STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION

DOCKET NO. DE 19-057

IN THE MATTER OF: **PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE D/B/A EVERSOURCE ENERGY**

Distribution Service Rate Case

DIRECT TESTIMONY

OF

SANEM I. SERGICI

December 20, 2019

TABLE OF CONTENTS

LIST OF ATTACHMENTS

SIS-1	Curriculum Vitae of Sanem Sergici
SIS-2	Eversource response to Staff 14-010, Attachment 14-010B
SIS-3	Eversource response to Staff 14-010, Attachment 14-010A
SIS-4	Eversource response to OCA 6-108
SIS-5	Eversource response to Staff 14-011
SIS-6	Eversource response to Staff 14-019

I. STATEMENT OF QUALIFICATIONS

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

A. My name is Sanem Sergici, and 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. I have a Ph.D. in Applied Economics from Northeastern University in the fields of applied econometrics and industrial organization. I received my M.A. in Economics from Northeastern University, and B.S. in Economics from Middle East Technical University (METU), Ankara, Turkey. 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. Yes. I submitted direct testimony on behalf of the New Hampshire Public Utilities Commission Staff on rate design in Docket DE 19-064.

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 methods used to develop class revenue allocations and design of proposed permanent rates by Witness Davis for Eversource Energy (the “Company”).

Q. What are the major findings from your analyses?

A. Major findings of my analyses are as follows:

- The Company uses an equalized rate of return ("ROR") approach to move each class revenue allocation to the class average. While the methodology applied by Witness Davis to arrive at RORs closer to unity is not formulaic and somewhat ad hoc, the outcome moves each rate class closer to unity in a relatively balanced manner.
- The Company should rely on the marginal cost of service ("MCOS") study for rate design and 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 revise the revenue allocation for the Rate LG for which ROR allocated revenues are substantially different from the MCOS allocated revenues.
- The Company should increase the customer charges further for Rate GV and Rate LG to achieve a better alignment with the MCOS based customer charges.
- The Company should revise the TOU rate design to more closely mirror the time periods and seasonality identified in the MCOS study. Witness Nieto's proposed Option B constitutes a good starting point for the revision of the TOU rate design.
- 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. How is your testimony organized?

A. Section III discusses the principles of rate design. Section IV evaluates the Company's approach to determine the class revenue allocations 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, 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 kWhs in Year 1, and

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

the number of kWhs halves in Year 2, then the price per kWh in Year 2 will double even though there is no change in the underlying infrastructure cost of the utility.

5. *Customer Satisfaction* – Rates should enhance customer satisfaction. Because most residential customers devote relatively little time to reading their electric bills, rates need to be relatively simple so that customers can understand them and perhaps 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. DETERMINATION OF CLASS REVENUE ALLOCATIONS

Q. From an economic perspective, how should the class revenue allocations be determined to encourage economic efficiency?

A. As indicated in the NARUC Cost of Service Manual, "the major reason for allocating costs using marginal costs principles is to promote economic efficiency and social welfare by simulating the pricing structure and resource allocation of a competitive market."[2] This implies that determining the class revenue allocations based on marginal cost of service would maximize economic efficiency.

Q. Is it possible to implement class revenue allocations and design rates purely based on the marginal costs?

A. While it is theoretically 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

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

are almost never equal, and designing the rates based on marginal costs may lead to over or under collection of the revenues.

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 allocations in a way to conform to the revenue requirement. This adjustment is called "revenue reconciliation." There are four widely used revenue reconciliation methods in the literature: i) inverse elasticity; ii) lump-sum transfer; iii) differential adjustment of marginal cost components; and iv) equi-proportional adjustment. The goal in revenue reconciliation should be to do the least harm to the efficiency of the marginal cost-based rates.

Q. Did Witness Davis use a marginal cost approach to develop class revenue allocations?

A. No. Witness Davis's approach to class revenue allocations is based on each customer class ideally providing the same ROR. This approach compares the return from each class relative to its allocated share of rate base. The resulting class-based RORs are compared to the company average ROR to determine if a customer class is generating higher or lower returns than the company's overall average. To facilitate that comparison, the class-based ROR is divided by the company-average ROR, and the resulting quantity is referred to as the "unitized class-ROR." A unitized class-ROR of one means that the class has the same ROR as the company's average. A unitized class-ROR of less (more) than 1 indicates that the class's returns are less (more) than the company average. Witness Davis determines class revenue allocations such that unitized class RORs for each of the classes are brought closer to 1.[3]

[3] Direct Testimony of Edward A. Davis, Request for Permanent Rates, Docket No. DE 19-057. Further captured in Company's rate design workbook.

Q. How did Witness Davis apply the rate of return approach to develop class revenue allocations?

A. Witness Davis's approach to class revenue allocations is somewhat *ad hoc* but in alignment with moving toward equalized RORs for all rate classes. Of the ten rate classes, the Residential (Rate R & R-TOD), Water Heating (Rate R-WH and Rate G-WH), and Load Control Service (Rate R-LCS and Rate G-LCS), have unitized RORs less than one. For these three rate classes, Witness Davis allocates a greater than average increase in class revenue requirement and "directly assigns" the allocations. Witness Davis caps the revenue allocation increase for all classes at 120% of the average increase of 19.9% (amounting to a total allocated revenue increase of 24%) to preserve rate gradualism.[4] For the Residential class, Witness Davis assigns a revenue allocation of 120% of the average revenue requirement increase (equal to 24% total change in revenue requirement relative to current rates). For the Water Heating class, Witness Davis assigns a 119% of the average revenue requirement increase (equal to 24% total change in revenue requirements relative to current rates).[5] Finally, Witness Davis allocates the Load Control Service an increase of 113% of the average revenue requirement increase (equal to 22.5% total change in revenue requirements relative to current rates). An approach purely driven by equal RORs would assign the Load Control Service class the maximum increase (120%) as the current ROR for the class is negative.

With these revenue allocations set, Witness David allocates the remainder of the revenue requirement increase to the classes with unitized RORs greater than one.

---

[4] In data request OCA 6-108, Witness Davis states, "Limiting the revenue requirement increase in each class to no more than 24% provides a degree of gradualism for each class…" and in data request Staff 14-011 states that, "The Company relied on experience and judgement, and general proportions of revenue requirements among classes, in developing revenue allocations jurisdictions to determine that the 20% above average increase was reasonable for rate classes with significantly lower Rate of Return's…"

See Attachment SIS-4 (Response to OCA 6-108) and Attachment SIS-5 (Response to Staff 14-011).

[5] The Company has proposed to close Rate Controlled Water Heating as it no longer controls water heaters and migrate customers to the rates for Rate Uncontrolled Water Heating.

See Davis Testimony pages 13-14; Bates 01809-01810

Q. How did Witness Davis allocate the remaining increase in revenue requirement to the classes with a unitized ROR of greater than one?

A. First, Witness Davis modified the revenue allocation for the lighting classes to achieve a unitized ROR of one. He then distributed the remaining rate increase to the other classes in proportion to their return using the new Company based ROR.[6]

Q. Is the primary goal of the ROR approach to develop economically efficient rates?

A. No. A rate design approach that attempts to produce equalized RORs places a greater emphasis on achieving equitable contribution from individual classes rather than achieving economically efficient signals. If all customer groups were homogenous, equal RORs across customer groups would represent a "fair" rate design. In practice, there may be reasons that may justify different RORs. By its nature, the equalized ROR approach is backward looking, comparing the class's return to its allocated share of rate base. By contrast, MCOS-based rates are forward looking and are explicitly developed to reflect going-forward economically efficient price signals. Nevertheless, rate design that moves toward equalized RORs is commonly used in the industry.

Q. Can the MCOS based revenue allocation approach and rate of return approach result in similar allocations of class revenues?

A. Yes, but by coincidence rather than design. If the current rates are not reflective of marginal costs or ROR, and both are in the same direction, using the approaches would notionally move the revenue allocations in the same way. The degree to which the two approaches move the revenue requirement allocations in the same direction is dictated by the alignment between the underlying ROR and MCOS for each class as well as the application of rate increase caps to provide bill stability.

Q. For Eversource, do the class revenue allocations produced by a MCOS approach agree with those based on an equalized ROR approach?

[6] This calculation is shown in Davis Exhibit EAD-5 p.2 Aloc WP lines 19-34.

A. Only directionally for some rate classes. Equalized ROR and MCOS approaches move the revenue allocations in the same direction for 7 of 10 rate classes. As shown in Figure 1, while these changes are directionally aligned, they do not agree in overall magnitude.[7] For example, the class revenue allocations for Large General Service (Rate LG) is almost five times larger under an equalized ROR approach (shown in column 3) than based on an MCOS approach (shown in column 2). Thus, although the revenue allocations align directionally in this specific rate case, the pursuit of an equalized ROR approach would not arrive at economically efficient signals in the long run.

Directionally, 3 of 10 classes do not align (Water Heating (Rates R-WH and G-WH), General Service (Rates G & GTOD), and Primary General Service (Rate GV)), indicating that movement toward an equalized ROR approach produces revenue requirement allocations contrary to those reflecting economically efficient price signals.

[7] Note that the MCOS values cited here rely on the Eversource study, which uses a 75% loading criteria. I understand that the testimony of Staff witness Kurt Demmer is addressing the appropriateness of a 75% loading criteria. Further, I understand that in his testimony, Staff witness Agustin Ros addresses additional methodological issues with the Eversource MCOS study. However, the issues raised by both witnesses do not address my fundamental analysis or conclusions.

Figure 1: Comparison of Revenue Allocations based on MCOS and ROR Approaches

Rate Class	Current *(Rev $000)*	MCOS *(Rev $000)*	Equalized ROR *(Rev $000)*	Proposed *(Rev $000)*	MCOS - Current *(Rev $000)*	ROR - Current *(Rev $000)*
	[1]	[2]	[3]	[4]	[5] = [2] - [1]	[6] = [3] - [1]
Rates R & R-TOD	197,370	288,408	278,239	244,613	91,039	80,869
Rate R-WH & G-WH	4,332	2,770	5,713	5,362	-1,562	1,381
Rate LCS R&G	476	531	1,582	584	54	1,106
Rate G & G-TOD	83,945	85,020	78,393	97,722	1,075	-5,552
Rate G-SH	202	90	198	237	-112	-4
Rates GV	36,212	36,622	31,063	42,296	411	-5,149
Rate LG	18,846	3,773	18,242	22,369	-15,073	-604
Rate B GV&LG	1,519	29	804	1,668	-1,490	-715
Rate OL	4,509	2,843	4,040	4,047	-1,666	-469
Rate EOL	3,082	318	1,502	1,507	-2,764	-1,580
Total Company	**350,492**	**420,405**	**419,776**	**420,405**	**69,913**	**69,284**

Sources and Notes:
Figure relies on data from Company's rate design workbook and Company's MCOS and ACOS analyses.
Equalized ROR revenue requirement reflect level necessary to achieve 7.62% return across all classes.
MCOS revenue requirements based on class shares from Company's MCOS analysis applied to proposed revenue requirement.

Q. Do the proposed rate changes move all classes closer to unitized RORs under the Company's proposal?

A. Yes. All 10 classes move closer to unitized RORs of 1 as shown in Figure 2. The most notable changes in unitized ROR are for the Outdoor Lighting class (Rate EOL), which move from unitized ROR of 14.5 to 1.0.

Figure 2: Impact of Proposed Revenue Requirements on ROR

Rate Class	Rate of Return			Current to Proposed Change	
	Current	Proposed	Unitized ROR	Overall RoR Change	Makeup Towards Allocated Cost
	[1]	[2]	[3]	[4]	[5]
Rates R & R-TOD	0.1	0.6	1.0	805%	57%
Rate R-WH & G-WH	0.3	0.8	1.0	132%	67%
Rate LCS R&G	-2.8	-1.1	1.0	-63%	46%
Rate G & G-TOD	2.7	1.8	1.0	-33%	53%
Rate G-SH	2.3	1.6	1.0	-30%	52%
Rates GV	3.3	2.1	1.0	-37%	53%
Rate LG	2.4	1.7	1.0	-31%	52%
Rate B GV&LG	8.1	4.2	1.0	-48%	54%
Rate OL	3.3	1.0	1.0	-70%	100%
Rate EOL	14.5	1.0	1.0	-93%	100%
Total Company	**1.0**	**1.0**	**1.0**	**0%**	

Sources and Notes:
Figure relies on data from Company's rate design workbook
[4] = ([2] - [1]) / [1]
[5] = ([2] - [1]) / ([3] - [1])

Q. Do you have any concerns with how Witness Davis applied the ROR approach to determine the class revenue allocations?

A. No. While the methodology applied by Witness Davis to arrive at RORs closer to unity is not formulaic and somewhat ad hoc, the outcome moves each rate class closer to unity in a relatively balanced manner. Though the revenue allocations for 8 of 10 classes are still not completely aligned with their allocated costs, as can be seen in Column 5 of Figure 2, this is not uncommon in the application of class revenue allocations in the industry.

V. REVIEW OF RATE DESIGN

Q. Has Witness Davis proposed new rate structures for the rate classes?

A. No. The proposed rate structures mirror the current rate structures with the exception of outdoor lighting. Witness Davis states that "The decision to maintain current rate structure at this time is based on ensuring customer understanding and acceptability. Customers have become familiar with current rate structures, and it is important to

assure that any further changes to rates are understandable and that reflect an appropriate level of continuity and gradualism."[8]

Q. Has Witness Davis considered cost-reflectivity in his approach to rate design?

A. No, it does not seem so. Witness Davis indicates that "…changes to rates determined through a number of overall rate changes which may not result in entirely cost-reflective rate structures for all customer classes."

Q. Since the rate structures were not modified, did Witness Davis follow a consistent and formulaic approach to determine how the increase in revenue requirement would be allocated to rate component (i.e., customer charge, demand charge, volumetric charge)?

A. No, Witness Davis applied an *ad hoc* set of changes. In general, one component of the rate (customer, demand, or volumetric) was held to a level similar as proposed in the temporary rates, which reflects a 9.4% increase,[9] and the remaining charges were increased to recover the outstanding class revenue requirement allocations. The specific choice for which rate component would remain at the temporary rate level was unique to each rate class. As shown in Figure 3, the residential rate classes (including Rate R, Rate R-OTOD, and Rate R-UWH) generally have the customer charge held constant at the temporary rate levels and the remaining revenue increase is recovered through the volumetric charge.[10] For the general service customers, the proposed volumetric rates typically reflect the temporary rates and the remaining revenue is recovered through the customer and demand charges.

[8] Direct Testimony of Edward A. Davis, Request for Permanent Rates, Docket No. DE 19-057, p. 10 of 27 lines 1-5. Bates 001807.

[9] Direct Testimony of Edward A. Davis, Request for Temporary Rates, Docket No. DE 19-057, p. 6 of 10 lines 2-4 Bates 000477.

[10] With regard to time of day rates, while the differential between peak on-peak and off-peak remain similar (from $0.13/kWh to $0.14/kWh), the ratio between on-peak and off-peak prices has decreased significantly from 69:1 to 14:1.

Figure 3: Percentage Change in Rate Components by Rate Class

Rate	Customer	Volumetric	Demand
Rate R	9.46%	31.39%	-
Rate R OTOD	9.43%	22.98%	-
Rate UWH	9.40%	41.63%	-
Rate CWH	-37.94%	1148.33%	-
Rate LCS	24.04%	24.17%	-
Rate G P&L	20.94%	9.44%	20.41%
Rate G TOD	9.44%	9.45%	17.37%
Rate G Space	9.40%	18.01%	-
Rate GV	16.81%	9.42%	19.87%
Rate LG	18.70%	9.50%	22.74%
Rate B	9.44%	-	9.82%

Sources and Notes:
Figure relies on data from Company's rate design workbook.
Block rates are averaged to allow for single percent change figure.
Water heating and load control service (radio controlled) are same across R and G customers.

Q. The rate components for Water Heating and Load Control Service have significant changes in both fixed and volumetric rates. Why do these classes differ?

A. As described earlier, the Company states that it no longer controls water heaters,[11] so the rate structure for controlled water heating (Rates R-CWH and G-CWH) is being transitioned to the rate structure for Uncontrolled Water Heating (Rates R-UWH and G-UWH). While I cannot comment on the value of the controllable water heating program as previously implemented by the Company, I do observe from industry studies that there is potentially significant value in controlling water heaters as a demand management approach.[12] The Company proposes that the rate transition take place in two steps. The first step, reflected in Figure 3 sets the customer charge equal to the Uncontrolled Water Heating class and increases the volumetric rate 50% toward

[11] Witness Davis Direct Testimony p. 12 lines 11-12, Bates 01809.

[12] See for example, R. Hledik, J. Chang, and R. Lueken, "The Hidden Battery: Opportunities in Electric Water Heating," Prepared for the National Rural Electric Cooperative Association, the Natural Resources Defense Council, and the Peak Load Management Alliance, January 2016.

the Uncontrolled Water Heating leading to a 1,148% increase. The second step, which the Company proposes for July 1, 2021, increases the volumetric rate to the level of the Uncontrolled Water Heating rate. Thus, the Company's proposal increases in the volumetric rate (relative to current rates) a total of 2,296% in July 2021. The Load Control Service rates (Rates R-LCS and G-LCS, excluding Radio Controlled), are proposed to transition to the same rate structure as Uncontrolled Water Heating.

For the Radio Controlled LCS service, Witness Davis elected to increase the customer and volumetric charges "using a comparable percentage increase."[13] The Company does not provide a specific rationale for increasing both charges in tandem. However, the Company does propose to close the rate to new applicants as Witness Davis states that the rate was developed for customers with "older technologies."[14]

Q. Do the proposed rate changes bring the customer charges closer to the economically efficient levels identified by Witness Nieto?

A. In part. As shown in Figure 4, the proposed customer charge for Residential (Rate R) and Residential Controlled Water Heating (Rate R-CWH) move toward the economically efficient level identified by Witness Nieto, while the customer charges for the other residential rates exceeded the levels identified by the MCOS prior to the rate increase and further increases by the proposed rate design. With regard to the proposed general service rates, the customer charges are all closer to the MCOS identified values excluding the Single Phase General Service rate (Rate G P&L-P1) and General Service Time of Use Rates (Rate G TOD-P1 and Rate G TOD-P3). While the proposed customer charges for Rate G-Space, GV and LG also get closer to the MCOS values, the proposed rates represent only a modest percentage of the MCOS based customer charges (18% and 58%, respectively).

[13] Direct Testimony of Edward A. Davis, Request for Permanent Rates, Docket No. DE 19-057, p. 13 of 27 lines 14-16, Bates 001810.

[14] As an example of older technologies, Witness Davis cites the "heat smart" program.
See Direct Testimony of Edward A. Davis, Request for Permanent Rates, Docket No. DE 19-057, p. 13 of 27 lines 16-20, Bates 001810.

Figure 4: Customer Charge Comparison

Rate	Current [1]	Proposed [2]	MCOS [3]	Current Percent of MCOS [4] = [1] / [3]	Proposed Percent of MCOS [5] = [2] / [3]	Alignment towards Marginal Cost [6]
Rate R	$12.69	$13.89	$14.91	85%	93%	54%
Rate R OTOD	$29.47	$32.25	$17.15	172%	188%	-23%
Rate UWH	$4.47	$4.89	$1.75	255%	279%	-15%
Rate CWH	$7.88	$4.89	$1.75	450%	279%	49%
Rate LCS	$9.11	$11.30	$2.39	381%	473%	-33%
Rate G P&L-P1	$14.89	$18.00	$15.04	99%	120%	2073%
Rate G P&L-P3	$29.76	$36.00	$32.64	91%	110%	217%
Rate G TOD-P1	$38.57	$42.21	$20.06	192%	210%	-20%
Rate G TOD-P3	$55.12	$60.32	$44.33	124%	136%	-48%
Rate G Space	$2.98	$3.26	$4.52	66%	72%	18%
Rate GV	$194.03	$226.65	$1,238.71	16%	18%	3%
Rate LG	$606.47	$719.88	$1,245.15	49%	58%	18%

Sources and Notes:
Figure relies on data from Company's rate design workbook and Company's MCOS analysis.
[6] = ([5] - [4]) / (100% - [4])
[6]: Positive values indicate proposed customer charge is closer to marginal cost than current customer charge; negative values indicate proposed customer charge is further from marginal cost than current customer charge.
[6]: Customer costs for Rates G P&L are very high because proposed customer charge goes from being less than marginal cost to more than marginal cost. This does not necessarily mean that the proposed customer charge is closer to marginal cost.

Q. Do you recommend any changes to the customer charges proposed by Witness Davis?

A. Yes. While there is room for improvement in most rates for better alignment with the marginal cost based customer charges, I recommend that the customer charges for Rate GV and LC classes are increased further, given that the magnitude of the difference between the proposed and MCOS-based customer charges is quite substantial. This adjustment would also help reduce volumetric rates and demand charges for these rate classes, and provide more efficient price signals for customer's consumption decisions.

Q. Did the Company incorporate the results of Witness Nieto's costing period analysis into the on-peak and off-peak rates for time of use rates?

A. No. The Company did not modify the on-peak and off-peak timing despite Witness Nieto's conclusion that the current pricing periods are "not appropriate."[15] The current time-of-use rates define on-peak hours as 7:00 AM through 8:00 PM for all weekdays excluding holidays. Witness Nieto identified and evaluated two alternative time of day and seasonal options (Option A and Option B) with improved correspondence with the underlying MCOS.[16] In Option A, the peak period is defined as 11 am through 7 pm to be applicable during the summer months defined as July and August. In Option B, the peak period is still defined as 11 am through 7 pm, but the summer months include June through September. By the way of spreading summer peak capacity marginal cost over the course of four months, the peak to off-peak differential is lower under Option B compared to Option A.

Witness Davis explained that the Company considered changes to the time of use rates in the "longer term" but did not opt to propose the changes in this rate case "due to keeping in mind all aspects of rate design which include consistency and continuity."[17]

Q. Did Witness Davis explain what constitutes "longer term" and present a plan for prioritizing cost reflectivity along with consistency and continuity?

A. No. Witness Davis did not offer any details around what constitutes longer term and a plan or requirements for prioritizing cost reflectivity along with rate consistency and continuity.

Q. Do you have a recommendation on how the TOU rate design should be revised?

A. Yes. The TOU rate design should be aligned with the marginal cost price signals identified in Company's marginal cost study. In addition to communicating efficient price signals, the design of the TOU rate should take into account customer experience

[15] At Bates 01771 (Attachment MCOS Report), Witness Nieto states, "The seasonality observed in the hourly marginal costs indicates that consideration of seasonality for Eversource's distribution rates may be required for efficient pricing. These results also show that the broad definition of the peak period in current rates (7am to 8pm, Monday through Friday), is not appropriate. Hours 11 am to 7 pm of summer weekdays include the highest marginal hourly distribution costs."

[16] See Witness Nieto's Attachment 1 (MCOS Report) at Bates 001771-001773.

[17] Attachment SIS-6 (Response to Staff 14-019).

with these rates, in terms of the length of the TOU window (too long of a window is generally difficult to manage from a customer experience perspective) as well as the ratio between peak and off-peak prices (while too high of a ratio might lead to a rate shock, too little of a ratio would not incentivize customers to respond to the TOU rates). Given these considerations, Witness Nieto's Option B represents a good starting point for the redesign of the TOU rate.

Q. Did Witness Davis analyze the impacts to customer bills of the proposed rate changes?

A. Yes, but only in part. Witness Davis calculated the class average total bill impact in Attachment EAD-7. In addition, Witness Davis calculated representative bill impacts relative to the temporary rates for different levels of consumption and demand in Attachment EAD-9 and provided the same analysis relative to current rates as part of an information request.[18] While these comparisons show the customer bill impact for certain levels of customer consumption and demand, they do not provide context on the number of customers at each level of consumption nor do they capture the complete range customers and impacts of the proposed rate increase. Figure 5 below presents the total customers for each rate class, the number of customers represented in Witness Davis's bill impact analysis (in Attachment EAD-9), the customers *not* represented in Witness Davis's bill impact analysis (in Attachment EAD-9) and the average rate impact analysis provided by Witness Davis (in Attachment EAD-7).

[18] See Attachment SIS-3 (Data Response Attachment Staff 14-010A).

Figure 5: Average Total Bill Impact by Customer Class

	Total Customers	Not Included in Customer Bill Analysis	Percent Not Included	Average Total Bill Impact
Rate R	445,391	32	0%	7.40%
Rate R OTOD	42	0	0%	7.76%
Rate G 1-Phase	57,296	9,480	17%	4.30%
Rate G 3-Phase	20,253	12,645	62%	4.30%
Rate G OTOD	38	11	29%	8.55%
Rate G Space	425	181	43%	3.60%
Rate GV	1,432	264	18%	2.04%
Rate LG	111	17	15%	1.85%
Rate G OTD (1-Phase)	15	0	0%	8.55%
Rate G OTD (3-Phase)	23	11	48%	8.55%
Rate R UWH	43,304	75	0%	5.97%
Rate G UWH	1,299	95	7%	5.90%
Rate R CWH	251	0	0%	-1.51%
Rate G CWH	-	-	-	-
Rate R LCS	3,486	1,119	32%	1.98%
Rate G LCS	192	96	50%	1.07%
Total Company	**573,558**	**24,026**	**4%**	

Sources and Notes:
Figure relies on data from Company's rate design workbook and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).
Customer counts and bill impacts were not provided for G CWH.
LCS rates reflect only the LCS Radio Controlled customers.

Q. How did you determine which customers are not captured in Witness Davis's bill impact analysis?

A. Customers are counted as not included (i.e., not represented) in the customer bill analysis if they could not be mapped to a corresponding range of demand and/or volumetric usage within the bill impact analysis. The customer count data provided by Witness Davis is "binned" into ranges using the characteristic usages included in Attachment EAD-9. When determining which customers are mapped to which bill impact, I assume customers map to the high end of their provided range (e.g., customers in a range of 101-200 kWh would map to the 200 kWh impact). For example, for Rate G LCS Radio Controlled, Witness Davis provides customer bill impacts for customers from 100 kWh to 1,000 kWh, providing a representative bill impact every 100 kWh. However, the customer count data shows that there are 96 customers with greater than 1,000 kWh (50% of the class). Since I do not know the range of consumption or

approximate distribution of customers with consumption greater than 1,000 kWh, I cannot accurately determine the range of their bill impacts and, therefore, identify them as not included in the analysis. I similarly identify customers with demand that does not map to a corresponding range in the bill impact analysis.

Q. Based on the data provided by Witness Davis, is there significant variation in the bill impacts within classes on a total bill basis?

A. Yes, especially within the general service and water heating/load control rate classes. The range of rate impacts, as provided by Witness Davis, is shown in Figure 6. Note that the rate classes missing more than 25% of customers are shown as dashed, indicating the uncertainty relative to the total range of impacts.

As shown in Figure 6, the widest variation in rate impacts is for the customers on the controlled water heating rates. The proposed rate change for the controlled water heating classes (shown in the figure as Rate CWH) has two phases. Based on the data provided by Witness Davis, the range of bill impacts for the first phase of the rate increase produces impacts ranging from a decrease of approximately -8% to an increase of 7%. This range in impacts results from a decreased customer charge but increased volumetric rate. The first phase of the rate change includes a volumetric rate increase of more than tenfold. Under the proposed rate changes, customers in the controlled water heating classes will have a second rate change that further increases their volumetric rates.

Similarly, the radio controlled load control service customers have a wide variation in the range of total impacts, shown in the figure as Rate LCS. While the average impact is approximately a 2% increase, the highest impacts (as provided by Witness Davis) represent approximately a 10% increase. This range in impacts reflects the difference in the percentage of the bill from distribution versus other energy-related charges because the customer and energy chargers were both increased 24%. While the average energy usage of customers in the Radio Load Control Service rates sample provided by Witness Davis is 550 kWh, the average across the entire rate class is 873 kWh for residential (Rate R LCS Radio Controlled) and 1,900 kWh for general service (Rate G

LCS Radio Controlled). If the full set of customer information had been provided, the total bill impacts range would have been wider, with the largest customers showing bill rate impacts directionally closer to zero. This is because the volumetric portion of the customer's bill is approximately 1% distribution costs and 99% energy and transmission costs.[19] Thus a 24% change in the volumetric distribution rate cannot impact the total bill more than 0.24%.

The total bill impacts for the main general service rates (Rates G 1-Phase and G 3-Phase) range from approximately 4% to 8%.[20] This range likely results from the heterogeneity of usage within the customer classes. The proposed rate changes include an approximate 20% increase in the customer charge (fixed), 20% increase in the demand charge (for customers over 5 kW), and 10% increase in the volumetric charge. As a result, customers with low usage and/or a low load factor will see the greatest rate increase.[21]

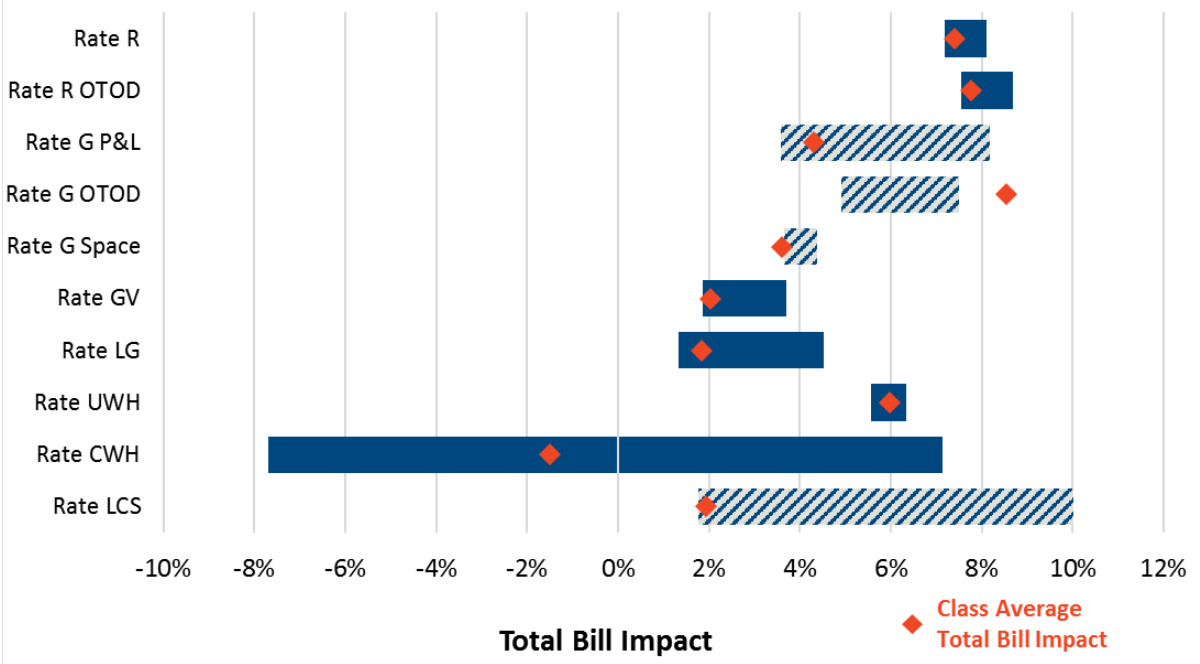
Finally residential customers have relatively low variation in total bills. The impact ranges from an increase of approximately 7% to 8%.

[19] The volumetric component of the proposed rage is $0.00149/kWh of a total $0.13088/kWh for Rate G LCS.

[20] Note that this range of impacts relies on the ranges of impact provided by Witness Davis. The actual range of impacts will be wider due to customers not included in the analysis.

[21] Load factor describes the ratio between average and peak demand. A customer with a low load factor has a high peak demand relative to average usage.

Figure 6: Total Bill Impacts



Sources and Notes:

Figure relies on data from Company's updated customer bill impact analysis from Attachment SIS-3 (Data Response Attachment Staff 14-010A) and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).

Dashed bars reflect classes where greater than 25% of customers do not have corresponding bill impacts.

Rates UWH in figure captures impact across Rate R UWH and Rate G UWH because the class have the same underlying customer and volumetric distribution charges and changes. Rate CWH similarly captures impact across Rates R CWH and G CWH. Rate LCS captures impact across Rate R LCS Radio Controlled and Rate G LCS Radio Controlled.

Rates G P&L and G OTOD represent range of impacts from respective 1-Phase and 3-Phase customers.

Average impact for Rate CWH just captures average impact of Rate R CWH because there was no average impact provided for Rate G CWH.

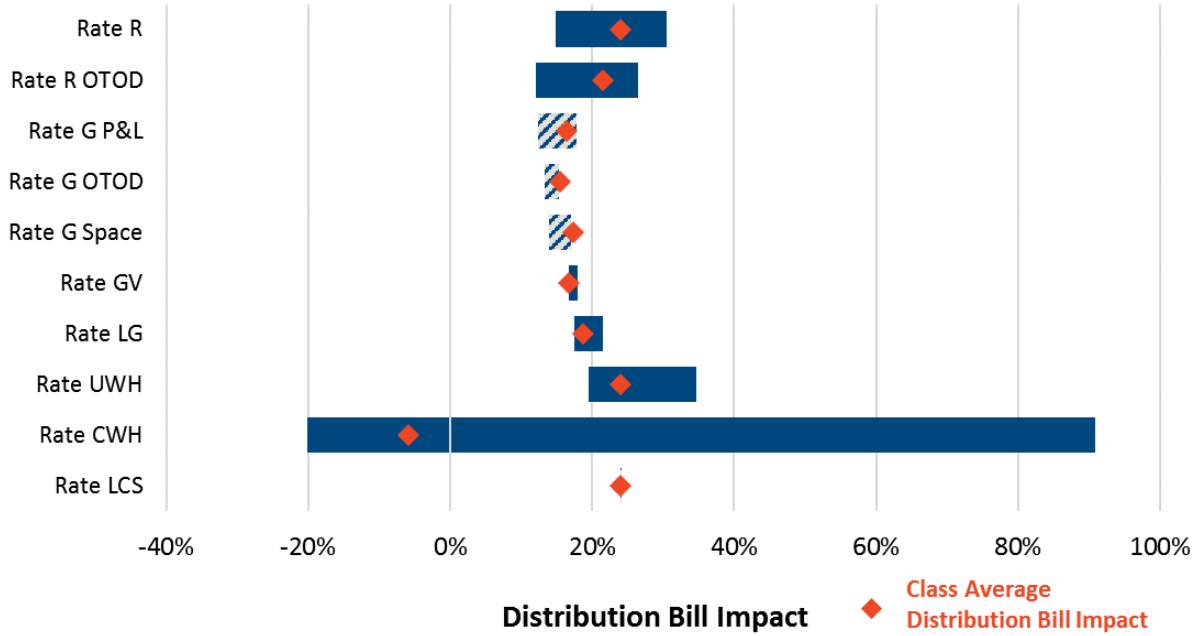
Q. Did you consider the impact of the proposed rate increases on the distribution portion of the bill as well?

A. Yes. While the total bill impact is the "take home" impact that a customer sees immediately, the rate impact on the distribution portion of the bill is also meaningful to consider because it will remain in place regardless of whether energy or transmission prices rise or fall.

As shown in Figure 7 below, the range of distribution impacts is significantly larger for the residential and uncontrolled water heating classes than on a total bill basis. The proposed increases result in a 15% to 30% increase in the distribution portion of the bill for residential customers. This range of 15% to 30% roughly holds for the

Uncontrolled Water Heating (19% to 35%, Rates R UWH and G UWH) and Residential Time of Use class (12% to 26%, Rate R OTOD).

Figure 7: Distribution Portion of the Bill Impact



Sources and Notes:

Figure relies on data from Company's updated customer bill impact analysis from Attachment SIS-3 (Data Response Attachment Staff 14-010A) and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).

Dashed bars reflect classes where greater than 25% of customers do not have corresponding bill impacts.

Rates UWH in figure captures impact across Rate R UWH and Rate G UWH because the class have the same underlying customer and volumetric distribution charges and changes. Rate CWH similarly captures impact across Rates R CWH and G CWH. Rate LCS captures impact across Rate R LCS Radio Controlled and Rate G LCS Radio Controlled.

Rates G P&L and G OTOD represent range of impacts from respective 1-Phase and 3-Phase customers.

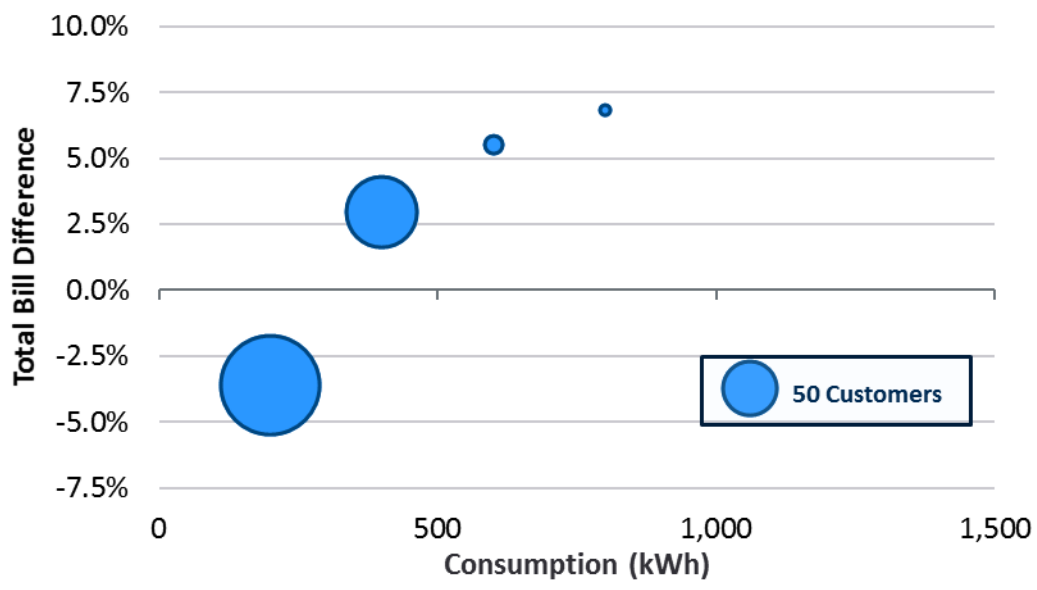
Average impact for Rate CWH just captures average impact of Rate R CWH because there was no average impact provided for Rate G CWH.

Q. Did you conduct an analysis that provides additional context on bill impacts at varying levels of consumption?

A. Yes, for a subset of customer classes (Rate R CWH, Rate R, and Rate G 1-Phase), I replicated Witness Davis's rate impact analysis relative to the current (permanently approved) rates. I selected these rates because they either represented a very large range of potential impacts, or impacted the most amount of customers.

I selected the Controlled Water Heating classes (R CWH and G CWH) because they have the largest ranges of bill impacts on a total bill basis (-8% to 7%). In Figure 8, which shows the total bill impact of the proposed rate increase, the size of the circle indicates the number of customers (with larger circles indicating a greater number of customers). As shown below in Figure 8, customers with lower usage see a reduction in total bill (based on the first phase of the rate change), while customers with higher usage experience bill increases. The greater number of customers with lower consumption and, therefore, total bill reductions explains why the class average total bill impact for Rate CWH is negative in Figure 6.

Figure 8: Residential Controlled Water Heating (Rate R CWH) Total Bill Impacts

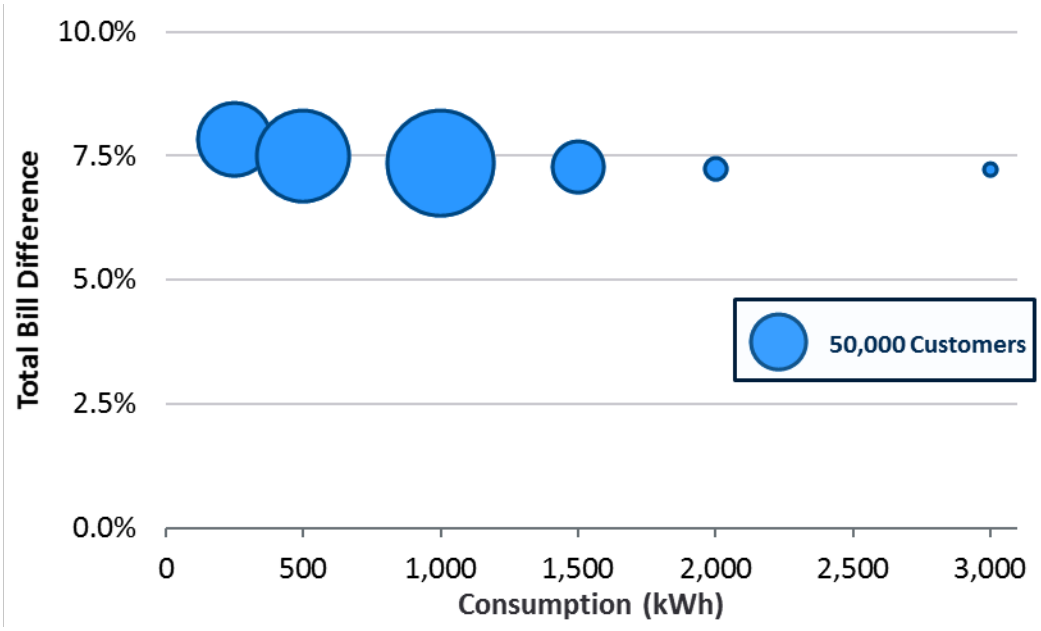


Sources and Notes:
Figure relies on data from Company's updated customer bill impact analysis from Attachment SIS-3 (Data Response Attachment Staff 14-010A) and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).
Bubbles located on x-axis according to upper consumption bound (e.g., bubble at 400 kWh represents customers between 201 kWh and 400 kWh consumption, where bill impact is customer weighted across 201-300 and 301-400 customer bins).

The residential (Rate R) total bill impact affects the most customers (445,391 customers). Figure 9 shows the total bill impacts from the proposed rate changes for residential customers. The total bill impact slightly decreases with increasing

consumption because the fixed customer charge increases more (9%) than the total volumetric rate (7%).[22]

Figure 9: Residential (Rate R) Total Bill Impacts



Sources and Notes:

Figure relies on data from Company's updated customer bill impact analysis from Attachment SIS-3 (Data Response Attachment Staff 14-010A) and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).

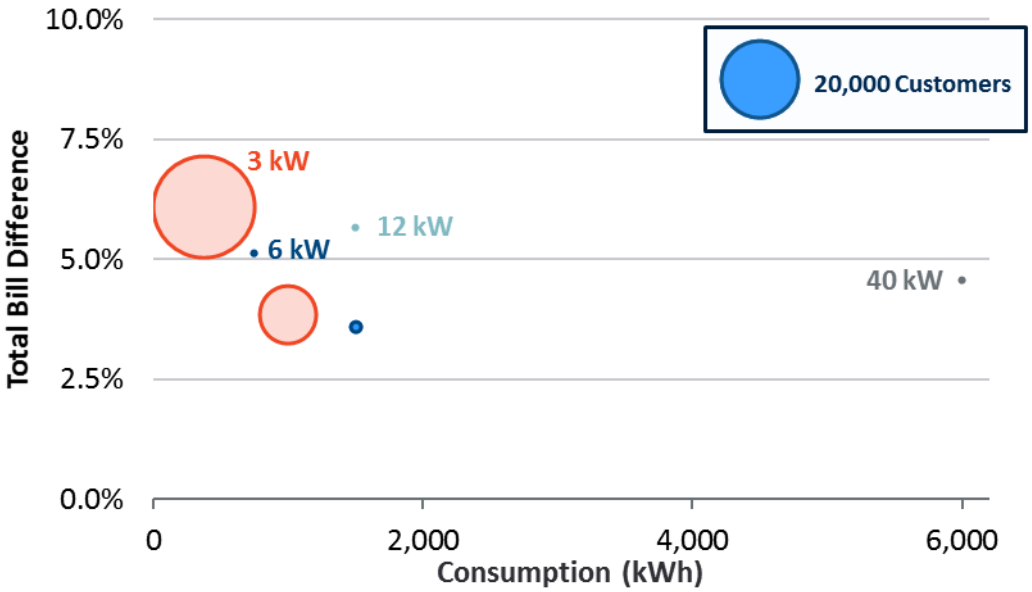
Bubbles located on x-axis according to upper consumption bound ((e.g., bubble at 500 kWh represents customers between 251 kWh and 500 kWh consumption, where bill impact is customer weighted across 251-300, 301-400 and 401-500 customer bins).

For graphing purposes, highest bubble at 3,000 kWh represents customers between 2,001 kWh and 7,500 kWh.

The Rate G 1-Phase class has the greatest number of general service customers. For these general service customers, the rate impact depends both on volumetric and demand charges. In Figure 10, the number of customers in each group are shown by the size of the bubble and the colors indicate the customers' demand levels. All else held equal, customers with lower volumetric usage will see higher rate increases as the fixed and demand charges increased more on a percentage basis than the volumetric charges.

[22] Although the proposed volumetric distribution rate increases 31%, the rest of the other volumetric charges that the customer sees (e.g., transmission and energy) do not change, so the customer only experiences a 7% impact on a total volumetric rate basis.

Figure 10: General Service (Rate G 1-Phase) Total Bill Impacts



Sources and Notes:

Figure relies on data from Company's updated customer bill impact analysis from Attachment SIS-3 (Data Response Attachment Staff 14-010A) and customer count data from Attachment SIS-2 (Data Response Attachment Staff 14-010 B).

Bubbles located on x-axis according to upper consumption bound. Customer with consumption above upper consumption bound for a given level of demand are not included in analysis.

40 kW bubble represents weighted impacts from 30 kW and 40 kW customer buckets.

Q. What are your conclusions based on your analyses 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 generally reasonable for all rate classes, and range from 1% to 10% (excluding Rate R CWH). 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 *bill stability for customers* (given the small total bill impacts); *customer satisfaction* (given the simple structure of the rates) and *Revenue Adequacy and Stability* (given that the ROR approach ends up moving all class revenue allocations closer to the allocated costs).

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. This is mostly due to the prioritization of bill stability principle by the Company preventing broader updates to the rate design that may improve economic efficiency of the rates. 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).

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

A. I have four main recommendations:

- The Company should rely on the MCOS study for rate design and 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 revise the revenue allocation for the Rate LG for which ROR allocated revenues are substantially different from the MCOS allocated revenues.
- The Company should increase the customer charges further for Rate GV and Rate LG to achieve a better alignment with the MCOS based customer charges.

- The Company should revise the TOU rate design to more closely mirror the time periods and seasonality identified in the MCOS study. Witness Nieto's Option B constitutes a good starting point for the revision of the TOU rate design.
- 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. Do you have any comments regarding any existing rate structures?

A. Yes. I recommend elimination of the declining block rate structure in Rates G and GV. Declining block rates do not accurately reflect costs nor do they provide the proper incentive for customers to conserve energy. While I recognize that switching from a declining block rate to a flat rate in these rate classes might have a significant bill impact, such a flat rate could be phased-in to provide for a more gradual rate impact if the impact is determined to be too great.

Q. Did the Company propose a separate rate for electric vehicle (EV) charging stations?

A. No. They did not.

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 rate 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. Do you believe that the Company should address rates for EV charging stations in this rate case?

A. No. While I believe that a rate case is typically the proper venue for proposing new 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. Does this conclude your testimony?

A. Yes.