

STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION

Docket No. DE 19-064

IN THE MATTER OF: **Liberty Utilities (Granite State Electric) Corp.
d/b/a Liberty Utilities**

Distribution Service Rate Case

.

DIRECT TESTIMONY

OF

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December 06, 2019

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1 **I. STATEMENT OF QUALIFICATIONS**

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

3 A My name is Sanem Sergici, I am a Principal with The Brattle Group in the Boston
4 office, located at One Beacon Street, Boston, Massachusetts 02108.

5 **Q Please describe your professional experience and educational background.**

6 A I am an energy economist with sixteen years of consulting and research experience.
7 My consulting practice is focused on understanding customer adoption of and response
8 to innovative rate designs and emerging technologies. I regularly assist my clients on
9 matters related to retail rate design, big data analytics, grid modernization investments,
10 resource planning and alternative ratemaking mechanisms. A statement of my
11 qualifications is included in Attachment SIS-1.

12 **Q Have you previously testified before the New Hampshire Public Utilities
13 Commission (PUC)?**

14 A No, I have not.

15 **II. PURPOSE OF TESTIMONY**

16 **Q On whose behalf are you testifying?**

17 A I am testifying on behalf of the New Hampshire Public Utilities Commission Staff.

18 **Q What is the purpose of your testimony?**

19 A The purpose of my testimony is to comment on the application of the Marginal Cost of
20 Service (MCOS) study to determine class revenue targets and design proposed
21 permanent rates by Witness Heintz for Liberty Utilities (the “Company”).

22 **Q What are the major findings from your analyses?**

23 A Major findings of my analyses are as follows:

- 1 • Witness Heintz' use of the marginal cost study for determining the class revenue
2 targets is appropriate and consistent with the widely accepted implementation
3 practices in the industry.
- 4 • The Company should move towards more cost reflective rates, which encourage
5 economic efficiency and market-enabled decision making for both operations and
6 new investments, in a technology neutral manner.
- 7 • The Company should consider further increasing the customer charges for the
8 residential class, instead of relying on the revenue decoupling for the recovery of
9 the fixed costs.
- 10 • The Company should try to minimize unintended intra class subsidies by cost
11 reflective rate design, and analyze the benefits and costs for metering infrastructure
12 that would enable alternative rate designs for residential customers.

13 **Q How is your testimony organized?**

14 A Section III discusses the principles of rate design. Section IV evaluates the Company's
15 use of the MCOS study to determine the class revenue targets for rate design. Section
16 V evaluates the Company's proposed rate design and its conformity with the principles
17 of rate design.

18

19 **III. PRINCIPLES OF RATE DESIGN**

20 **Q Please describe the principles of rate design that you used to review the proposed**
21 **rate design.**

22 A Widely accepted principles of rate design were outlined in the various editions of James
23 C. Bonbright's *Principles of Public Utility Rates*.¹ These can be condensed into five
24 core principles:

- 25 1. *Economic Efficiency* – The price of electricity should convey to the customer the cost
26 of producing it, ensuring that resources consumed in the production and delivery of
27 electricity are not wasted. If the price is set equal to the cost of providing a kWh,

¹ James C. Bonbright, *Principles of Public Utility Rates*, (Columbia University Press: 1961) 1st Edition.

- 1 customers who value the kWh more than the cost of producing it will use the kWh and
 2 customers who value the kWh less will not. This will encourage the development and
 3 adoption of energy technologies that are capable of providing the most valuable
 4 services to the power grid, and thus the greatest benefit to electric customers as a whole.
- 5 2. *Equity* – There should be no unintentional subsidies between customer types. A classic
 6 example of the violation of this principle occurs under flat rate pricing structures (i.e.,
 7 cents/kWh). Since customers have different load profiles, “peaky” customers, who use
 8 more electricity when it is most expensive, are subsidized by less “peaky” customers
 9 who overpay for cheaper off-peak electricity.
- 10 3. *Revenue Adequacy and Stability* – Rates should recover the authorized revenues of the
 11 utility and should promote revenue stability. Theoretically, all rate designs can be
 12 implemented to be revenue neutral within a class, but this would require perfect
 13 foresight of the future. Changing technologies and customer behaviors make load
 14 forecasting more difficult and increase the risk of the utility either under-recovering or
 15 over-recovering costs when rates are not cost-reflective.
- 16 4. *Bill Stability* – Customer bills should be stable and predictable while striking a balance
 17 with the other ratemaking principles. Rates that are not cost reflective will tend to be
 18 less stable over time, since both costs and loads are changing over time. For example,
 19 if fixed infrastructure costs are spread over a certain number of kWh’s in Year 1, and
 20 the number of kWh’s halves in Year 2, then the effective price per kWh in Year 2 will
 21 need to double even though there is no change in the underlying infrastructure cost of
 22 the utility, leading to substantial bill fluctuations for some customers.
- 23 5. *Customer Satisfaction* – Rates should enhance customer satisfaction. Rates need to be
 24 relatively simple so that customers can understand them and respond to the rates by
 25 modifying their energy use patterns. Giving customers meaningful cost reflective rate
 26 choices helps enhance customer satisfaction.

27 **Q Is there an overriding principle that underlies the Bonbright principles?**

28 **A** Yes, it is the principle of cost causation. What this means is that rates should reflect
 29 the structure of the costs that are incurred to serve them. Ideally, fixed costs should be
 30 recovered through a fixed monthly charge, capacity costs through a demand charge and
 31 energy costs through an energy (volumetric charge). However, there might be practical

1 constraints such as lack of advanced metering infrastructure that might prevent the
2 implementation of purely cost reflective rates.

3 **IV. USE OF MCOS STUDY TO DETERMINE CLASS REVENUE TARGETS**

4 **Q What is the economic rationale for using the results of a marginal cost study to**
5 **inform rate design?**

6 A Economic theory predicates that pricing goods at the marginal cost maximizes
7 economic efficiency as it mimics the pricing structure and resulting resource allocation
8 of a competitive market.² Professor Alfred Kahn introduced marginal cost pricing to
9 the utility regulation in his seminal book, *The Economics of Regulation* (1970), as a
10 way to bring economic efficiency to regulated utilities.

11 **Q Is it possible to design rates purely based on the marginal costs?**

12 A While it is possible to design rates purely based on the marginal costs, it is practically
13 never done. The reason simply is that marginal costs and embedded costs are almost
14 never equal, and designing the rates based on marginal costs may lead to over or under
15 collection of the revenue requirement.

16 **Q How are the results of a marginal cost study used to inform rate design?**

17 A Since the revenues that would be collected under marginal cost-based rates will not
18 precisely coincide with the revenue requirements permitted under an embedded cost of
19 service study, it is necessary to modify the class revenue allocation targets in a way to
20 conform to the revenue requirement. This adjustment is called “revenue
21 reconciliation.” There are four widely used revenue reconciliation methods: i) inverse
22 elasticity; ii) lump-sum transfer; iii) differential adjustment of marginal cost
23 components; and iv) equiproportional adjustment. The goal in revenue reconciliation
24 should be to do the least harm to the efficiency of the marginal cost-based rates.

² NARUC Electric Utility Cost Allocation Manual (1992).

1 **Q Which revenue reconciliation method did Witness Heintz use to adjust for the**
2 **difference between the Company's proposed revenue requirement and MCOS-**
3 **based class revenue targets?**

4 A Witness Heintz used the equiproportional adjustment method which involves
5 increasing or decreasing all rate components for all classes *equally by a factor* sufficient
6 to yield the revenue requirement.³

7 **Q Is equiproportional approach a broadly accepted way to adjust for the difference**
8 **between proposed revenue requirements and MCOS-based rates?**

9 A Yes. The goal of a revenue reconciliation mechanism is to ensure the recovery of
10 revenue requirement with a minimum distortion to the marginal cost price signals. At
11 the same time, it is essential to balance inter-class fairness and equity considerations.
12 The equiproportional approach strikes a good balance among these considerations.

13 **Q Following the equiproportional adjustment to class-based revenue targets, how**
14 **did Witness Heintz incorporate caps on increases in class-based revenue targets?**

15 A At a high level, Witness Heintz applied an iterative process whereby 1) a cap is
16 calculated for the total target class-based revenue targets, 2) the revenue shortfall
17 between the total proposed revenue requirement and resulting sum of all class-based
18 revenue targets is determined and 3) the shortfall is allocated to rate classes below the
19 caps according to the class's pro rata share of total revenues at current rates. In more
20 detail, beginning with the MCOS-based revenue targets by class, Witness Heintz:

- 21 1. Calculates potential increase in base revenues as the percentage difference between
22 historical and MCOS-based revenue targets by class
- 23 2. For any class with a decrease in target revenues (relative to historical), increases the
24 revenue target to be neutral (0% change between proposed and historical)
- 25 3. If any class has a target revenue above the cap (120% of the total revenue requirement
26 percentage increase; equivalent to a revenue target increase of 17.15%),⁴ reduces that
27 class's target revenue requirement to the cap

³ Note that Witness Heintz applied the equiproportional approach for all classes excluding Rate Class M (Outdoor Lighting Service). The class revenue requirement target for Rate Class M was increased by the percentage difference between the current and proposed revenue requirement.

⁴ The total Company proposed revenue requirement increase is 14.29%. Thus, the maximum class-share revenue increase is calculated as $1.2 \times 14.29\% = 17.15\%$.

- 1 4. Calculates the shortfall between the proposed revenue requirement and revenue
- 2 targets (after the enforcement of the caps)
- 3 5. Allocates the shortfall to all rate classes with target revenues below the cap based
- 4 on the pro rata share of revenues at current rates
- 5 6. Repeats steps 3-5 until no shortfall exists

6 **Q How did Witness Heintz select these caps? Does the use of caps on revenue-**
7 **increases comport with the principles of rate design that you described earlier?**

8 A Witness Heintz established caps with consultation with the Company as a “reasonable
9 variance.” These caps are introduced to mitigate rate shocks and ensure that the bill
10 stability principle is met. See Attachment SIS-2 (Data Response Staff 9-10).

11 **Q Do you have any concerns with how Witness Heintz used the marginal cost study**
12 **to determine the class revenue targets?**

13 A No. Based on my review, Witness Heintz’ use of the marginal cost study for
14 determining the class revenue targets is appropriate and consistent with the widely
15 accepted implementation practices in the industry.

16 **V. REVIEW OF RATE DESIGN**

17 **Q What documents did you rely upon for your review?**

18 A I reviewed the testimony of Company Witness Heintz, the testimony of Company
19 Witnesses Greene and Simek regarding temporary rates as well as a subset of discovery
20 responses related to rate design.

21 **Q Please describe how Witness Heintz determined the rate components for each rate**
22 **class.**

23 A Witness Heintz calculated the individual rate components by 1) adopting the customer
24 charge proposed in the temporary rate increase, which reflects a 5.28% increase relative
25 to current rates, 2) increasing demand charges by the total percentage increase in
26 revenue requirement between current and proposed rates, and 3) calculating an energy
27 charge based on the anticipated revenue shortfall from the customer charge and demand

1 charge.⁵ To determine the revenue shortfall for each rate class, Witness Heintz
2 subtracted the anticipated revenues from the customer and demand charges (if
3 applicable) based on pro forma test year billing determinants from the class's revenue
4 target. With the class shortfall calculated, Witness Heintz calculated the energy
5 component of rates by dividing the shortfall by the pro forma test year energy quantity
6 by class.

7 **Q Do the rates from Witness Heintz's testimony reflect pure marginal cost rates?**

8 A No. As described earlier, designing rates purely based on the marginal costs would
9 lead to under recovery of the revenues in the Company's case. Therefore, marginal
10 costs were adjusted using the equiproportional adjustment factor to ensure the recovery
11 of the embedded costs. The resulting class revenue targets were also adjusted using
12 the revenue increase caps to limit disproportionate rate shock to any given class.
13 Moreover, within the rate class, rate components such as the customer charge and
14 energy charge also do not reflect pure marginal cost-based price signals. Witness
15 Heintz explains the deviation of the proposed customer charges from the marginal
16 customer cost on the basis of rate continuity and the proposed revenue decoupling
17 mechanism. See Attachment SIS-3 (Data Response Staff 9-11).

18 **Q You stated that the customer charges do not reflect pure marginal cost-based**
19 **price signals. How do the proposed customer charges compare to the marginal**
20 **cost-based customer charges for the residential classes?**

21 A If approved, the Rate D and Rate D-10 customer charges would increase from \$14.02
22 to \$14.76, while the marginal customer costs are \$32.02 and \$39.59, respectively. As
23 indicated in Witness Heintz's direct testimony, "... MCOS clearly indicates that current
24 fixed monthly rates are significantly below costs..."⁶ Figure 1 shows the proposed

⁵ Witness Heintz says that the customer charge increased by the overall percentage increase for temporary rates. See Attachment SIS-3 (Data Response Staff 9-11). Witnesses Green and Simek's testimony, which sets the temporary rates, cites a 5.18% increase in distribution revenue, slightly less than the 5.28% increase to customer charges reflected in the numbers proposed by Witness Heintz. See Bates II-007, lines 17-19.

⁶ See Bates II-309, lines 4-5.

1 customer charges relative to the customer charges based on Witness Bartos' MCOS
 2 study for all customer classes (excluding Rate M).

3 **Figure 1: Proposed vs Marginal Cost Customer Charges**

	Rate D	Rate D-10	Rate G-1	Rate G-2	Rate G-3	Rate T	Rate V
Liberty Proposed	\$14.02	\$14.02	\$365.24	\$60.90	\$14.02	\$14.02	\$14.02
Liberty MCOS	\$32.02	\$39.59	\$87.57	\$61.98	\$47.26	\$34.37	\$37.27
<i>Difference</i>	<i>\$18.00</i>	<i>\$25.57</i>	<i>-\$277.67</i>	<i>\$1.08</i>	<i>\$33.24</i>	<i>\$20.35</i>	<i>\$23.25</i>

4 Sources and Notes:
 5 Figure relies on data from the Company's marginal cost model.
 6
 7

8 **Q Witness Heintz indicates in his testimony that the proposed customer charge**
 9 **increases were limited to the temporary rate increases, given the proposed**
 10 **revenue decoupling mechanism. Is the proposed decoupling mechanism an**
 11 **adequate substitute for cost-reflective rate design?**

12 **A** No, it is not. Full decoupling breaks the link between utilities sales and revenues, and
 13 allows the rates to be adjusted up or down to ensure that the utility earns its approved
 14 revenue requirement. Full decoupling does not investigate the cause of the gap between
 15 actual and allowed revenues, and adjusts for all potential factors such as economy, weather,
 16 and DSM initiatives. However, it is not intended to be a substitute for cost-reflective rate
 17 design.

18 **Q Do you see any potential unintended consequences of Witness Heintz's reliance on**
 19 **the decoupling mechanism for limiting proposed customer charge increases?**

20 **A** Yes, I do. If the revenue decoupling mechanism is approved, the Company will be
 21 made whole relative to its revenue requirement and becomes indifferent to the
 22 mechanism through which the costs are recovered. While the proposed approach
 23 results in rate continuity, it may lead to unintended cross subsidies and result in
 24 inequitable cost recovery. Due to the volumetric structure of current rates, distributed
 25 generation (DG) customers are able to bypass the portion of distribution costs
 26 recovered on a volumetric basis. As the penetration of DG resources increases, an
 27 increasing share of customers may be able to bypass paying for distribution charges.
 28 The bypass may result in a greater share of the distribution costs being collected

1 through the decoupling mechanism, which has the effect of shifting costs to the non-
2 DG customers. DG customers would be unable to bypass these costs if assessed
3 through a fixed monthly customer charge. Designing cost reflective rates is a more
4 equitable and efficient practice to recover class revenue requirements.

5 **Q Are the rates designed by Witness Heintz cost-reflective?**

6 A They are only partially cost-reflective to the extent that they reflect marginal cost based
7 revenue allocation for the class as a whole. With the exception of Rates G-1 and G-2,
8 customer charges are lower than those implied by the MCOS, leading to higher energy
9 charges than those would be implied by the MCOS. These higher energy charges may
10 lead to under consumption compared to the economically efficient levels and lead to a
11 deadweight loss, which is essentially a welfare loss.

12 **Q The rate structures for several classes include fixed and volumetric charges. Is
13 this an economically efficient rate structure?**

14 A Not necessarily, although the Company is currently limited in its metering capabilities
15 to enable more efficient rate structures. The most efficient and cost-reflective rate is a
16 three-part rate that combines:⁷

- 17 • A *fixed monthly charge* to recover the full costs of billing, metering and customer
18 service.
19 • A *demand charge* for recovering distribution capacity costs.
20 • A *time-varying energy charge* for recovering energy costs. This could take one of many
21 forms, such as a simple time-of-use rate, a critical-peak pricing rate, a variable-peak
22 pricing rate, or a real-time pricing rate.
23

24 **Q Turning to the customer impact of the proposed rates, did Witness Heintz develop
25 a rate impact analysis?**

26 A Yes, Witness Heintz developed a bill impact analysis that calculated customer impacts
27 both on total bills and on distribution only bills. The total bill analysis includes base

⁷ For a detailed discussion, see Ahmad Faruqui, "Rate Design 3.0: Future of Rate Design," Public Utilities Fortnightly, May 2018 and Advanced Energy Economy, "Rate Design for a DER Future: Designing Rates to Better Integrate and Value Distributed Energy Resources," Jan 2018.

1 (distribution) rates, the energy service charge and additional riders. For all customer
2 classes, excluding Rate D, Witness Heintz used 12 months of monthly data for each
3 customer to calculate annual bills under the proposed rates and current rates.⁸ For Rate
4 D, Witness Heintz created usage (kWh) bins to evenly divide customers into 20 groups.
5 Witness Heintz repeated this analysis for rates including the proposed step increase.
6 See Attachment SIS-4 (Attachment DAH-8).

7 **Q Please describe the impacts of the proposed rate increase on the varying rate**
8 **groups.**

9 A On a total bill basis, the bill impact for the rate classes with the largest customer counts
10 produce rate increase ranges of:

- 11 • Residential (Rate D): 5.5% to 7.4% with an average of 6.5%,
- 12 • General Service (Rate G-3): 5.3% to 5.5% with an average of 5.4%.

13 The bill impact differences within a rate class are driven by a combination of
14 heterogeneity in the class (e.g., different volumetric and demand usage) and the
15 distribution of the revenue increase across the components of the bill (i.e., customer,
16 demand, and volumetric). If, for example, a class is homogenous with little variation
17 in the total usage or demand requirements, then the impact of a rate increase would
18 produce similar bill impacts regardless of whether the rate increase was implemented
19 through a customer charge or volumetric charge. However, if a class is heterogeneous
20 with one group of users with low volumetric usage of the system and a second group
21 with high volumetric usage, implementing the rate increase through either the customer
22 charge or the volumetric charge would create different bill impacts (i.e., a higher
23 customer charge would disproportionately affect the bills of low usage customers while
24 a higher volumetric charge would disproportionately affect high usage customers).

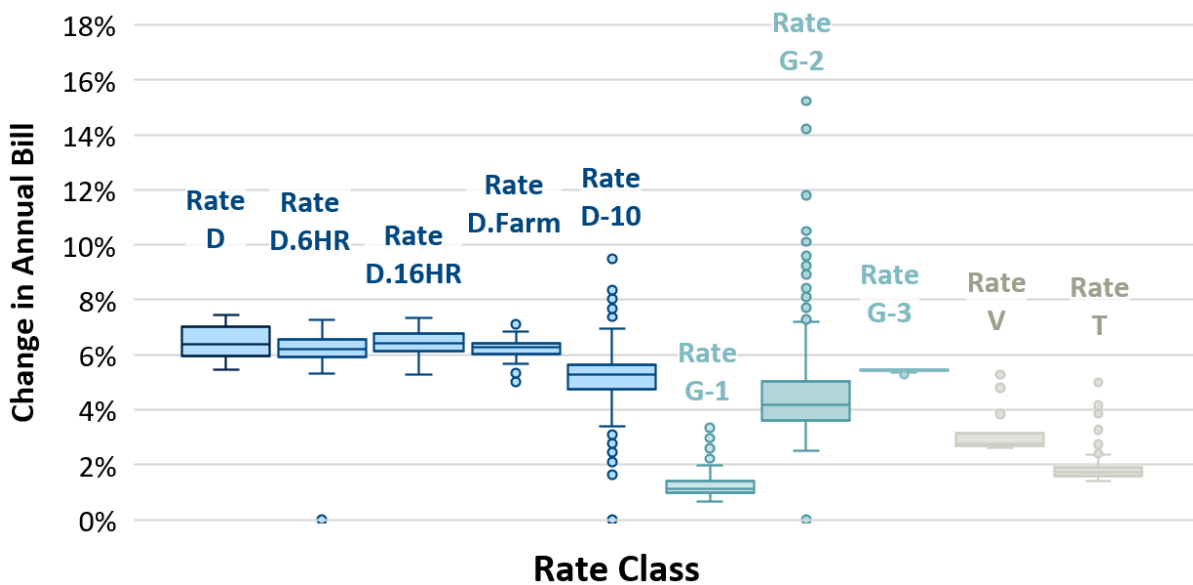
25 Figure 2 shows the total bill impact analysis for each rate class including the median
26 impact and range of impacts. For each rate class, the middle of the “box” shows the
27 median impact on customers (i.e., 50% of impacts are above the median and 50% are

⁸ Current rates refers to the most recently approved permanent base rates. Current rates do not reflect the temporary rate increase.

1 below). The ends of the box show the range in the first quartile above and below the
 2 average (i.e., the middle 50% of all bill impacts are within the box), and the edges of
 3 the whiskers show the range (excluding outliers).⁹ Note that because Witness Heintz
 4 did not provide the customer-level data for the residential (Rate D) class, the charts and
 5 statistics below will underestimate the variability in this class.

6 As shown in Figure 2, the highest overall total bill impacts are generally within the
 7 residential rate classes, while the largest range of bill impacts is within Rate G-2. The
 8 total bill impacts for the residential rate classes ranges between 5% and 7%, with the
 9 exception of the of Rate D-10 (optional peak/off peak pricing) with bill impacts ranging
 10 from 2% to 10%.

11 **Figure 2: Total Bill Impact of Proposed Rate Increase Relative to Current Rates**



12 Sources and Notes:

13 Figure relies on data from the Company's marginal cost model. Zeros values on chart reflect
 14 missing values from underlying data, and do not represent customers with no change in bill. Rate
 15 G-2 analysis as presented by Witness Heintz did not include the formula to calculate customer
 16 charges for all customers. Analysis was modified to include the formula for customer charge for
 17 all G-2 customers. No other modifications were made to the underlying analysis.
 18
 19
 20

⁹ As shown in Figure 1, outliers are those entries more than 1.5 above or below the inner quartile range.

1 The base rate bill impact of the proposed rate increase, presented in Figure 3, shows that
2 the largest bill impacts are in the residential and general service rate classes, excluding
3 Rate G-1. This comports with the total changes in targeted class revenues, which increase
4 17.2% for Rates D and G-3, 17.3% for Rate G-2, and less for Rates G-1 (5.7%), T (5.7%)
5 and V (8.6%).¹⁰ The variability of impacts within the groups is due to the heterogeneity
6 of the group and the allocation of the rate increase between the different charge types for
7 each rate class. Rate G-1, for example, has a relatively small variability in the rate impact
8 on the total bill. This is because the proposed customer fixed charge, and on- and off-
9 peak variable charges increased in relative proportion to one another (5.3% fixed
10 customer charge increase, and 5.4% and 5.3% on- and off-peak increase respectively).
11 In contrast, the proposed customer charge for Rate G-2 increased 5.3%, the demand
12 charge increased 17.3% and the energy component increased 44.4%.

13 **Figure 3: Base Rate Bill Impact of Proposed Rate Increase Relative to Current Rates**

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Sources and Notes:

Figure relies on data from the Company's marginal cost model. Zeros values on chart reflect missing values from underlying data, and do not represent customers with no change in bill. Rate G-2 analysis as presented by Witness Heintz did not include the formula to calculate customer charges for all customers. Analysis was modified to include the formula for customer charge for all G-2 customers. No other modifications were made to the underlying analysis.

¹⁰ The G-2 class is able to increase slightly above the 120% cap based off of the revenues that it was allocated under Witness Heintz's approach.

1 **Q If the median residential Rate D impact of the proposed rate increase is 17%, why**
 2 **is the median total bill impact only 6%?**

3 A For the median Rate D customer, approximately 37% of the total annual bill currently
 4 results from base distribution rates with the remaining bill resulting from energy
 5 services (43%) and other trackers (20%). As shown in Figure 4, these percentages
 6 would remain relatively stable under the proposed rates with 40% of the total bill due
 7 to base distribution rate charges, 41% due to energy services, and 19% from other
 8 trackers.

9 **Figure 4: Median Residential Bill by Charge Type**

Rate Mechanism	Units	Current Rate Structure	Proposed Rate Structure	Median Customer Monthly Bill Current Rates	Median Customer Monthly Bill Proposed Rates
Base Rates					
Customer Charge	(\$/mo)	\$14.02	\$14.76	\$14.02	\$14.76
Energy Charge (1st 250 kWh)	(\$/kWh)	\$0.04299	\$0.05737	\$11	\$14
Energy Charge (over 250 kWh)	(\$/kWh)	\$0.04883	\$0.05737	\$16	\$19
Trackers					
Energy Services	(\$/kWh)	\$0.08299	\$0.08299	\$48	\$48
Other Trackers	(\$/kWh)	\$0.03900	\$0.03900	\$23	\$23
Total Bill				\$112	\$119
% of Bill Base Rates				37%	40%
% of Bill Energy Services				43%	41%
% of Bill Other Trackers				20%	19%

10 Sources and Notes:

11 Figure relies on data from the Company's marginal cost model.

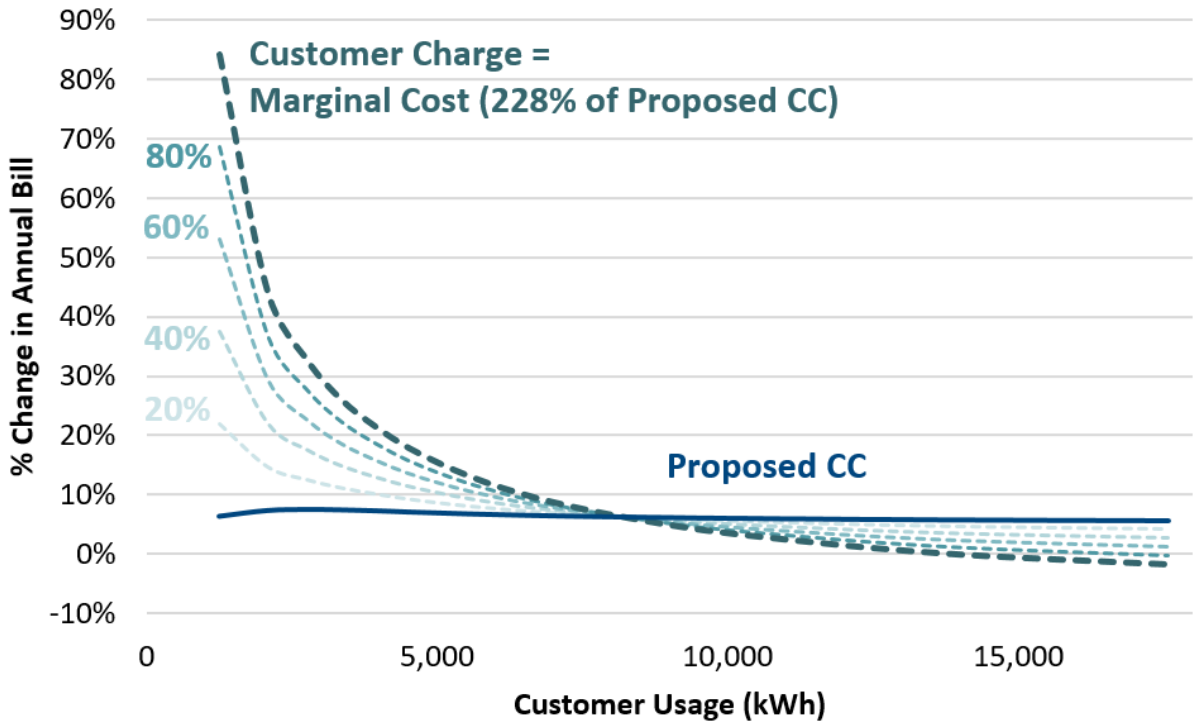
12 Median annual residential customer usage is 6,978 kWh (581.5 kWh per month).
 13

14 **Q Did you consider how changing the customer charge would impact the**
 15 **distribution of the Rate D total bill impact?**

16 A Yes, for Rate D, I held the targeted class revenues constant and varied the customer
 17 charge between the proposed customer charge and the customer charge calculated in
 18 the MCOS study. On a total bill basis, increasing the customer charge an additional
 19 20% toward the cost of service (relative to the proposed) would increase annual bills
 20 for the lowest usage customers (up to 2,076 kWh annually) between 15% and 22%,

1 relative to current levels, as shown in Figure 5. At full marginal cost levels, total
 2 customer bills for the lowest usage customers would increase 44% to 84%, relative to
 3 current levels, and total bills for the highest usage customers (14,412 to 131,676 kWh)
 4 would range between a 2% and a 4% decrease.

6 **Figure 5: Total Bill Impact of Varying the Customer Charge for Rate D**



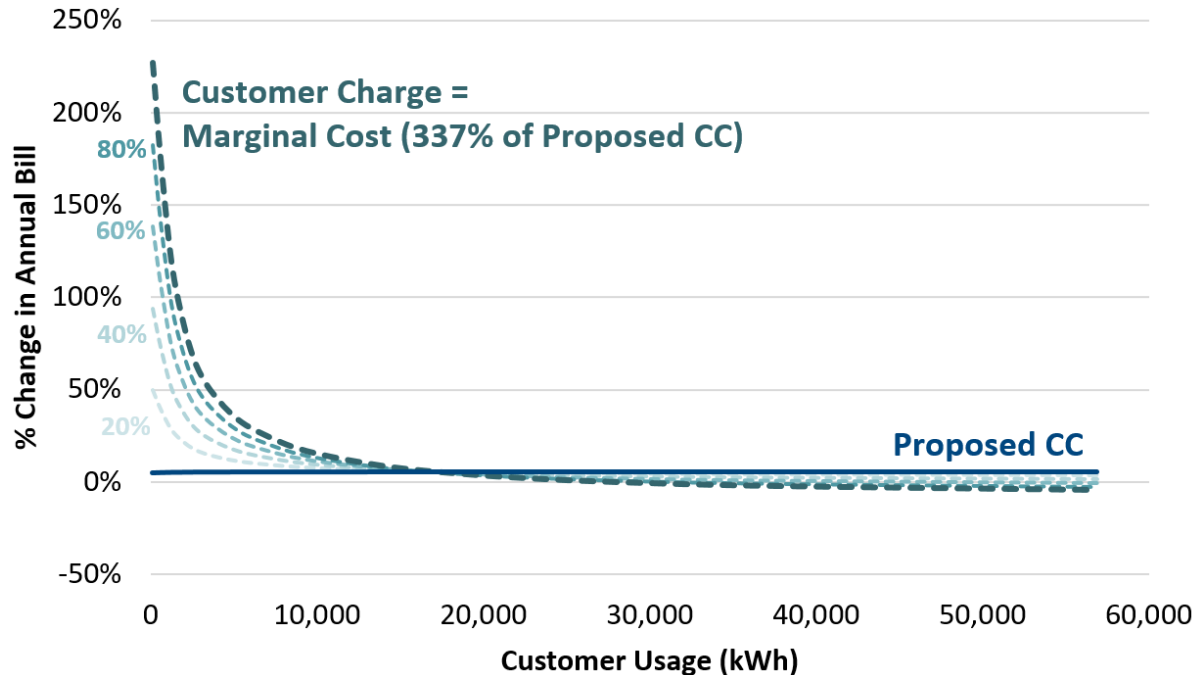
7 Sources and Notes:
 8 Figure relies on data from the Company's marginal cost model.
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 10

11 **Q Did you similarly consider how changing the customer charge would impact Rate**
 12 **G-3, for small general service customers?**

13 **A** Yes, I repeated the same analysis for Rate G-3 to demonstrate how moving the
 14 customer charge closer to the customer charge in the marginal cost of survey study
 15 would impact customer bills. For this analysis, I held the proposed target class
 16 revenues constant and varied the customer charge to examine the impact on customer
 17 bills. As shown in Figure 6, increasing the customer charge 20% closer to the marginal
 18 cost of service study value would have an impact between 39% and 50% for the
 19 smallest 10% of Rate G-3 customers (up to 581 kWh annually). For the same
 20 customers, increasing the customer charge to the value derived from the marginal cost

1 of service study would increase their bills 176% to 227%. Conversely, for the largest
2 10% of customers, setting the customer charge equal to the marginal cost of service
3 would reduce annual bills 4.5% to 7.5%.

4 **Figure 6: Total Bill Impact of Varying the Customer Charge for Rate G-3**



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Sources and Notes:
Figure relies on data from the Company's marginal cost model.

8 **Q What are your conclusions based on your review of customer bill impacts of**
9 **Company's proposed rate designs?**

10 **A** My analyses indicate that the total bill impacts of the proposed rate designs are
11 reasonable for all rate classes, with fairly tight distributions around the median.¹¹ These
12 results indicate that Company's proposed rate design meets three of the five
13 requirements of the rate design principles outlined at the onset of my testimony.
14 Proposed rates would lead to *Revenue Adequacy and Stability* (especially given the
15 proposed revenue decoupling mechanism), *bill stability for customers* (given the small
16 total bill impacts) and *customer satisfaction* (given the simple structure of the rates).

¹¹ Rate G-2 class is an exception and has a larger variation around the median compared to the other rate classes due to the heterogeneous nature of the class, combined with disproportional adjustments to different rate components (customer charge, demand and energy charge).

1 However, the proposed rate structure may be detrimental to *equity* as it may lead to
2 intra-class subsidies as the penetration of distributed generation increases. This may
3 occur due to the volumetric structure of the proposed rates, DG customers avoid paying
4 for their fair share of the distribution system costs that are mainly recovered through
5 the energy charges under the proposed design.

6 Also, the proposed rates are not cost-reflective, and therefore do not promote *economic*
7 *efficiency* as discussed earlier; mostly due to the prioritization of bill stability principle
8 and limiting the increase in the customer charges. Absence of smart meters for smaller
9 customers is currently a barrier for the Company to developing more cost reflective
10 rates that align the cost structure with the rate structure (i.e., introduction of demand
11 charges to recover capacity related costs of the distribution system, time based rates,
12 etc.)

13 **Q Are these alternative rate designs being considered in other dockets?**

14 A Yes, in the alternative net metering docket (DE 16-576), Eversource Energy and Unitil
15 Energy Systems are required to conduct a time of use pilot and Liberty Utilities is
16 working on a real time pricing pilot (See DE 19-033 for Unitil Energy Systems
17 proposal). In addition, alternative rate designs are being considered in the grid
18 modernization docket (IR 15-296). Liberty Utilities has also proposed a time of use
19 rate in their battery storage pilot (DE 17-189). Liberty Utilities-Gas was approved for
20 decoupling in its last rate case (DG 17-048).

21 **Q What are your conclusions based on your analysis of moving customer charges**
22 **closer to values implied by the marginal cost study?**

23 A This analysis has revealed that on a total bill basis, increasing the customer charge an
24 additional 20% toward the cost of service (relative to the proposed) would increase
25 annual bills for the lowest usage Rate D customers between 15% and 22%, relative to
26 current levels. Similarly for the Rate G-3 customers, increasing the customer charge
27 20% closer to the marginal cost of service study value would have an impact between
28 39% and 50% for the smallest usage group. While the resulting total bill impact for G-
29 3 customers is too high; residential bill impacts are more tolerable. This implies that

1 there is potentially more room to increase customer charges for residential customers
2 and bring them closer to the marginal customer costs.

3 **Q What is your recommended increase for customer charges?**

4 A Currently, proposed customer charge increase is 5.3% (or \$0.74) relative to the current
5 customer charge, for both Rate D and Rate G-3 customers. While there is no formula
6 for what the increase should be, it is essential that the customer charges get closer to
7 the levels implied by the marginal cost study over time. Based on the “50 States of
8 Solar, Q4 2017 Quarterly Report,” forty-one utilities in 25 states and DC filed new
9 requests to increase residential fixed charges by at least 10% during 2017.¹² Overall,
10 the median increase requested in 2017 was \$4.80, with proposals ranging from \$0.71
11 to \$29.20. I recommend that Liberty increases its customer charges by 10% relative to
12 the current customer charges, implying \$1.40.

13 **Q Witness Ros proposes modifications to Witness Bartos’s MCOS study. Did you**
14 **recalculate the class revenues allocations using the marginal cost values resulting**
15 **from MCOS Witness Dr. Ros’ analysis? Please explain.**

16 A Yes, I did. Figure 7 below presents the class revenue allocations using the new
17 marginal cost values calculated by Dr. Ros (See Attachment AJR-6). While Dr. Ros’
18 proposed method results in lower marginal costs, the contribution of each class to the
19 total target revenue requirement remains fairly constant after the implementation of the
20 equiproportional allocation method, with the exception of Rate D (1.55 percentage
21 point difference) and G-1 (-1.84 percentage point difference) classes. Once the rate
22 caps are implemented, most class revenue allocations are the same or practically the
23 same between Liberty and Brattle MCOS based allocations, with the exception of Rates
24 G-1 and G-2. For these two classes, the differences are still fairly minimal and are 0.23
25 percentage point and -0.26 percentage point, respectively.

26
27 On the other hand, since the updated marginal cost values are significantly lower than
28 Liberty proposed values, the marginal customer costs are also substantially lower. For

¹² NC Clean Energy Technology Center, “50 States of Solar, Q4 2017 Quarterly Report,” January 2018.

1 instance, updated marginal customer costs for Rate D and G-3 classes are \$22.33 and
 2 \$34.35, compared to \$32.02 and \$47.26 based on Liberty’s marginal cost values.

3 **Figure 7: Impact of Brattle MCOS Values**

	Rate D	Rate D-10	Rate G-1	Rate G-2	Rate G-3	Rate M	Rate T	Rate V	Company Total
Marginal Cost Target Revenue Requirement									
Liberty MCOS	\$22,768,108	\$334,482	\$8,623,563	\$5,528,861	\$6,390,155	\$1,074,431	\$703,241	\$18,482	\$45,441,322
Brattle MCOS	\$23,471,527	\$351,933	\$7,787,631	\$5,354,103	\$6,656,640	\$1,074,431	\$726,281	\$18,775	\$45,441,322
<i>Difference</i>	\$703,419	\$17,451	-\$835,932	-\$174,758	\$266,486	\$0	\$23,041	\$294	\$0
Marginal Cost Target Revenue Requirement Share									
Liberty MCOS	50.10%	0.74%	18.98%	12.17%	14.06%	2.36%	1.55%	0.04%	
Brattle MCOS	51.65%	0.77%	17.14%	11.78%	14.65%	2.36%	1.60%	0.04%	
<i>Difference</i>	1.55%	0.04%	-1.84%	-0.38%	0.59%	0.00%	0.05%	0.00%	
Target Revenue Requirement (Including 120% Cap)									
Liberty MCOS	\$22,244,562	\$332,528	\$9,461,094	\$5,808,988	\$5,701,975	\$1,074,431	\$798,247	\$19,497	\$45,441,322
Brattle MCOS	\$22,244,562	\$332,528	\$9,567,517	\$5,693,079	\$5,701,975	\$1,074,431	\$807,226	\$20,005	\$45,441,322
<i>Difference</i>	\$0	\$0	\$106,423	-\$115,909	\$0	\$0	\$8,979	\$507	\$0
Target Revenue Requirement (Including 120% Cap) Share									
Liberty MCOS	48.95%	0.73%	20.82%	12.78%	12.55%	2.36%	1.76%	0.04%	
Brattle MCOS	48.95%	0.73%	21.05%	12.53%	12.55%	2.36%	1.78%	0.04%	
<i>Difference</i>	0.00%	0.00%	0.23%	-0.26%	0.00%	0.00%	0.02%	0.00%	
Customer Charge									
Liberty Proposed	\$14.76	\$14.76	\$384.52	\$64.11	\$14.76	N/A	\$14.76	\$14.76	N/A
Liberty MCOS	\$32.02	\$39.59	\$87.57	\$61.98	\$47.26	N/A	\$34.37	\$37.27	N/A
Brattle MCOS	\$22.33	\$28.29	\$63.60	\$44.67	\$34.35	N/A	\$24.20	\$26.48	N/A
<i>Liberty MCOS Difference</i>	\$17.26	\$24.83	-\$296.95	-\$2.14	\$32.50	N/A	\$19.61	\$22.51	N/A
<i>Brattle MCOS Difference</i>	\$7.57	\$13.53	-\$320.92	-\$19.44	\$19.59	N/A	\$9.44	\$11.72	N/A

4
 5 Sources and Notes:

6 Figure relies on data from the Company’s marginal cost model.
 7 The marginal cost target revenue requirements reflect the marginal cost estimates increased by
 8 the equiproportional adjustment factor. The Brattle MCOS numbers have been scaled to attain
 9 an equal company total target revenue requirement.

10 **Q Does this update affect your conclusions stated earlier?**

11 A No, it doesn’t. While the gap between the current customer charges and customer costs
 12 from the marginal cost study declines, the current customer charge is still lower by
 13 \$7.57 to \$19.59, depending on the rate class. Therefore, I still recommend a 10%
 14 increase in customer charges relative to the current rates for Rate D and G-3 classes.

15 **Q In addition to rates for the existing classes, what did the Company propose for
 16 rates for electric vehicles?**

17 A The Company proposed to use the same time of use (“TOU”) rates that were approved
 18 in Docket DE 17-189 as part of the Company’s battery storage pilot. The TOU rates
 19 are seasonal and involve three periods: critical peak, on-peak and off-peak. The TOU
 20 rate covers energy, distribution and transmission rates.

1 **Q Do you know of other activities in New Hampshire related to electric vehicle rates?**

2 A Yes. In SB 575, that became effective on August 11, 2018, the Public Utilities
3 Commission (“PUC”) must consider and determine whether it is appropriate to
4 implement certain related designs for electric companies and public service companies
5 for electric vehicle charging. The specific rate design standards for consideration are
6 as follows: 1) cost of service; 2) prohibition of declining block rates; 3) time of day
7 rates; 4) seasonal rates; 5) interruptible rates; 6) load management techniques; and 7)
8 demand charges. This bill also requires the PUC to consider and determine whether it
9 is appropriate to implement “electric vehicle time of day rates” for residential and
10 commercial customers.

11 **Q What do you recommend regarding the Company’s proposed electric vehicle
12 rates?**

13 A Because the PUC is going to consider and determine the appropriate rate design for
14 electric vehicle charging, including the use of TOU rates, I recommend that the
15 Company wait to implement electric vehicle charging rates until after the PUC
16 considers and determines the appropriate rate design for implementation across the
17 state.

18 **Q What are your recommendations regarding the rate design proposed by Liberty?**

19 A I have three main recommendations:

- 20 • The Company should move towards more cost reflective rates, which encourage
21 economic efficiency and market-enabled decision making for both operations and
22 new investments, in a technology neutral manner.
- 23 • The Company should consider further increasing the customer charges for the
24 residential class, instead of relying on the revenue decoupling for the recovery of
25 the fixed costs. I recommend 10% increase relative to the current customer charges
26 for rate D and G-3 classes in this rate case, with the goal of closing the gap with
27 marginal customer costs in the future.
- 28 • The Company should try to minimize unintended intra-class subsidies by cost
29 reflective rate design, and analyze costs and benefits of metering infrastructure that
30 would enable these advanced rates for residential customers.

31 **Q Does this conclude your testimony?**

32 A Yes.