

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)	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
1 Year	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 Batteries Installed																
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 coincident 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

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Deferred Tax Calculation															
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
Rate Base Calculation															
21 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
22 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)
23 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
24 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)
Revenue Requirement Calculation															
26 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)
27 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%
28 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
29 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
30 Property Taxes (b)	\$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
31 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**

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Deferred Tax Calculation																		
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	
FEDERAL Vintage Year Tax Depreciation:																		
3	\$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	
STATE Vintage Year Tax Depreciation:																		
6	\$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	
Book Depreciation Rate (a)																		
9	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	
Book/Tax Timer (Federal)																		
12	(\$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	
Effective Tax Rate (Federal)																		
15	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	
Rate Base Calculation																		
21 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	
22 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)	
23 Deferred Tax Reserve	\$182	(\$245)	(\$178)	(\$116)	(\$60)	(\$7)	\$42	\$87	\$94	\$95	\$94	\$95	\$94	\$95	(\$549)	\$0	\$0	
24 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)	
Revenue Requirement Calculation																		
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 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%	
27 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	
28 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	
29 Property Taxes (b)	\$1,488	\$1,391	\$1,312	\$1,232	\$1,152	\$1,073	\$993	\$912	\$831	\$749	\$667	\$586	\$504	\$422	\$0	\$0	\$0	
30 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)																		
Weighted																		
	Ratio	Rate	Rate	Pre Tax														
31 Long Term Debt	50.00%	5.97%	2.99%	2.99%														
32 Common Equity	50.00%	9.40%	4.70%	6.46%														
33	100.00%		7.69%	9.45%														
34a 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

	<u>CY 2019</u>	<u>CY 2020</u>	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 Plant Additions	1,630,000														
2 less CIAC	<u>\$600,000</u>														
3 Total Plant In Service	1,030,000														
4 <u>Tax Depreciation (Federal)</u>															
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 <u>Remaining Tax Depreciation (State)</u>															
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

	<u>CY 2019</u>	<u>CY 2020</u>	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 <u>Tax Depreciation (Federal)</u>															
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 <u>Remaining Tax Depreciation (State)</u>															
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 Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)		
2 Batteries Installed	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
Benefits																			
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	Total
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	\$0	\$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)	\$0	(\$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 coincident 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

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Deferred Tax Calculation															
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
Rate Base Calculation															
21 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
22 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)
23 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
24 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)
Revenue Requirement Calculation															
26 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)
27 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%
28 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
29 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
30 Property Taxes (b)	\$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
31 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

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Deferred Tax Calculation																		
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	\$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	\$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	
FEDERAL Vintage Year Tax Depreciation																		
3 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	\$4,751	\$2,851	\$2,851
4 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	
STATE Vintage Year Tax Depreciation:																		
6 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	\$4,751	\$2,851	\$2,851
7 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	
Book Depreciation Rate (a)																		
9 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	\$5,570	\$3,342	\$3,342
10 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	\$82,435	\$88,005	
Book/Tax Timer (Federal)																		
12 less: Deferred Tax Reserve (State)	(\$50)	\$67	(\$26)	\$132	\$89	\$50	\$13	(\$21)	(\$43)	(\$62)	(\$65)	(\$65)	(\$65)	(\$65)	(\$65)	(\$65)	(\$39)	(\$39)
13 Net Book/Tax Timer (Federal)	(\$580)	\$780	(\$304)	\$1,542	\$1,042	\$578	\$150	(\$246)	(\$503)	(\$718)	(\$753)	(\$754)	(\$753)	(\$754)	(\$753)	(\$754)	(\$452)	(\$452)
14 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%	21.00%	121.00%	221.00%
15 Deferred Tax Reserve (Federal)	(\$132)	\$178	(\$69)	\$352	\$238	\$132	\$34	(\$56)	(\$115)	(\$164)	(\$172)	(\$172)	(\$172)	(\$172)	(\$172)	(\$172)	(\$594)	(\$1,085)
16 Book/Tax Timer (State)	(\$630)	\$847	(\$330)	\$1,674	\$1,131	\$628	\$163	(\$267)	(\$546)	(\$780)	(\$818)	(\$819)	(\$818)	(\$819)	(\$818)	(\$818)	(\$491)	(\$491)
17 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%	7.90%
18 Deferred Tax Reserve (State)	(\$50)	\$67	(\$26)	\$132	\$89	\$50	\$13	(\$21)	(\$43)	(\$62)	(\$65)	(\$65)	(\$65)	(\$65)	(\$65)	(\$65)	(\$39)	(\$39)
19 TOTAL Deferred Tax Reserve	(\$182)	\$245	(\$95)	\$484	\$327	\$182	\$47	(\$77)	(\$158)	(\$225)	(\$236)	(\$237)	(\$236)	(\$237)	(\$236)	(\$236)	(\$633)	(\$1,124)
Rate Base Calculation																		
21 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	\$106,500	\$63,900	\$63,900
22 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)	(\$82,435)	(\$88,005)	
23 Deferred Tax Reserve	\$182	(\$245)	\$95	(\$484)	(\$327)	(\$182)	(\$47)	\$77	\$158	\$225	\$236	\$237	\$236	\$237	\$236	\$236	\$633	\$1,124
24 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)	
Revenue Requirement Calculation																		
26 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)	
27 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%	
28 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	
29 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	\$5,570	\$3,342	\$3,342
30 Property Taxes (b)	\$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	
31 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															
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

	<u>CY 2019</u>	<u>CY 2020</u>	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 Plant Additions	1,630,000														
2 less CIAC	<u>\$600,000</u>														
3 Total Plant In Service	1,030,000														
4 <u>Tax Depreciation (Federal)</u>															
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 <u>Remaining Tax Depreciation (State)</u>															
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

	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 Plant Additions	2,445,000												
2 less CIAC	<u>\$900,000</u>												
3 Total Plant In Service	1,545,000												
4 <u>Tax Depreciation (Federal)</u>													
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 <u>Remaining Tax Depreciation (State)</u>													
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

	<u>CY 2019</u>	<u>CY 2020</u>	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 <u>Tax Depreciation (Federal)</u>															
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 <u>Remaining Tax Depreciation (State)</u>															
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

	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	<u>CY 2024</u>	<u>CY 2025</u>	<u>CY 2026</u>	<u>CY 2027</u>	<u>CY 2028</u>	<u>CY 2029</u>	<u>CY 2030</u>	<u>CY 2031</u>	<u>CY 2032</u>	<u>CY 2033</u>
1 <u>Tax Depreciation (Federal)</u>													
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 <u>Remaining Tax Depreciation (State)</u>													
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