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

SANEM I. SERGICI

December 06, 2019

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I. STATEMENT OF QUALIFICATIONS

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

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

Q Please describe your professional experience and educational background.

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

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

A No, I have not.

II. PURPOSE OF TESTIMONY

Q On whose behalf are you testifying?

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

Q What is the purpose of your testimony?

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

Q What are the major findings from your analyses?

A Major findings of my analyses are as follows:

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

Q How is your testimony organized?

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

III. PRINCIPLES OF RATE DESIGN

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

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

1. *Economic Efficiency* – The price of electricity should convey to the customer the cost of producing it, ensuring that resources consumed in the production and delivery of 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.

customers who value the kWh more than the cost of producing it will use the kWh and customers who value the kWh less will not. This will encourage the development and adoption of energy technologies that are capable of providing the most valuable services to the power grid, and thus the greatest benefit to electric customers as a whole.

2. *Equity* – There should be no unintentional subsidies between customer types. A classic example of the violation of this principle occurs under flat rate pricing structures (i.e., cents/kWh). Since customers have different load profiles, "peaky" customers, who use more electricity when it is most expensive, are subsidized by less "peaky" customers who overpay for cheaper off-peak electricity.
3. *Revenue Adequacy and Stability* – Rates should recover the authorized revenues of the utility and should promote revenue stability. Theoretically, all rate designs can be implemented to be revenue neutral within a class, but this would require perfect foresight of the future. Changing technologies and customer behaviors make load forecasting more difficult and increase the risk of the utility either under-recovering or over-recovering costs when rates are not cost-reflective.
4. *Bill Stability* – Customer bills should be stable and predictable while striking a balance with the other ratemaking principles. Rates that are not cost reflective will tend to be less stable over time, since both costs and loads are changing over time. For example, if fixed infrastructure costs are spread over a certain number of kWh's in Year 1, and the number of kWh's halves in Year 2, then the effective price per kWh in Year 2 will need to double even though there is no change in the underlying infrastructure cost of the utility, leading to substantial bill fluctuations for some customers.
5. *Customer Satisfaction* – Rates should enhance customer satisfaction. Rates need to be relatively simple so that customers can understand them and respond to the rates by modifying their energy use patterns. Giving customers meaningful cost reflective rate choices helps enhance customer satisfaction.

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

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

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

IV. USE OF MCOS STUDY TO DETERMINE CLASS REVENUE TARGETS

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

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

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

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

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

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

[2] NARUC Electric Utility Cost Allocation Manual (1992).

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

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

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

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

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

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

1. Calculates potential increase in base revenues as the percentage difference between historical and MCOS-based revenue targets by class
2. For any class with a <u>decrease</u> in target revenues (relative to historical), increases the revenue target to be neutral (0% change between proposed and historical)
3. If any class has a target revenue above the cap (120% of the total revenue requirement percentage increase; equivalent to a revenue target increase of 17.15%),[4] reduces that 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 x 14.29% = 17.15%.

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

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

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

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

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

V. REVIEW OF RATE DESIGN

Q What documents did you rely upon for your review?

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

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

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

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

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

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

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

A If approved, the Rate D and Rate D-10 customer charges would increase from $14.02 to $14.76, while the marginal customer costs are $32.02 and $39.59, respectively. As indicated in Witness Heintz's direct testimony, "… MCOS clearly indicates that current 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.

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

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
Difference	*$18.00*	*$25.57*	*-$277.67*	*$1.08*	*$33.24*	*$20.35*	*$23.25*

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

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

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

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

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

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

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

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

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

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

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

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

A Yes, Witness Heintz developed a bill impact analysis that calculated customer impacts 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.

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

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

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

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

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

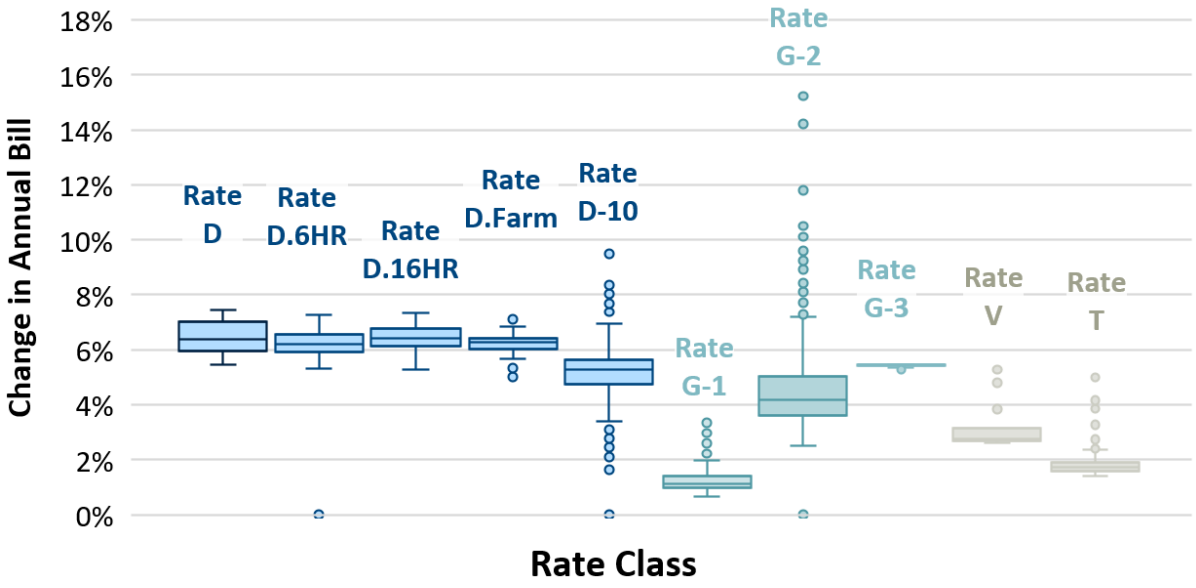
Figure 2 shows the total bill impact analysis for each rate class including the median impact and range of impacts. For each rate class, the middle of the "box" shows the median impact on customers (i.e., 50% of impacts are above the median and 50% are

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

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

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

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

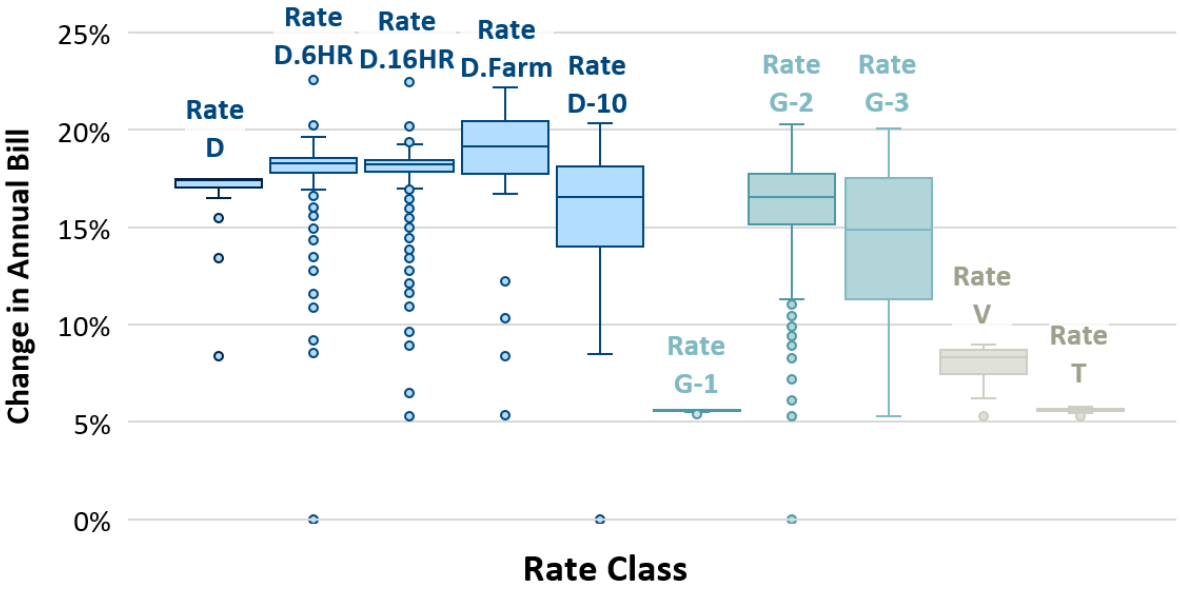


Sources and Notes:
Figure relies on data from the Company's marginal cost model. Zeros values on chart reflect missing values from underlying data, and do not represent customers with no change in bill. Rate G-2 analysis as presented by Witness Heintz did not include the formula to calculate customer 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.

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

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

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



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.

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

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

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%

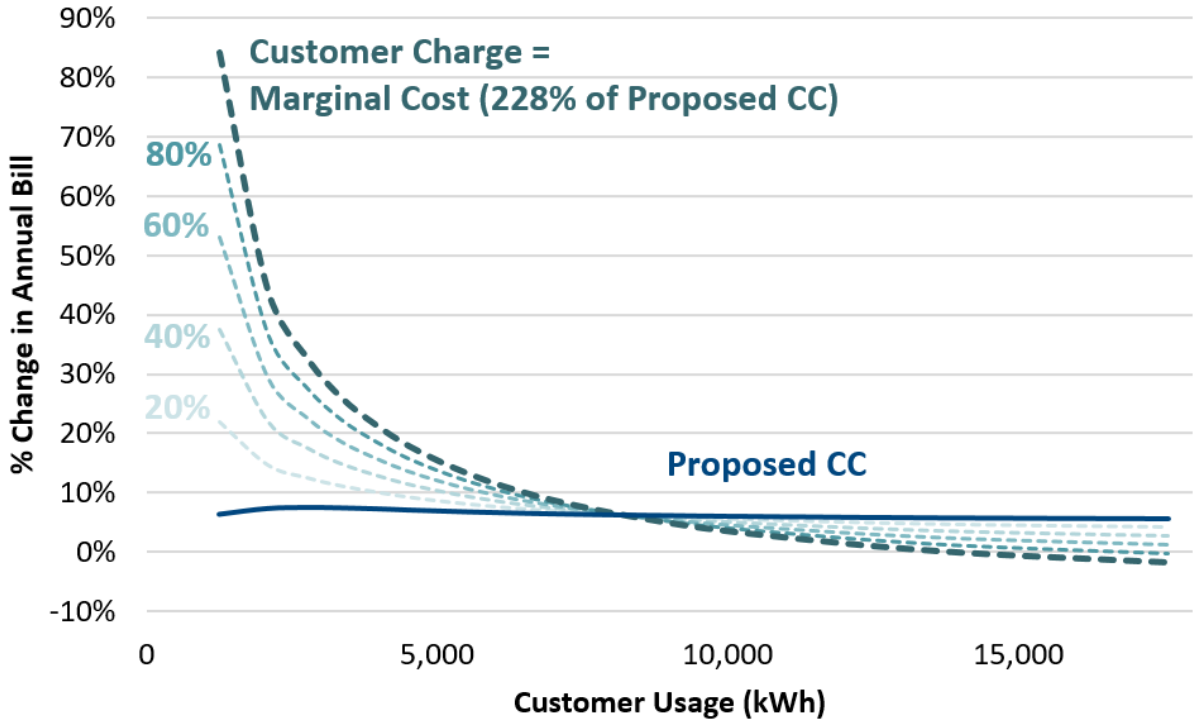
Sources and Notes:
Figure relies on data from the Company's marginal cost model.
Median annual residential customer usage is 6,978 kWh (581.5 kWh per month).

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

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

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

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



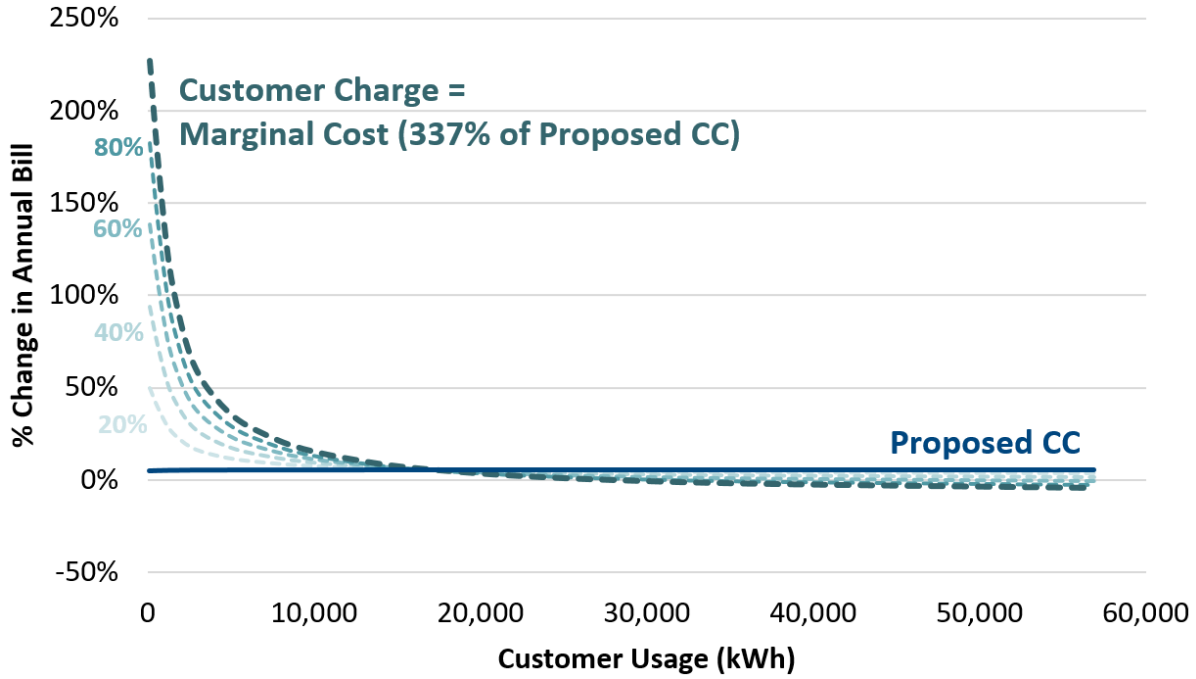
Sources and Notes:
Figure relies on data from the Company's marginal cost model.

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

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

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

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



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

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

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

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

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

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

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

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

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

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

Q What is your recommended increase for customer charges?

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

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

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

On the other hand, since the updated marginal cost values are significantly lower than 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.

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

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
Difference	*$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%	
Difference	*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
Difference	*$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%	
Difference	*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
Liberty MCOS Difference	*$17.26*	*$24.83*	*-$296.95*	*-$2.14*	*$32.50*	*N/A*	*$19.61*	*$22.51*	*N/A*
Brattle MCOS Difference	*$7.57*	*$13.53*	*-$320.92*	*-$19.44*	*$19.59*	*N/A*	*$9.44*	*$11.72*	*N/A*

Sources and Notes:

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

Q Does this update affect your conclusions stated earlier?

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

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

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

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

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

Q What do you recommend regarding the Company's proposed electric vehicle rates?

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

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

A I have three main recommendations:

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

Q Does this conclude your testimony?

A Yes.