b) The efficient and cost-effective realization of the purposes of the renewable portfolio standards of RSA 362-F and the restructuring policy principles of RSA 374-F:3;

(c) The energy security benefits of the investment to the state of New Hampshire;

(d) The environmental benefits of the investment to the state of New Hampshire;

(e) The economic development benefits and liabilities of the investment to the state of New Hampshire;

(f) The effect on competition within the region's electricity markets and the state's energy services market;

(g) The costs and benefits to the utility's customers, including but not limited to a demonstration that the company has exercised competitive processes to reasonably minimize costs of the project to ratepayers and to maximize private investment in the project;

(h) Whether the expected value of the economic benefits of the investment to the utility's ratepayers over the life of the investment outweigh the economic costs to the utility's ratepayers; and

(i) The costs and benefits to any participating customer or customers.

The Settling Parties stipulate and agree that the Commission should determine, subject to the terms and conditions set forth herein, that the legally-required consideration of these nine specific factors warrant a determination by the Commission that approval of the Liberty battery storage pilot is in the public interest as referenced in RSA 374-G:5, II. In particular, the Settling Parties agree that the proposed pilot program has the potential to reduce utility customer costs, provide environmental benefits, and enhance energy security and reliability. The non-utility-owned battery program described herein also has the potential to improve competition in the states' energy services market. The Settling Parties further stipulate and agree that in any rate case or subsequent proceeding in which Liberty seeks to include in rate base the investments at issue in this docket, Liberty's decision to make the investments approved in this docket shall not be subject to further prudence review, but that the prudence of how Liberty implemented this agreement in making such investments shall be subject to the same scrutiny and potential disallowances as any other investment to be included in rate base for purposes of determining Liberty's revenue requirement.

B. Program Description, Size and Phasing

The Settling Parties stipulate and agree that Liberty may ultimately purchase and include in the pilot up to 500 Tesla "PowerWall 2" batteries that will be owned by Liberty and installed on customers' premises, subject to the conditions, limitations, and phased implementation

described herein. Liberty shall use the "GridLogic" software platform developed by Tesla or an equivalent software program, which shall be configured to allow the customer and/or Liberty to control the battery and its output according to the requirements of the pilot program. Liberty shall also purchase and install cell-based metering systems capable of recording three different TOU registers at the premises of each customer for whom Liberty provides a PowerWall 2 in the pilot program.

The Settling Parties stipulate and agree that the Liberty-owned battery pilot program should proceed in two phases, with Phase 1 implemented upon Commission approval of this settlement and Phase 2 deferred and conditional on the demonstrated success of Phase 1, as described in Section D below. During Phase 1, Liberty shall deploy at least 100 and up to 200 batteries. The purpose of Phase 1 is to serve as test of program concept and execution, benefit-cost analysis parameter assumptions, and incurred actual costs, as well as customer acceptance and engagement.

The Settling Parties further stipulate and agree that a working group will be established during Phase 1 to develop a potential "bring your own device" ("BYOD") program, that would include up to 500 additional batteries (or the number of batteries with the equivalent capacity of 2,500 kW) not owned by Liberty, and deployed by one or more third-party aggregators. Implementation of a BYOD program will not be conditional on Liberty seeking approval of Phase 2 if the BYOD program will not utilize Liberty's peak event forecasting. The potential BYOD program is described more fully in Section G below.

C. Phase 1

The Settling Parties stipulate and agree that Liberty shall not proceed with the installation of any batteries under Phase 1 until it has received binding commitments from customers for the

installation of at least 100 batteries and all customer premises have been inspected and confirmed to be suitable for battery installation, provided that Liberty shall begin installing metering equipment and collecting customer usage data from participating customers prior to that time. Within nine (9) months following Commission approval of this settlement, at least 100 batteries shall have been installed and become fully operational and available for Liberty to control and dispatch. No batteries shall be installed in Phase 1 of the program later than twelve (12) months following Commission approval of this settlement. Phase 1 shall be open to residential customers only, throughout the Liberty service territory. The total number of batteries installed as part of Phase 1 shall be limited to 200. Each participating customer shall be required to have at least two batteries and one gateway installed at the customer's premises.

Liberty shall place its Phase 1 participants on TOU rates as specified in Section F below. The Company shall offer batteries to customers in Phase 1 in exchange for either an up-front customer contribution for each battery of $2,433 or the payment of $25 per month on the customer's monthly electric bill for ten years, with an option to extend to 15 years with no additional payments due during the extension years. Customers who decide to terminate their participation in the program prior to the tenth anniversary of battery installation shall be charged $450 for removal of each installed battery, which sum Liberty shall use to defray the costs of the program. Customers receiving the batteries shall have access to the output of the batteries, as a source of stored electricity and backup power, except when Liberty is charging the batteries prior to or discharging the batteries during forecasted peak demand conditions after such conditions have been declared in advance by Liberty. Participating customers without on-site distributed generation ("DG") shall not be permitted to export battery power to the grid except when the batteries are under Liberty's control. Net-metered customers shall not be permitted to charge

their batteries from the grid except when the batteries are under Liberty's control; subject to the foregoing limitation, those customers shall receive credit for all energy exported to the grid, whether from their batteries or from their DG, according to the terms of the Alternative Net Metering Tariff with credits determined based on the TOU rates. The form of contract to be used by Liberty with participating customers for Phase 1 shall be submitted for Commission approval prior to implementation of the Program.

When Liberty determines that potential peak demand conditions will exist, Liberty shall provide at least 24-hours' advance notice to pilot participants that at midnight Liberty will take control of the batteries for purposes of charging them during the overnight hours and using the output during the following day. Such use of the battery output by Liberty shall include exports to the distribution system to the extent the battery power is not meeting on-premises load. Liberty shall provide timely public notice through its website or otherwise, at or near the time notice is given to customers participating in the battery pilot, of its dispatch events for the hours expected to be potential ISO New England ("ISO-NE") coincident monthly or annual peaks in demand.

On days when Liberty has taken control of the batteries to meet forecasted peak demand, Liberty shall dispatch the battery output so as to maximize savings to Liberty and its customers of regional network service ("RNS") and local network service ("LNS") transmission charges imposed by ISO-NE, as well as Forward Capacity Market ("FCM") costs, by reducing ISO-NE coincident system peak load.

The Settling Parties stipulate and agree that Phase 1 shall be subject to an initial test period of 18 months, beginning on the date that Liberty has installed at least 100 batteries and caused them to become fully operational and available for Liberty to control and dispatch.

Liberty shall notify the Settling Parties of that date within three (3) business days following its occurrence.

D. Phase 2

The Settling Parties stipulate and agree that Liberty may request permission from the Commission to commence a second phase of the pilot, subject to certain terms and conditions. Liberty may only initiate Phase 2 after having installed a minimum of 100 Phase 1 batteries that have been operational and available for Liberty to control and dispatch for at least 18 months. In addition, Liberty shall not commence Phase 2 unless (a) it has dispatched the Phase 1 batteries coincident with the monthly ISO-NE system coincident peak on average with an accuracy of at least 75 percent or greater determined with reference to expected peak hour kWh reduction achieved during actual peak hours in connection with either the full 18-month Phase 1 period or the most recent 12-month period during Phase 1; (b) it has realized RNS and LNS and FCM cost savings during Phase 1 that are not less than projected in the submitted benefit-cost analyses, taking into account and adjusting for changes in actual rates or clearing prices; (c) it demonstrates to the Commission that the investments and costs necessary to implement Phase 2, when considered in conjunction with those incurred or anticipated to be incurred in connection with Phase 1, have a forecasted net present value that is positive after incorporating historical Phase 1 average peak forecasting accuracy as described in (a) above, updated information about applicable RNS and LNS transmission rates, and other updated assumptions for relevant benefits and costs (those assumptions shall include, but are not limited to, FCM rates, actual battery costs, revised revenue-neutral TOU rates based on the default energy service rate (assuming no change in load shape as a result of participation in the pilot), transmission rates, and distribution rates then in effect, actual customer behavioral response to and experience with the Phase 1 TOU

rates, actual full net energy metering credit costs based on the actual number of discharge events when Liberty takes control of the installed batteries and the actual costs (e.g., energy, distribution, transmission, etc.) associated with those discharge events, and any costs or benefits associated with utility revenue impacts attributable to battery charging, actual charging rates, TOU rates, and default energy service rates; and (d) there has been no material adverse change in any relevant circumstances or criteria. If Phase 2 is not approved, the Commission may examine the prudence of continuing Phase 1, based on a revised and updated benefit-cost analysis of alternatives regarding the batteries installed during Phase 1, and a determination may be made to terminate the Phase 1 program following an adjudicative proceeding.

Upon Commission approval of Phase 2, Liberty may purchase and deploy additional Tesla PowerWall 2 batteries up to a quantity such that the total number of Liberty-owned batteries in both phases of the pilot combined is limited to 500. No batteries shall be installed in Phase 2 later than twelve (12) months following Commission approval of Phase 2 of the program. Each participating customer shall be required to have at least two batteries and one gateway installed at the customer's premises. As with Phase 1, customers participating in Phase 2 shall be placed on the TOU rates specified below and shall either make an up-front contribution for each battery of $2,433 or payment of $25 on the customer's monthly electric bill for ten years, with an option to extend the contract to 15 years with no additional payments due during the extension years. Customers who decide to terminate their participation in the program prior to the tenth anniversary of battery installation shall be charged $450 for removal of each installed battery, which sum Liberty shall use to defray the costs of the program. If the initial evaluation of the pilot program shows that the customer contribution or TOU rate design or structure requires adjustment prior to implementation of Phase 2, Liberty shall include a request

for such an adjustment in its request for Phase 2 implementation. Participation in Phase 2 shall not be limited to residential customers; Liberty may also seek the participation of single phase General Service Rate G-3 customers at strategic municipal facilities that may provide additional benefits to their host communities during power outages or emergencies for deployment of not more than 50 batteries (with a maximum of 4 batteries per Rate G-3 customer location).

Liberty's ability to proceed with Phase 2 shall require the approval of the Commission after an expedited adjudicative process. Staff shall file its recommendation regarding Phase 2 approval within 60 days of Liberty's request for approval of Phase 2. After Staff's recommendation has been filed, Liberty's implementation of Phase 2 may be approved by secretarial letter or an order *nisi* of the Commission, unless Staff recommends that a hearing on the merits be held or the Commission otherwise determines.

E. Risk-Sharing

In connection with the evaluation of Phase 2, Liberty may propose for Commission consideration and approval a symmetrical mechanism through which it would share with its customers in the financial risks associated with the need to predict monthly ISO-NE coincident system peak hourly load so as to dispatch the battery output to reduce that peak hour load. Such risk-sharing may apply to those batteries installed in both Phase 1 and Phase 2, and may consist of upward and downward adjustments to the return on equity (ROE) associated with Liberty's investment in the batteries and related equipment, including meters, based on Liberty's ability to accurately forecast ISO-NE coincident system peak hours and dispatch installed battery output to reduce that peak hour load. The Settling Parties stipulate and agree that such a risk-sharing mechanism may be considered by the Commission consistent with RSA 374-G:5, IV, which

provision authorizes the Commission to "add an incentive to the return on equity component as it deems appropriate to encourage investments in distributed energy resources."

F. TOU Rate Design

Customers participating in Phase 1 or Phase 2 of the pilot program shall take retail energy, transmission, and distribution service from Liberty according to the seasonal TOU rate design set forth in this section and as further described and explained in the Technical Statement Regarding TOU Model prepared by Heather Tebbetts, Lon Huber, and Clifton Below filed together with this settlement, with the exception that any participating customer may take competitive energy supply in lieu of default energy service according to the terms agreed upon between the customer and its supplier. The TOU periods shall be as follows, with illustrative volumetric rates[1] shown for residential customers based on the current default energy service time period (8/1/18 through 1/31/19):

<u>Summer Period (May 1 to October 31)</u>

Off-Peak:	8:00 p.m. through 8:00 a.m. (all days)	$0.0683 per kWh
Mid-Peak:	8:00 a.m. through 3:00 p.m. (non-holiday M-F)	$0.1526 per kWh
	8:00 a.m. through 8:00 p.m. (weekends and holidays)	
Critical Peak:	3:00 p.m. through 8:00 p.m. (non-holiday M-F)	$0.3644 per kWh

<u>Winter Period (November 1 to April 30)</u>

Off-Peak:	8:00 p.m. through 8:00 a.m. (all days)	$0.1302 per kWh
Mid-Peak:	8:00 a.m. through 3:00 p.m. (non-holiday M-F)	$0.1668 per kWh
	8:00 a.m. through 8:00 p.m. (weekends and holidays)	

[1] The rates shown here are for the volumetric (per kWh) rate components only and do not include the fixed customer charge of $14.54 per month, but the total rates do include the minor volumetric rate components of storm recovery adjustment, stranded cost recovery charges, system benefits charge, and electricity consumption tax.

Critical Peak: 3:00 p.m. through 8:00 p.m. (non-holiday M-F) $0.3567 per kWh

The Settling Parties stipulate and agree that the purposes of these seasonal time-varying rates are to deliver appropriate price signals to participating customers so as to encourage them to shift load away from peak hours, and to allow customers to save money by charging their batteries during off-peak hours and discharging the batteries during mid-peak and, especially, critical peak hours. It is acknowledged that the rates above will change as the underlying cost components change over time; however, Liberty shall commit to keeping the TOU rates revenue-neutral with regard to customer class average load shapes and each component's underlying methodology as similar as possible to the illustrative rate design and model as described herein and in the Technical Statement Regarding TOU Model filed with this settlement.

The Settling Parties further stipulate and agree that to participate in either phase of the pilot, a net energy metering customer must participate in net energy metering according to the terms of the Alternative Net Metering Tariff issued by Liberty in compliance with Order No. 26,029 in Docket DE 16-576 issued on June 23, 2017. Such net energy metering customers shall not be permitted to charge their batteries from the grid except when the batteries are under Liberty's control; those customers shall receive credit for energy exported to the grid according to the terms of the Alternative Net Metering Tariff with monetary credits determined based on the TOU rates. Participating customers who do not have net-metered DG shall receive a monetary credit for all energy exported to the grid when Liberty takes control of batteries that is equivalent to the monetary credit provided under the Alternative Net Metering Tariff based on the TOU rates. Following the expiration or termination of their participation in the program, net-metered customers who were grandfathered under the original standard net metering tariff may return to service under that original standard tariff.

G. BYOD Program Design and Approval

The Settling Parties stipulate and agree that the Commission shall convene a Working Group to design a BYOD component of the pilot program to be implemented subject to the terms and conditions of this section. The Working Group shall finalize programmatic recommendations for submission to the Commission within four (4) months of a Commission Order approving this settlement. For purposes of this section, "BYOD component" means an aspect of the pilot in which customers acquire batteries other than through Liberty, rely on one or more third-party aggregators to dispatch the batteries for purposes of ISO-NE coincident system hourly peak load reduction, and have the option to take retail transmission, distribution, and energy service from Liberty according to the TOU rates specified in section F above (and only TOU transmission and distribution rates if procuring energy from a competitive electric power supplier), provided that no less than twenty-five percent (25%) of BYOD participating customers shall be on Liberty's TOU rates.

The BYOD Working Group initially shall consist of representatives of Liberty, the OCA, Staff, and any other parties to this docket. The Working Group shall issue a request for information ("RFI") to inform the program design to be ultimately recommended. The BYOD program design recommended by the Working Group shall provide for the use of a competitive solicitation and accreditation process to choose one or more participating aggregators, the primary purposes of such process being maximum customer and ratepayer benefit, innovation, consumer protection, and the reduction of total program costs eligible to be recovered from all Liberty customers.

In connection with development of a detailed competitive solicitation process, the BYOD Working Group shall consist of Liberty, the OCA, Staff, and any other non-aggregator parties to

this docket. The competitive solicitation process shall include a request for proposals ("RFP") based on the program design developed by the Working Group based on evaluation of RFI responses. The RFP shall include a list of preferred qualifications and commitments, with weights given to each item. Bidders will be scored based on satisfaction of that list, as well as proposed compensation structure, with particular emphasis on the relative costs, benefits, and risks to ratepayers of proposed battery capacity aggregation services. Other criteria to be included in the specified list of RFP qualifications and commitments may include aggregator experience and aggregator commitment to enroll customers using TOU rate structures for more than the minimum percentage of all participating customers. Bonus points may be assigned to bidders proposing to offer a diversity of service offerings, such as those providing solar plus storage rather than storage only. Customers participating in any approved BYOD component shall be subject to restrictions on availability of the net energy metering-based credit for battery discharge exports that are equivalent to those applicable to customers with Liberty-owned batteries, including the same provisions for monetary credits provided to net-metered DG customers. If no bid receives at least 65% of the total possible score, then the Working Group shall reconvene to discuss whether to recommend to the Commission that the BYOD component of the pilot program be cancelled and that a separate generic docket be opened to address relevant issues.

If one or more bidders are selected through the RFP process, the successful bidders will commence the BYOD component of the battery storage pilot program within three (3) months of the Commission's order approving the BYOD program component. The BYOD program component can only be approved for implementation during Phase 1 if the selected aggregator(s) will not rely on Liberty's dispatch instructions to discharge batteries to the electric grid. If the

proposed BYOD program component will rely on Liberty's dispatch instructions, then it can only be approved as part of and conditioned on implementation of Liberty's Phase 2. Any proposed BYOD component of the pilot program must be supported by a benefit-cost analysis demonstrating a positive net present value over the relevant time period.

To qualify for participation in the BYOD program component, an aggregator must be responsible for the costs associated with required metering and communications equipment and systems, to have the same or equivalent capability and functionality as in the Liberty-owned phases of the program, as well as the aggregator's adherence to transparent disclosure and consumer protection provisions developed by the Working Group. In exchange, Liberty shall engage in co-marketing and customer outreach with any accredited aggregator. Each participating aggregator shall record and provide to Liberty and the Commission performance data of the installed battery storage asset, including, but not limited to, customer behavior and battery peak dispatch events, tracked and recorded in detail. Such data shall include timing, duration, discharge quantity, correspondence to daily and monthly peaks, and other data required to evaluate the program. All such data shall be provided in comparable form to the corresponding data provided by Liberty to the Commission, with battery charge and discharge data at an interval no less frequent than hourly. The Working Group shall include recommendations related to BYOD aggregator compensation structures that are based on the load forecasting and battery dispatch decisions of the aggregators, as well as the actual savings in RNS and LNS transmission rates achieved as a result, and recommendations on compensation structures for aggregators proposing to follow Liberty dispatch signals. Structures or mechanisms to prevent any double payment of transmission savings from battery discharge shall be implemented in the BYOD component of the pilot program.

H. Non-Wires Alternative ("NWA") Component

The Parties stipulate and agree that there may be value in utilizing DERs, including, but not limited to, battery storage, for the purpose of deferring or eliminating the need for otherwise necessary distribution system investments, but agree that currently the optimal venue for analyzing an electric distribution utility's planned capital investments for NWA candidates would be the review of its least cost integrated resource or similar plan ("LCIRP"). To that end, Liberty shall provide a detailed grid needs assessment within its next LCIRP. That grid needs assessment shall describe all forecasted grid needs related to distribution system capital investments of $250,000 or more over a five-year planning horizon at the circuit level. The grid needs assessment shall be available in spreadsheet format and shall include the following attribute-based columns and content: (1) Substation, Circuit, and/or Facility ID: identify the location and system granularity of grid need; (2) Distribution service required: capacity, reliability, and resiliency; (3) Anticipated season or date by which distribution upgrade must be installed; (4) Existing facility/equipment rating: MW, kVA, or other; and (5) Forecasted percentage deficiency above the existing facility/equipment rating over five years. Upon filing of the LCIRP and associated grid needs assessment, Commission Staff, the OCA, and Liberty will review planned capital investments to identify candidates that may be appropriate for NWA opportunities.

I. Customer Marketing and Disclosure

Liberty and aggregators participating in any approved BYOD program shall develop detailed customer marketing and disclosure information, focused on potential benefits, costs, and risks of program participation (including additional customer costs such as the potential need for in-home electrical work and the possibility of increases in insurance premiums). Liberty shall

also develop customer education materials and programs to inform participating customers of the most effective strategies to maximize program benefits and overall savings. During Phase 2, if approved, Liberty shall use analysis of actual average participating customer bill impacts during Phase 1 in its program marketing and educational initiatives, in a manner easily visible to and understandable by the average customer. Liberty shall provide copies of any and all such materials and information to Commission Staff upon request.

J. Program Evaluation and Data Analysis

The Settling Parties stipulate and agree that program evaluation and data analysis are integral aspects of the battery storage pilot program. Liberty shall solicit and engage an evaluation, monitoring, and verification ("EM&V") consultant promptly after Commission approval of this settlement, so that the consultant may help inform pilot program evaluation and related program design features. The EM&V consultant shall be managed by Liberty, in consultation with Staff and the OCA. The scope of work of the EM&V consultant shall include analysis of cost-effective methods for control group load monitoring. Liberty shall collect the following information, both from customers obtaining batteries from Liberty and customers acquiring batteries through the BYOD program component:

1. Customer load profile and demographic information, to be obtained at time of enrollment and during the pre-installation period;

2. Customer behavioral information, including, but not limited to, load interval data for the battery, service, and DG (if applicable), and customer experience with TOU rates, to be collected during the entire battery operational period;

3. Participating customer bill impacts, including net savings or costs;

4. Battery performance data, including, but not limited to, charging and discharge timing, duration, quantity, and degradation over time, for all operational periods;

5. Battery charging and discharging data for net-metered DG customers, including the timing and quantity of charging from and discharging to the grid; and

6. Battery peak dispatch events, tracked and recorded in detail, including, but not limited to, timing, duration, discharge quantity, and correspondence to daily and monthly peaks.

Liberty shall make available to the other parties in the docket all data collected pursuant to this section, subject to appropriate aggregation or redaction to ensure the protection of confidential customer information. The EM&V consultant shall analyze and report on pilot program data collection and technical and financial results of program implementation, for both the Liberty component and any BYOD program component, on a quarterly basis within thirty (30) days following the end of each calendar quarter. As an interim deliverable, the EM&V consultant shall issue an initial report and analysis within eighteen (18) months of Phase 1 minimum battery deployment describing the average participant net bill savings and the overall technical and financial results of pilot program implementation during Phase 1. The consultant shall calculate average participant bill savings by comparing actual customer billing data against calculated counterfactual usage. The parties agree that any changes to the pilot program that appear reasonable and prudent based on initial evaluation results or interim deliverables may be included in the Phase 2 filing and reflected in the associated benefit-cost analysis. The EM&V consultant's final deliverable shall be a full impact and process evaluation of the pilot program, including the BYOD component, due within three years of the initial 100 batteries becoming operational and available for Liberty to control and dispatch.

K. Benefit-Cost Analyses

Appended to this Settlement Agreement as Attachments 1 and 2 are spreadsheets reflecting the benefit-cost analyses to which the Settling Parties have agreed. The benefit-cost analyses are based on (a) initial Phase 1 200 battery installation and 15-year time horizon, and

(b) full Phase 1 and Phase 2 500 battery installation and 17-year time horizon (i.e., 15 years for each of Phase 1 and Phase 2, assuming that Phase 2 begins two years after Phase 1). The analysis assumes a 75 percent success rate for dispatch of the batteries during the ISO-NE coincident system peak demand hour each month for the first ten years of each relevant phase, with customer attrition and declining success rate assumed during the final five years of each phase. The benefit-cost analyses submitted herewith include as a program cost the full transmission component and the FCM portion of the energy service component associated with the monetary credit equivalent to the Alternative Net Metering Tariff credit provided to customers for energy exported to the grid during forecasted peak demand events, net of any corresponding off-peak retail rate charges associated with charging the batteries and accounting for round-trip efficiency, but the analyses do not include the distribution component or any portion of the energy service component other than the FCM portion associated with that monetary credit. Likewise, the benefit-cost analyses do not include the cost of the EM&V consultant, inasmuch as the EM&V work will inform Liberty's future distribution planning processes. A revised benefit-cost analysis for Phases 1 and 2 combined shall be conducted after Phase 1 and prior to Phase 2, as described in Section D.

The Settling Parties stipulate and agree that, although the benefit-cost analyses reflect only a minimally positive net present value for Phases 1 and 2 considered together, the program offers value and warrants deployment due to the qualitative benefits it will provide by informing future battery storage or TOU proposals brought before the Commission. The Settling Parties further stipulate and agree that a finding of positive net present value is not a prerequisite to Commission approval under RSA 374-G:5 for a pilot program.

L. Meter Compatibility

Until such time as Liberty purchases meters for use in this pilot program, Liberty agrees to work with Lebanon to consider options to optimize the utility of the meter used for the pilot for its compatibility with Lebanon's proposed real-time pricing pilot program under development in Docket DE 16-576, such as by providing near real-time access to the customer for its interval load data that the customer can elect to share with Lebanon's pilot program administrator, provided that such options can be technically implemented with cybersecurity acceptable to Liberty at no additional net cost to Liberty's pilot compared with the costs assumed in the current filed benefit-cost analyses.

III. Conditions

The Settling Parties agree to support the terms and conditions contained herein. The Settling Parties understand and acknowledge that this settlement is subject to adoption and approval by the Commission. The Settling Parties shall cooperate in submitting this settlement promptly to the Commission for approval so that it may be implemented in a timely manner. Each Settling Party shall make a witness or witnesses available, as deemed necessary, to answer questions in support of this settlement, or provide such other support as the Commission requests in connection with the hearing on the merits with respect to this matter. The Settling Parties agree to cooperate, in good faith, in the development of any such other information as may be necessary to support and explain the basis of this settlement and to develop and supplement the record supporting its approval accordingly.

The Settling Parties expressly condition their support of this settlement upon the Commission's acceptance of all its provisions, without change or condition. If the Commission does not accept the provisions in their entirety, without change or condition, any party hereto, at

its sole option exercised within fifteen (15) days of such Commission order, may withdraw from this settlement, in which event the settlement shall be deemed to be null and void and without effect and shall not be relied upon by any Settling Party to this proceeding or by the Commission for any purpose.

The Commission's acceptance of this settlement does not constitute continuing approval of, or precedent regarding, any particular principle or issue in this proceeding, but such acceptance does constitute a determination that the terms and conditions set forth herein are consistent with RSA 374-G, result in just and reasonable rates, and are consistent with the public interest. The Settling Parties request that, in its order addressing the approvals recommended in this settlement, the Commission expressly find that those approvals are unique to this case and should not be viewed as having precedential effect with respect to any particular principle or issue in this proceeding for any other case or situation or for any other reasons.

The Settling Parties enter into this settlement to avoid further expense, uncertainty, and delay in resolving the matters at issue in this proceeding. By its execution of this settlement agreement, no Settling Party shall be deemed to have accepted or consented to the facts, principles, methods, or theories employed in arriving at the terms of the settlement, and except to the extent expressly set forth in this settlement agreement, no Settling Party shall be deemed to have agreed that such terms are or would be appropriate for resolving matters at issue in any different proceeding or context. Each Settling Party shall be free to take the same or a different position on any of the issues resolved hereby in any such different proceeding or context.

The discussions that produced this settlement have been conducted on the express understanding that all offers of settlement relating thereto are and shall be confidential, shall be

without prejudice to the position of any party or participant presenting any such offer or participating in any such discussion, and are not to be used in connection with any future proceeding or otherwise.

This settlement agreement may be executed in one or more counterparts, all of which together shall represent one and the same agreement.

IN WITNESS WHEREOF, the Settling Parties have caused this settlement agreement to be duly executed in their respective names by their fully-authorized representatives on this 15th day of November, 2018.

Staff of the New Hampshire Public Utilities Commission

David Wiesner

By David Wiesner, Attorney for Staff

Office of the Consumer Advocate

By D. Maurice Kreis, Consumer Advocate

City of Lebanon

Clifton Below

By Clifton Below, City Councilor

New Hampshire Sustainable Energy Association

By Elijah Emerson, Esq.

Conservation Law Foundation

By Melissa Birchard, Esq.

Acadia Center

By Ellen Hawes, Senior Analyst. Energy Systems and Carbon Markets

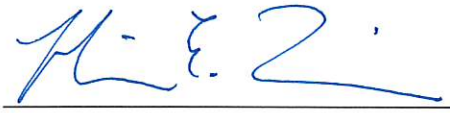
Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities

By Michael J. Sheehan, Esq.

New Hampshire Sustainable Energy Association

By Elijah Emerson, Esq.

Conservation Law Foundation



By Melissa Birchard, Esq.

Acadia Center

By Ellen Hawes, Senior Analyst. Energy Systems and Carbon Markets

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

By Michael J. Sheehan, Esq.

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Phase 1

		(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	Batteries Installed	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Benefits																**Total**
3	Regional Network System (RNS) rate ($/kW-year)	$117.00	$123.00	$129.00	$135.00	$141.29	$147.88	$154.77	$161.98	$169.53	$177.43	$185.69	$194.35	$203.40	$212.88	$222.80	
4	Local Network System (LNS) rate($/kW-year)	$23.57	$24.46	$25.17	$25.42	$26.61	$27.85	$29.14	$30.50	$31.92	$33.41	$34.97	$36.60	$38.30	$40.09	$41.96	
5	Avoided Capacity Cost rate ($/kW-year)	$100.00	$73.90	$59.90	$57.60	$58.80	$61.20	$65.70	$71.20	$76.90	$82.50	$88.10	$83.90	$82.50	$88.10	$83.90	
6	Regional Network System (RNS) Charges	$87,750	$92,250	$96,750	$101,250	$105,968	$110,906	$116,075	$121,484	$127,145	$133,070	$105,846	$87,457	$69,157	$51,092	$0	**$1,406,199**
7	Local Network System (LNS) Charges	$17,675	$18,347	$18,876	$19,066	$19,955	$20,884	$21,858	$22,876	$23,942	$25,058	$19,932	$16,469	$13,023	$9,621	$0	**$267,581**
8	Avoided Capacity Costs	$75,000	$55,425	$44,925	$43,200	$44,100	$45,900	$49,275	$53,400	$57,675	$61,875	$50,217	$37,755	$28,050	$21,144	$0	**$667,941**
9	Total Benefits	$180,425	$166,022	$160,551	$163,516	$170,023	$177,691	$187,207	$197,760	$208,762	$220,003	$175,994	$141,680	$110,230	$81,857	$0	**$2,341,721**
	Costs																
10	Revenue Requirement - Batteries	($222,944)	($205,447)	($194,668)	($183,107)	($170,984)	($157,475)	($143,958)	($132,190)	($120,419)	($106,905)	$0	$0	$0	$0	$0	**($1,638,097)**
11	Revenue Requirement - Cell Based Meters	($7,549)	($7,200)	($6,917)	($6,632)	($6,348)	($6,062)	($5,776)	($5,490)	($5,199)	($4,906)	($4,614)	($4,322)	($4,029)	($3,737)	$0	**($78,782)**
12	Monthly Cellular Reading Cost	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($5,700)	($5,400)	($5,100)	($4,800)	$0	**($81,000)**
13	Cogsdale Programming Costs	($102,185)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**($102,185)**
14	NEM Credit for battery	($15,782)	($15,309)	($14,835)	($14,362)	($13,888)	($13,415)	($12,941)	($12,468)	($11,994)	($11,521)	($10,495)	($9,517)	($8,585)	($7,702)	$0	**($172,814)**
15	Meter MV-90 Programming Costs	($107,500)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**($107,500)**
16	Total Costs	($461,960)	($233,956)	($222,420)	($210,101)	($197,220)	($182,952)	($168,675)	($156,148)	($143,612)	($129,333)	($20,809)	($19,238)	($17,715)	($16,239)	$0	($2,180,378)
17	Net Benefit to All Customers	($281,535)	($67,935)	($61,869)	($46,585)	($27,197)	($5,261)	$18,532	$41,612	$65,150	$90,670	$155,185	$122,442	$92,515	$65,618	$0	**$161,343**

Net Present Value Calculation

18	Required Rate of Return	7.69%
19	Net Present Value of Option	($138,037)
20	Net Present Value of Benefits	$1,432,205
21	Net Present Value of Costs	($1,570,241)

1 Year of installation
2 Total units in pilot
3 Based on ISO-NE forecast
4 Based on previous bills from National Grid
5 AESC 2018 Wholesale Capacity Values Cleared (FCA price), column j on p 273
6 Line 3 x amount of kW reduced
7 Line 4 x amount of kW reduced
8 Line 5 x amount of kW reduced at ISO NE concident peak
9 Sum of lines 3 through 8
10 Battery revenue requirement
11 Meter revenue requirement
12 Liberty's estimated costs for reading meters
13 Liberty's estimated programming costs associated with billing TOU rates
14 Net Metering Credit provided to customers when batteries are exported to the grid
15 Liberty's estimated costs for programming meters
16 Sum of lines 10 through 15
17 Line 9 - Line 16
18 After-tax discount rate
19 Net Present Value calculation of net benefits using discount rate in Line (20) and net benefits (or costs) in line (19)
20 Net Present Value calculation of benefits using discount rate in Line (20) and benefits in line (12)
21 Net Present Value calculation of costs using discount rate in Line (20) and costs in line (18)

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Battery Revenue Requirement

	Deferred Tax Calculation		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
1	Battery Capital Cost																
	2019 Battery Install (200)		$1,630,000														
	CIAC		$600,000														
	2021 Battery Install (300)				$0												
	CIAC				$0												
	Net Battery Install Costs for Depr (200)		$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$0	$0	$0	$0	$0
	Net Battery Install Costs for Depr (300)				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Total Plant In Service		$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$0	$0	$0	$0	$0
3	FEDERAL Vintage Year Tax Depreciation:		$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
4	Annual Tax Depreciation		$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
5	Cumulative Tax Depreciation		$147,187	$399,434	$579,581	$708,228	$800,207	$892,083	$984,062	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000
6	STATE Vintage Year Tax Depreciation:		$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
7	Annual Tax Depreciation		$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
8	Cumulative Tax Depreciation		$147,187	$399,434	$579,581	$708,228	$800,207	$892,083	$984,062	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000
9	Book Depreciation Rate (a)		10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	0.00%	0.00%	0.00%
10	Book Depreciation		$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$0	$0	$0	$0	$0
11	Cumulative Book Depreciation		$103,000	$206,000	$309,000	$412,000	$515,000	$618,000	$721,000	$824,000	$927,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000
12	Book/Tax Timer (Federal)		$44,187	$149,247	$77,147	$25,647	($11,021)	($11,124)	($11,021)	($57,062)	($103,000)	($103,000)	$0	$0	$0	$0	$0
13	less: Deferred Tax Reserve (State)		$3,491	$11,791	$6,095	$2,026	($871)	($879)	($871)	($4,508)	($8,137)	($8,137)	$0	$0	$0	$0	$0
14	Net Book/Tax Timer (Federal)		$40,696	$137,456	$71,052	$23,621	($10,150)	($10,245)	($10,150)	($52,554)	($94,863)	($94,863)	$0	$0	$0	$0	$0
15	Effective Tax Rate (Federal)		21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%
16	Deferred Tax Reserve (Federal)		$9,279	$31,342	$16,201	$5,386	($2,314)	($2,336)	($2,314)	($11,983)	($21,630)	($21,630)	$0	$0	$0	$0	$0
17	Book/Tax Timer (State)		$44,187	$149,247	$77,147	$25,647	($11,021)	($11,124)	($11,021)	($57,062)	($103,000)	($103,000)	$0	$0	$0	$0	$0
18	Effective Tax Rate (State)		7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%
19	Deferred Tax Reserve (State)		$3,491	$11,791	$6,095	$2,026	($871)	($879)	($871)	($4,508)	($8,137)	($8,137)	$0	$0	$0	$0	$0
20	TOTAL Deferred Tax Reserve		$12,770	$43,132	$22,295	$7,412	($3,185)	($3,215)	($3,185)	($16,491)	($29,767)	($29,767)	$0	$0	$0	$0	$0
21	**Rate Base Calculation**																
22	Plant In Service		$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$0	$0	$0	$0	$0
23	Accumulated Book Depreciation		($103,000)	($206,000)	($309,000)	($412,000)	($515,000)	($618,000)	($721,000)	($824,000)	($927,000)	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)
24	Deferred Tax Reserve		($12,770)	($43,132)	($22,295)	($7,412)	$3,185	$3,215	$3,185	$16,491	$29,767	$29,767	$0	$0	$0	$0	$0
25	Year End Rate Base		$914,230	$780,868	$698,705	$610,588	$518,185	$415,215	$312,185	$222,491	$132,767	$29,767	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)
26	**Revenue Requirement Calculation**																
27	Year End Rate Base		$914,230	$780,868	$698,705	$610,588	$518,185	$415,215	$312,185	$222,491	$132,767	$29,767	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)	($1,030,000)
28	Pre-Tax ROR		9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%
29	Return and Taxes		$86,392	$73,790	$66,025	$57,699	$48,967	$39,236	$29,500	$21,025	$12,546	$2,813	$0	$0	$0	$0	$0
30	Book Depreciation		$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$103,000	$0	$0	$0	$0	$0
31	Property Taxes (b)	3.67%	$33,552	$28,658	$25,642	$22,409	$19,017	$15,238	$11,457	$8,165	$4,873	$1,092	$0	$0	$0	$0	$0
32	Annual Revenue Requirement		$222,944	$205,447	$194,668	$183,107	$170,984	$157,475	$143,958	$132,190	$120,419	$106,905	$0	$0	$0	$0	$0

	Imputed Capital Structure (c)	Ratio	Rate	Weighted Rate	Pre Tax
34	Long Term Debt	50.00%	5.97%	2.99%	2.99%
35	Common Equity	50.00%	9.40%	4.70%	6.46%
36		100.00%		7.69%	9.45%

23a Total annual customer contribution collected on a montly basis

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Meter Revenue Requirement

	Deferred Tax Calculation	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
1	Meter Capital Cost																	
	2019 Meter Install (200)	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$0	$0	$0
	2021 Meter Install (300)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Total	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$0	$0	$0
3	FEDERAL Vintage Year Tax Depreciation:	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901	$0	$0
4	Annual Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901	$0	$0
5	Cumulative Tax Depreciation	$1,598	$4,673	$7,517	$10,148	$12,582	$14,833	$16,915	$18,841	$20,742	$22,642	$24,543	$26,443	$28,344	$30,244	$32,145	$32,145	$32,145
6	STATE Vintage Year Tax Depreciation:	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901	$0	$0
7	Annual Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901	$0	$0
8	Cumulative Tax Depreciation	$1,598	$4,673	$7,517	$10,148	$12,582	$14,833	$16,915	$18,841	$20,742	$22,642	$24,543	$26,443	$28,344	$30,244	$32,145	$32,145	$32,145
9	Book Depreciation Rate (a)	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%
10	Book Depreciation	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$0	$0	$0
11	Cumulative Book Depreciation	$2,228	$4,456	$6,684	$8,912	$11,140	$13,368	$15,596	$17,824	$20,052	$22,280	$24,508	$26,736	$28,964	$31,192	$31,192	$31,192	$31,192
12	Book/Tax Timer (Federal)	($630)	$847	$616	$403	$206	$23	($146)	($302)	($327)	($328)	($327)	($328)	($327)	($328)	$1,901	$0	$0
13	less: Deferred Tax Reserve (State)	($50)	$67	$49	$32	$16	$2	($12)	($24)	($26)	($26)	($26)	($26)	($26)	($26)	$150	$0	$0
14	Net Book/Tax Timer (Federal)	($580)	$780	$567	$371	$190	$21	($134)	($278)	($301)	($302)	($301)	($302)	($301)	($302)	$1,751	$0	$0
15	Effective Tax Rate (Federal)	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	121.00%	221.00%
16	Deferred Tax Reserve (Federal)	($132)	$178	$129	$85	$43	$5	($31)	($63)	($69)	($69)	($69)	($69)	($69)	($69)	$399	$0	$0
17	Book/Tax Timer (State)	($630)	$847	$616	$403	$206	$23	($146)	($302)	($327)	($328)	($327)	($328)	($327)	($328)	$1,901	$0	$0
18	Effective Tax Rate (State)	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%
19	Deferred Tax Reserve (State)	($50)	$67	$49	$32	$16	$2	($12)	($24)	($26)	($26)	($26)	($26)	($26)	($26)	$150	$0	$0
20	TOTAL Deferred Tax Reserve	($182)	$245	$178	$116	$60	$7	($42)	($87)	($94)	($95)	($94)	($95)	($94)	($95)	$549	$0	$0
21	**Rate Base Calculation**																	
22	Plant In Service	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$0	$0	$0
23	Accumulated Book Depreciation	($2,228)	($4,456)	($6,684)	($8,912)	($11,140)	($13,368)	($15,596)	($17,824)	($20,052)	($22,280)	($24,508)	($26,736)	($28,964)	($31,192)	($31,192)	($31,192)	($31,192)
24	Deferred Tax Reserve	$182	($245)	($178)	($116)	($60)	($7)	$42	$87	$94	$95	$94	$95	$94	$95	($549)	$0	$0
25	Year End Rate Base	$40,554	$37,899	$35,738	$33,572	$31,401	$29,225	$27,046	$24,863	$22,643	$20,415	$18,187	$15,959	$13,731	$11,503	($31,741)	($31,192)	($31,192)
26	**Revenue Requirement Calculation**																	
27	Year End Rate Base	$40,554	$37,899	$35,738	$33,572	$31,401	$29,225	$27,046	$24,863	$22,643	$20,415	$18,187	$15,959	$13,731	$11,503	($31,741)	($31,192)	($31,192)
28	Pre-Tax ROR	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%
29	Return and Taxes	$3,832	$3,581	$3,377	$3,172	$2,967	$2,762	$2,556	$2,350	$2,140	$1,929	$1,719	$1,508	$1,298	$1,087	$0	$0	$0
30	Book Depreciation	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$2,228	$0	$0	$0
31	Property Taxes (b) 3.67%	$1,488	$1,391	$1,312	$1,232	$1,152	$1,073	$993	$912	$831	$749	$667	$586	$504	$422	$0	$0	$0
32	Annual Revenue Requirement	$7,549	$7,200	$6,917	$6,632	$6,348	$6,062	$5,776	$5,490	$5,199	$4,906	$4,614	$4,322	$4,029	$3,737	$0	$0	$0

	Imputed Capital Structure (c)	Ratio	Rate	Weighted Rate	Pre Tax
34	Long Term Debt	50.00%	5.97%	2.99%	2.99%
35	Common Equity	50.00%	9.40%	4.70%	6.46%
36		100.00%		7.69%	9.45%

23a Total annual customer contribution collected on a montly basis

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Battery Depreciation Calculation
Phase 1

		CY 2019	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Plant Additions	1,630,000														
2	less CIAC	$600,000														
3	Total Plant In Service	1,030,000														
4	Tax Depreciation (Federal)															
5	Plant Additions	$1,030,000														
6	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
7	Remaining Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
8																
9	Remaining Tax Depreciation (State)															
10	Plant Additions	$1,030,000														
11	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
12	Remaining Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
13																
14	Federal Tax Depreciation	$ 147,187	$ 252,247	$ 180,147	$ 128,647	$ 91,979	$ 91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
15	State Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Meter Depreciation Calculation

		CY 2019	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Tax Depreciation (Federal)															
	Number of Meters	100														
	Cost of Meter ($/meter)	426														
2	Plant Additions	$42,600														
3	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%	4.461%	4.462%
4	Remaining Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
5	Remaining Tax Depreciation (State)															
6	Plant Additions	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600
7	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%	4.461%	4.462%
8	Remaining Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
9	Federal Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
10	State Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Phases 1 and 2

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
1	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
2	Batteries Installed	200	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Benefits																		**Total**
3	Regional Network System (RNS) rate ($/kW-year)	$117.00	$123.00	$129.00	$135.00	$141.29	$147.88	$154.77	$161.98	$169.53	$177.43	$185.69	$194.35	$203.40	$212.88	$222.80	$233.19	$244.05	
4	Local Network System (LNS) rate($/kW-year)	$23.57	$24.46	$25.17	$25.42	$26.61	$27.85	$29.14	$30.50	$31.92	$33.41	$34.97	$36.60	$38.30	$40.09	$41.96	$43.91	$45.96	
5	Avoided Capacity Cost rate ($/kW-year)	$100.00	$73.90	$59.90	$57.60	$58.80	$61.20	$65.70	$71.20	$76.90	$82.50	$88.10	$83.90	$82.50	$88.10	$83.90	$82.50	$88.10	
6	Regional Network System (RNS) Charges	$87,750	$92,250	$241,875	$253,125	$264,921	$277,266	$290,187	$303,709	$317,862	$332,674	$314,752	$306,098	$242,458	$193,724	$42,286	$29,205	$0	**$3,590,141**
7	Local Network System (LNS) Charges	$17,675	$18,347	$47,190	$47,665	$49,886	$52,211	$54,644	$57,191	$59,856	$62,645	$59,270	$57,640	$45,657	$36,480	$21,146	$15,544	$0	**$703,046**
8	Avoided Capacity Costs	$75,000	$55,425	$112,313	$108,000	$110,250	$114,750	$123,188	$133,500	$144,188	$154,688	$149,330	$132,143	$98,340	$80,171	$42,286	$29,205	$ -	**$1,662,774**
9	Total Benefits	$180,425	$166,022	$401,378	$408,790	$425,057	$444,227	$468,018	$494,400	$521,905	$550,007	$523,352	$495,881	$386,455	$310,374	$105,717	$73,954	$0	**$5,955,960**
	Costs																		
10	Revenue Requirement - Batteries	($222,944)	($205,447)	($529,084)	($491,278)	($462,986)	($432,136)	($400,434)	($368,402)	($336,355)	($305,190)	($154,500)	($154,500)	$0	$0	$0	$0	$0	**($4,063,257)**
11	Revenue Requirement - Cell Based Meters	($7,549)	($7,200)	($18,240)	($17,433)	($16,723)	($16,011)	($15,298)	($14,583)	($13,863)	($13,141)	($12,412)	($11,681)	($10,950)	($10,220)	($9,489)	($3,342)	$0	**($198,135)**
12	Monthly Cellular Reading Cost	($6,000)	($6,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($14,700)	($14,400)	($13,620)	($12,840)	($12,060)	($11,220)	$0	**($210,840)**
13	Cogsdale Programming Costs	($102,185)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**($102,185)**
14	NEM Credit for battery	($15,782)	($15,309)	($38,508)	($37,325)	($36,141)	($34,957)	($33,774)	($32,590)	($31,406)	($30,223)	($28,487)	($26,798)	($24,273)	($21,871)	($12,727)	($11,360)	$ -	**($431,530)**
15	Meter MV-90 Programming Costs	($107,500)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**($107,500)**
16	Total Costs	($461,960)	($233,956)	($600,832)	($561,036)	($530,850)	($498,104)	($464,506)	($430,576)	($396,625)	($363,555)	($210,099)	($207,379)	($48,843)	($44,931)	($34,276)	($25,922)	$0	($5,113,447)
17	Net Benefit to All Customers	($281,535)	($67,935)	($199,454)	($152,246)	($105,793)	($53,877)	$3,513	$63,824	$125,281	$186,452	$313,253	$288,501	$337,611	$265,443	$71,441	$48,032	$0	**$842,513**
	Net Present Value Calculation																		
18	Required Rate of Return	7.69%																	
19	Net Present Value of Option	$8,470																	
20	Net Present Value of Benefits	$3,346,801																	
21	Net Present Value of Costs	($3,338,331)																	

1 Year of installation
2 Total units in pilot
3 Based on ISO-NE forecast
4 Based on previous bills from National Grid
5 AESC 2018 Wholesale Capacity Values Cleared (FCA price), column j on p 273
6 Line 3 x amount of kW reduced
7 Line 4 x amount of kW reduced
8 Line 5 x amount of kW reduced at ISO NE concident peak
9 Sum of lines 3 through 8
10 Battery revenue requirement
11 Meter revenue requirement
12 Liberty's estimated costs for reading meters
13 Liberty's estimated programming costs associated with billing TOU rates
14 Net Metering Credit provided to customers when batteries are exported to the grid
15 Liberty's estimated costs for programming meters
16 Sum of lines 10 through 15
17 Line 9 - Line 16
18 After-tax discount rate
19 Net Present Value calculation of net benefits using discount rate in Line (20) and net benefits (or costs) in line (19)
20 Net Present Value calculation of benefits using discount rate in Line (20) and benefits in line (12)
21 Net Present Value calculation of costs using discount rate in Line (20) and costs in line (18)

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Battery Revenue Requirement

	Deferred Tax Calculation	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
1	Battery Capital Cost															
	2019 Battery Install (200)	$1,630,000														
	CIAC	$600,000														
	2021 Battery Install (300)			$2,445,000												
	CIAC			$900,000												
	Net Battery Install Costs for Depr (200)	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$1,030,000	$0	$0	$0	$0	$0
	Net Battery Install Costs for Depr (300)			$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$1,545,000	$0	$0	$0
2	Total Plant In Service	$1,030,000	$1,030,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$1,545,000	$1,545,000	$0	$0	$0
3	FEDERAL Vintage Year Tax Depreciation:	$147,187	$252,247	$400,928	$507,018	$362,200	$284,847	$229,948	$183,752	$137,969	$68,907	$0	$0	$0	$0	$0
4	Annual Tax Depreciation	$147,187	$252,247	$400,928	$507,018	$362,200	$284,847	$229,948	$183,752	$137,969	$68,907	$0	$0	$0	$0	$0
5	Cumulative Tax Depreciation	$147,187	$399,434	$800,362	$1,307,380	$1,669,580	$1,954,427	$2,184,375	$2,368,127	$2,506,096	$2,575,003	$2,575,003	$2,575,003	$2,575,003	$2,575,003	$2,575,003
6	STATE Vintage Year Tax Depreciation:	$147,187	$252,247	$400,928	$507,018	$362,200	$284,847	$229,948	$183,752	$137,969	$68,907	$0	$0	$0	$0	$0
7	Annual Tax Depreciation	$147,187	$252,247	$400,928	$507,018	$362,200	$284,847	$229,948	$183,752	$137,969	$68,907	$0	$0	$0	$0	$0
8	Cumulative Tax Depreciation	$147,187	$399,434	$800,362	$1,307,380	$1,669,580	$1,954,427	$2,184,375	$2,368,127	$2,506,096	$2,575,003	$2,575,003	$2,575,003	$2,575,003	$2,575,003	$2,575,003
9	Book Depreciation Rate (a)	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	0.00%	0.00%	0.00%
10	Book Depreciation	$103,000	$103,000	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$154,500	$154,500	$0	$0	$0
11	Cumulative Book Depreciation	$103,000	$206,000	$463,500	$721,000	$978,500	$1,236,000	$1,493,500	$1,751,000	$2,008,500	$2,266,000	$2,420,500	$2,575,000	$2,575,000	$2,575,000	$2,575,000
12	Book/Tax Timer (Federal)	$44,187	$149,247	$143,428	$249,518	$104,700	$27,347	($27,552)	($73,748)	($119,531)	($188,593)	($154,500)	($154,500)	$0	$0	$0
13	less: Deferred Tax Reserve (State)	$3,491	$11,791	$11,331	$19,712	$8,271	$2,160	($2,177)	($5,826)	($9,443)	($14,899)	($12,206)	($12,206)	$0	$0	$0
14	Net Book/Tax Timer (Federal)	$40,696	$137,456	$132,097	$229,806	$96,429	$25,187	($25,375)	($67,922)	($110,088)	($173,694)	($142,295)	($142,295)	$0	$0	$0
15	Effective Tax Rate (Federal)	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%
16	Deferred Tax Reserve (Federal)	$9,279	$31,342	$30,120	$52,399	$21,987	$5,743	($5,786)	($15,487)	($25,102)	($39,605)	($32,445)	($32,445)	$0	$0	$0
17	Book/Tax Timer (State)	$44,187	$149,247	$143,428	$249,518	$104,700	$27,347	($27,552)	($73,748)	($119,531)	($188,593)	($154,500)	($154,500)	$0	$0	$0
18	Effective Tax Rate (State)	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%
19	Deferred Tax Reserve (State)	$3,491	$11,791	$11,331	$19,712	$8,271	$2,160	($2,177)	($5,826)	($9,443)	($14,899)	($12,206)	($12,206)	$0	$0	$0
20	TOTAL Deferred Tax Reserve	$12,770	$43,132	$41,451	$72,111	$30,258	$7,903	($7,963)	($21,313)	($34,544)	($54,503)	($44,651)	($44,651)	$0	$0	$0
21	**Rate Base Calculation**															
22	Plant In Service	$1,030,000	$1,030,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$2,575,000	$1,545,000	$1,545,000	$0	$0	$0
23	Accumulated Book Depreciation	($103,000)	($206,000)	($463,500)	($721,000)	($978,500)	($1,236,000)	($1,493,500)	($1,751,000)	($2,008,500)	($2,266,000)	($2,420,500)	($2,575,000)	($2,575,000)	($2,575,000)	($2,575,000)
24	Deferred Tax Reserve	($12,770)	($43,132)	($41,451)	($72,111)	($30,258)	($7,903)	$7,963	$21,313	$34,544	$54,503	$44,651	$44,651	$0	$0	$0
25	Year End Rate Base	$914,230	$780,868	$2,070,049	$1,781,889	$1,566,242	$1,331,097	$1,089,463	$845,313	$601,044	$363,503	($830,850)	($985,350)	($2,575,000)	($2,575,000)	($2,575,000)
26	**Revenue Requirement Calculation**															
27	Year End Rate Base	$914,230	$780,868	$2,070,049	$1,781,889	$1,566,242	$1,331,097	$1,089,463	$845,313	$601,044	$363,503	($830,850)	($985,350)	($2,575,000)	($2,575,000)	($2,575,000)
28	Pre-Tax ROR	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%
29	Return and Taxes	$86,392	$73,790	$195,613	$168,383	$148,005	$125,784	$102,951	$79,879	$56,797	$34,350	$0	$0	$0	$0	$0
30	Book Depreciation	$103,000	$103,000	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$257,500	$154,500	$154,500	$0	$0	$0
31	Property Taxes (b) 3.67%	$33,552	$28,658	$75,971	$65,395	$57,481	$48,851	$39,983	$31,023	$22,058	$13,341	$0	$0	$0	$0	$0
32	Annual Revenue Requirement	$222,944	$205,447	$529,084	$491,278	$462,986	$432,136	$400,434	$368,402	$336,355	$305,190	$154,500	$154,500	$0	$0	$0

	Imputed Capital Structure (c)	Ratio	Rate	Weighted Rate	Pre Tax
34	Long Term Debt	50.00%	5.97%	2.99%	2.99%
35	Common Equity	50.00%	9.40%	4.70%	6.46%
36		100.00%		7.69%	9.45%

23a Total annual customer contribution collected on a montly basis

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Meter Revenue Requirement

	Deferred Tax Calculation	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
1	Meter Capital Cost																	
	2019 Meter Install (200)	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$0	$0
	2021 Meter Install (300)			$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900
2	Total	$42,600	$42,600	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$63,900	$63,900
3	FEDERAL Vintage Year Tax Depreciation	$1,598	$3,075	$5,240	$7,244	$6,701	$6,198	$5,733	$5,303	$5,024	$4,790	$4,752	$4,751	$4,752	$4,751	$4,752	$2,851	$2,851
4	Annual Tax Depreciation	$1,598	$3,075	$5,240	$7,244	$6,701	$6,198	$5,733	$5,303	$5,024	$4,790	$4,752	$4,751	$4,752	$4,751	$4,752	$2,851	$2,851
5	Cumulative Tax Depreciation	$1,598	$4,673	$9,913	$17,157	$23,858	$30,056	$35,789	$41,092	$46,116	$50,906	$55,658	$60,409	$65,161	$69,912	$74,664	$77,515	$80,366
6	STATE Vintage Year Tax Depreciation:	$1,598	$3,075	$5,240	$7,244	$6,701	$6,198	$5,733	$5,303	$5,024	$4,790	$4,752	$4,751	$4,752	$4,751	$4,752	$2,851	$2,851
7	Annual Tax Depreciation	$1,598	$3,075	$5,240	$7,244	$6,701	$6,198	$5,733	$5,303	$5,024	$4,790	$4,752	$4,751	$4,752	$4,751	$4,752	$2,851	$2,851
8	Cumulative Tax Depreciation	$1,598	$4,673	$9,913	$17,157	$23,858	$30,056	$35,789	$41,092	$46,116	$50,906	$55,658	$60,409	$65,161	$69,912	$74,664	$77,515	$80,366
9	Book Depreciation Rate (a)	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%	5.23%
10	Book Depreciation	$2,228	$2,228	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$3,342	$3,342
11	Cumulative Book Depreciation	$2,228	$4,456	$10,026	$15,596	$21,166	$26,736	$32,306	$37,876	$43,446	$49,016	$54,586	$60,155	$65,725	$71,295	$76,865	$80,207	$83,549
12	Book/Tax Timer (Federal)	($630)	$847	($330)	$1,674	$1,131	$628	$163	($267)	($546)	($780)	($818)	($819)	($818)	($819)	($818)	($491)	($491)
13	less: Deferred Tax Reserve (State)	($50)	$67	($26)	$132	$89	$50	$13	($21)	($43)	($62)	($65)	($65)	($65)	($65)	($65)	($39)	($39)
14	Net Book/Tax Timer (Federal)	($580)	$780	($304)	$1,542	$1,042	$578	$150	($246)	($503)	($718)	($753)	($754)	($753)	($754)	($753)	($452)	($452)
15	Effective Tax Rate (Federal)	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	121.00%	221.00%
16	Deferred Tax Reserve (Federal)	($132)	$178	($69)	$352	$238	$132	$34	($56)	($115)	($164)	($172)	($172)	($172)	($172)	($172)	($594)	($1,085)
17	Book/Tax Timer (State)	($630)	$847	($330)	$1,674	$1,131	$628	$163	($267)	($546)	($780)	($818)	($819)	($818)	($819)	($818)	($491)	($491)
18	Effective Tax Rate (State)	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%	7.90%
19	Deferred Tax Reserve (State)	($50)	$67	($26)	$132	$89	$50	$13	($21)	($43)	($62)	($65)	($65)	($65)	($65)	($65)	($39)	($39)
20	TOTAL Deferred Tax Reserve	($182)	$245	($95)	$484	$327	$182	$47	($77)	($158)	($225)	($236)	($237)	($236)	($237)	($236)	($633)	($1,124)
21	**Rate Base Calculation**																	
22	Plant In Service	$42,600	$42,600	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$106,500	$63,900	$63,900
23	Accumulated Book Depreciation	($2,228)	($4,456)	($10,026)	($15,596)	($21,166)	($26,736)	($32,306)	($37,876)	($43,446)	($49,016)	($54,586)	($60,155)	($65,725)	($71,295)	($76,865)	($80,207)	($83,549)
24	Deferred Tax Reserve	$182	($245)	$95	($484)	($327)	($182)	($47)	$77	$158	$225	$236	$237	$236	$237	$236	$633	$1,124
25	Year End Rate Base	$40,554	$37,899	$96,569	$90,420	$85,007	$79,583	$74,147	$68,701	$63,212	$57,710	$52,151	$46,581	$41,011	$35,441	$29,871	($15,674)	($18,525)
26	**Revenue Requirement Calculation**																	
27	Year End Rate Base	$40,554	$37,899	$96,569	$90,420	$85,007	$79,583	$74,147	$68,701	$63,212	$57,710	$52,151	$46,581	$41,011	$35,441	$29,871	($15,674)	($18,525)
28	Pre-Tax ROR	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%	9.45%
29	Return and Taxes	$3,832	$3,581	$9,126	$8,544	$8,033	$7,520	$7,007	$6,492	$5,973	$5,453	$4,928	$4,402	$3,875	$3,349	$2,823	$0	$0
30	Book Depreciation	$2,228	$2,228	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$5,570	$3,342	$3,342
31	Property Taxes (b) 3.67%	$1,488	$1,391	$3,544	$3,318	$3,120	$2,921	$2,721	$2,521	$2,320	$2,118	$1,914	$1,710	$1,505	$1,301	$1,096	$0	$0
32	Annual Revenue Requirement	$7,549	$7,200	$18,240	$17,433	$16,723	$16,011	$15,298	$14,583	$13,863	$13,141	$12,412	$11,681	$10,950	$10,220	$9,489	$3,342	$3,342

	Imputed Capital Structure (c)	Ratio	Rate	Weighted Rate	Pre Tax
34	Long Term Debt	50.00%	5.97%	2.99%	2.99%
35	Common Equity	50.00%	9.40%	4.70%	6.46%
36		100.00%		7.69%	9.45%

23a Total annual customer contribution collected on a montly basis

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Battery Depreciation Calculation
Phase 1

		CY 2019	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Plant Additions	1,630,000														
2	less CIAC	$600,000														
3	Total Plant In Service	1,030,000														
4	Tax Depreciation (Federal)															
5	Plant Additions	$1,030,000														
6	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
7	Remaining Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
8																
9	Remaining Tax Depreciation (State)															
10	Plant Additions	$1,030,000														
11	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
12	Remaining Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0
13																
14	Federal Tax Depreciation	$ 147,187	$ 252,247	$ 180,147	$ 128,647	$ 91,979	$ 91,876	$ 91,979	######	$0	$0	$0	$0	$0	$0	$0
15	State Tax Depreciation	$147,187	$252,247	$180,147	$128,647	$91,979	$91,876	$91,979	$45,938	$0	$0	$0	$0	$0	$0	$0

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Battery Depreciation Calculation
Phase 2

		CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Plant Additions	2,445,000												
2	less CIAC	$900,000												
3	Total Plant In Service	1,545,000												
4	Tax Depreciation (Federal)													
5	Plant Additions	$1,545,000												
6	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%
7	Remaining Tax Depreciation	$220,781	$378,371	$270,221	$192,971	$137,969	$137,814	$137,969	$68,907	$0	$0	$0	$0	$0
8														
9	Remaining Tax Depreciation (State)													
10	Plant Additions	$1,545,000												
11	7 Year MACRS Rate	14.290%	24.490%	17.490%	12.490%	8.930%	8.920%	8.930%	4.460%	0.000%	0.000%	0.000%	0.000%	0.000%
12	Remaining Tax Depreciation	$220,781	$378,371	$270,221	$192,971	$137,969	$137,814	$137,969	$68,907	$0	$0	$0	$0	$0
13														
14	Federal Tax Depreciation	$ 220,781	$ 378,371	$ 270,221	$ 192,971	$ 137,969	$ 137,814	$ 137,969	$ 68,907	$0	$0	$0	$0	$0
15	State Tax Depreciation	$220,781	$378,371	$270,221	$192,971	$137,969	$137,814	$137,969	$68,907	$0	$0	$0	$0	$0

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Meter Depreciation Calculation

		CY 2019	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Tax Depreciation (Federal)															
	Number of Meters	100														
	Cost of Meter ($/meter)	426														
2	Plant Additions	$42,600														
3	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%	4.461%	4.462%
4	Remaining Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
5	Remaining Tax Depreciation (State)															
6	Plant Additions	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600	$42,600
7	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%	4.461%	4.462%
8	Remaining Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
9	Federal Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901
10	State Tax Depreciation	$1,598	$3,075	$2,844	$2,631	$2,434	$2,251	$2,082	$1,926	$1,901	$1,900	$1,901	$1,900	$1,901	$1,900	$1,901

Liberty Utilities (Granite State Electric) d/b/a Liberty Utilities Proposed Battery Pilot Project
Benefit/Cost Analysis
Meter Depreciation Calculation

		CY 2021	CY 2022	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	CY 2028	CY 2029	CY 2030	CY 2031	CY 2032	CY 2033
1	Tax Depreciation (Federal)													
	Number of Meters	150												
	Cost of Meter ($/meter)	426												
2	Plant Additions	$63,900												
3	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%
4	Remaining Tax Depreciation	$2,396	$4,613	$4,267	$3,947	$3,651	$3,377	$3,123	$2,890	$2,851	$2,851	$2,851	$2,851	$2,851
5	Remaining Tax Depreciation (State)													
6	Plant Additions	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900	$63,900
7	20 Year MACRS Rate	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%	4.462%	4.461%	4.462%
8	Remaining Tax Depreciation	$2,396	$4,613	$4,267	$3,947	$3,651	$3,377	$3,123	$2,890	$2,851	$2,851	$2,851	$2,851	$2,851
9	Federal Tax Depreciation	$2,396	$4,613	$4,267	$3,947	$3,651	$3,377	$3,123	$2,890	$2,851	$2,851	$2,851	$2,851	$2,851
10	State Tax Depreciation	$2,396	$4,613	$4,267	$3,947	$3,651	$3,377	$3,123	$2,890	$2,851	$2,851	$2,851	$2,851	$2,851