EXHIBIT
#8
DE 16-576

UNITIL ENERGY SYSTEMS, INC.

DIRECT TESTIMONY OF

THOMAS P. MEISSNER JR.

New Hampshire Public Utilities Commission

Docket No. DE 16-576

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Thomas P. Meissner, Jr. My business address is 6 Liberty Lane West, Hampton, New Hampshire 03842.

Q. What is your position and what are your responsibilities?

A. I am the Chief Operating Officer of Unitil Corporation and a Senior Vice President of Unitil Service Corp. ("Unitil Service") which provides centralized utility management services to Unitil Corporation's subsidiary companies. I am also a Senior Vice President of Unitil Corporation's utility operating subsidiaries Fitchburg Gas and Electric Light Company ("FG&E"), Granite State Gas Transmission, Inc. ("Granite"), Northern Utilities, Inc. ("Northern"), and Unitil Energy Systems, Inc. ("UES" or "the Company"). My responsibilities are primarily in the areas of utility operations and engineering.

Q. Please describe your business and educational background.

A. I have over 30 years of professional experience in the utility industry and an extensive background in all areas of gas and electric energy delivery. I joined Unitil Service Corp. in 1994 as a design engineer and was named Director of Engineering in 1996, Senior Vice President of Operations and Engineering in 2003, and assumed my current responsibilities as Chief Operating Officer of Unitil Corporation in 2005. Prior to joining Unitil Corporation, I was employed for ten years at Public Service of New Hampshire ("PSNH") where I advanced through a variety of positions in engineering and operations. The last position I held with PSNH prior to joining Unitil was that of Electrical Superintendent in Portsmouth, New Hampshire.

I hold Bachelor of Science degrees in Electrical Engineering and Mechanical Engineering from Northeastern University, a Certificate in Electric Power Systems Engineering from Power Technologies, Inc., a Master's degree in Business Administration from the University of New Hampshire, and graduated the Tuck Executive Program at Dartmouth College. I am also a registered Professional Engineer in the State of New Hampshire.

Q. Have you previously testified before the New Hampshire Public Utilities Commission or other regulatory agencies?

A. Yes, I have testified before this Commission in various proceedings including testimony filed in UES' current rate case (DE 16-384) and UES' prior rate case in 2010 (DE 10-055). I have also testified before the Maine Public Utilities Commission and the Massachusetts Department of Public Utilities and have been actively involved in proceedings related to the Company's Grid Modernization strategies and investment plans in both Massachusetts and New Hampshire.

Q. What is the purpose of your testimony?

A. I will offer testimony in support of the Commission's efforts to develop new alternative net metering tariffs and/or other regulatory mechanisms and tariffs for customer-generators. Specifically, I will describe the benefits of the grid and explain why net energy metering or an equivalent utility service is important to the adoption and expansion of distributed energy. I will also explain why the services and functionality provided by the utility grid are essential to customers wishing to install small scale clean energy generation and represent more than an economic subsidy as reflected in current net metering policy. Finally, I will identify concerns with the current rate design of net energy metering and will propose a three-part rate design that will allow the Company to appropriately charge customer-generators for their use of the distribution system while continuing to allow net metering of energy.

Q. Does the proposed three-part rate design incorporate Value of Solar (VOS) including any applicable external and societal benefits?

A. No. The Company's proposal is generally limited to its utility cost of service, and to the distribution services it provides to customers. It should be noted at the outset that UES does not generate electricity and is not a transmission owner. UES is a distribution utility operating in a restructured state where it is responsible for constructing, operating and maintaining the distribution system. Most of the value that has been attributed to solar in this proceeding is not related to the service we provide. Under the proposed three-part rate, the Company is seeking to clearly separate the utility's cost of service from any external, societal and forward looking value areas that the Commission may deem appropriate. To the extent clean energy technologies confer non-wires benefits to other customers, those benefits should be recognized in the appropriate rate components from which such value is derived or associated and should not be monetized through the utility's distribution cost of service.

Q. Is UES proposing to eliminate net energy metering?

A. No. UES supports New Hampshire's 10-Year State Energy Strategy, including efforts to increase penetration of small and commercial scale energy generation in order to diversify our fuel supply and increase the use of in-state resources. The Company supports net energy metering as an important policy that is vital to the growth of small scale renewable energy, especially resources that may be intermittent in nature. However, the Company believes it is the *service* provided by the utility under net energy metering that is essential, whereas the policy (subsidy) of net metering has generally been misunderstood or mischaracterized. Without net energy metering or an equivalent utility service, small scale renewable energy is neither economically viable nor operationally palatable to customers. Simply stated, a connection to an affordable and reliable electric grid is essential to the expansion and adoption of distributed clean energy.

UES believes that a viable and sustainable long-term net metering policy will only be achieved through transparent, efficient and cost-based rate designs that provide sufficient revenue to support the significant investments needed to modernize the grid, while also incenting appropriate behaviors and assuring fairness and equity among customers. Net metering tariffs and rate design methodologies must adhere to long-standing and well-established ratemaking principles that recognize the importance of cost causation among homogenous rate classes when setting rates.

II. NEW HAMPSHIRE ENERGY STRATEGY AND THE RISE OF THE PROSUMER

Q. Why are distributed energy resources an important part of New Hampshire's 10-year energy strategy and how will they benefit consumers?

A. The New Hampshire 10-Year State Energy Strategy ("NH Energy Strategy") envisions a future in which consumers are empowered to manage their energy use by taking full advantage of the information, market mechanisms, energy efficient technologies, diverse fuel sources, and transportation options available to them. Fuel diversity and customer choice are essential to this vision. Small and commercial scale energy generation is expected to play an increasingly important role in meeting New Hampshire's energy goals in order to diversify our fuel supply and increase the use of in-state resources. As this occurs, electric utilities will need to adjust their operational practices and planning processes, and make investments to modernize the electric grid, in order to accommodate growing levels of distributed generation. The ability to seamlessly integrate all types and sizes of electrical generation and storage systems using simplified interconnection processes and universal interoperability standards to support a "plug-and-play" level of convenience will be one of the cornerstones of a modernized grid.

Q. What is a prosumer?

A. The term "prosumer" is being increasingly used within the electric industry to describe customers that both produce and consume electricity. In the future, a surge in distributed energy technologies will empower customers to manage their onsite needs through a variety of options and resources, giving rise to a new class of customers unlike those of the past. Unitil believes prosumers represents a new and distinct class of customers who will use the utility system very differently than traditional consumers. Just as the functionality of a modernized grid must necessarily change in response to the needs of these customers, the Company believes the pricing of grid services must change as well. Throughout this testimony, I will use the term "prosumer" to describe customer-generators who are both producing and consuming energy behind the meter.

Q. How does net energy metering support New Hampshire's Energy Strategy?

A. The NH Energy Strategy identifies a number of mechanisms to encourage small scale energy generation and make it more affordable. These mechanisms include increasing Renewable Portfolio Standards (RPS) Targets and Alternative Compliance Payment (ACP) Prices, expanding the state's net metering policy, implementing rate design changes to properly value Distributed Generation (DG), increasing and leveraging private financing, as well as tax exemptions and other incentives. Given the focus on expanding the state's net metering policy and implementing rate design changes to properly value DG, the Company believes it is important to address the pricing of the utility services needed to support this class of customer, and also to address the cross-subsidies resulting from current net metering rate design. Unitil supports net energy metering as an important policy that is vital to the growth of customer-owned renewable energy, especially intermittent energy resources. However, the Company believes it is the *service* provided by net metering that is essential, not the subsidy, and the policy of net energy metering has generally been misunderstood or mischaracterized. I will address net energy metering in greater detail in the next section of this testimony.

Q. Do prosumers use the grid differently than traditional consumers?

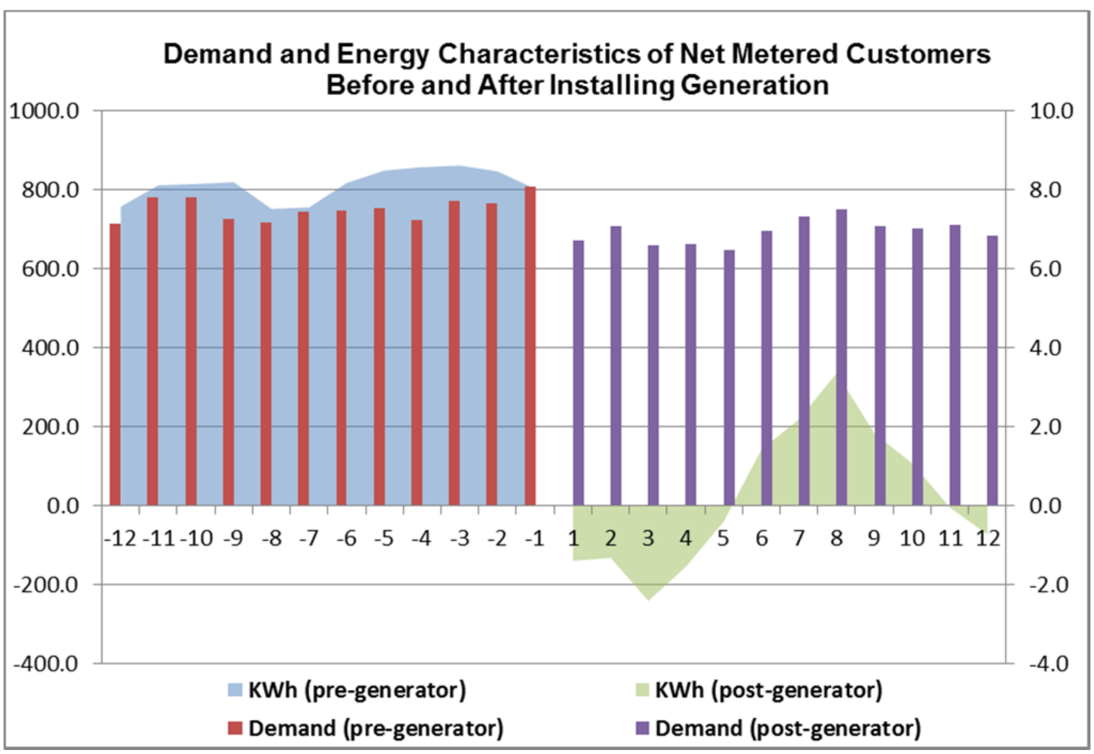
A. Yes. Traditional customers who consume but do not produce electricity are considered "full requirements" customers because they purchase all of their energy services from the regulated utility. Prosumers are "partial requirements" customers because they purchase only some of their energy services from the regulated utility, and typically rely on other sources for the remaining portion of their energy. In addition, because solar, wind and other clean energy technologies are intermittent in nature and produce electricity on an "as available" basis, these customers may use all of the services provided by the utility, but only on a part-time or intermittent basis. While the prosumer generates electricity on an "as available" basis, the utility must provide its services on an "always available" basis. To the extent the selection of services chosen by the customer and provided by the utility results in a different mix of hourly loads and intermittent use of particular services, partial requirements customers should be treated differently for ratemaking purposes.

Arguably, customers with on-site generation (prosumers) use more distribution services than customers using the grid for consumption only, and the investments that may be needed to support increased penetration of DG are not necessarily beneficial to non-generating customers. The hours during which prosumers generate their electricity typically do not correspond to their peak use of electricity, and hence, their generation may not result in any reduction in peak demand. On the other hand, prosumers use their electric service to both import and export electricity (two-way power flow) in order to balance their production with their consumption, and the electric system was not designed for bi-directional power flow. As a result, new technologies and investments will be needed accommodate growth of this new class of customers, and these investments may not be necessary to serve traditional consumers.

Q. Is there any evidence to support your statement that the hours during which prosumers generate electricity do not correspond to their peak use of electricity, and therefore may not result in any reduction in peak demand?

A. Yes. The Direct Testimony of H. Edwin Overcast incorporates an analysis comparing demand data for residential and commercial customer classes with the DG hourly demands for the same period. The results demonstrate that the UES residential and commercial customer classes peak in the late afternoon to early evening when there is little production from solar PV facilities. Reference Table 1 and Table 2 in Appendix E of the Overcast Testimony. In addition, in NHSEA 1-7 the company provided data on its net metered customers including 12 months of kWh usage and kW demand in the year before the net metered system was installed, and 12 months of kWh usage and kW demand after the net metered system was installed. In total, data was compiled for 37 net metered customers in the UES service areas to provide an aggregate picture of the average usage characteristics of net metered customers both before and after installing on-site generation. As shown in Figure 1, it is apparent that net metered customers' demand for electricity is virtually unchanged before and after the installation of on-site generation, though kWh usage is markedly different. On average, these customers used 812 kWh per month before installing the net metered system, and just 17 kWh per month afterward. Yet demand stayed relatively constant at 7.5 kW before and 6.9 kW afterward. This confirms that prosumers are largely successful in offsetting kWh energy purchases, but their peak demand for electricity is not reduced and the distribution facilities needed to serve this class of customers are essentially identical to the facilities serving non-generating consumers.

Figure 1.



Q. Can you identify investments that may be needed to support increased penetration of DG that are not beneficial to non-generating customers?

A. To provide one example, in the Company's Massachusetts service area heavy penetration of solar PV on certain circuits has resulted in the potential for peak solar output to exceed the total customer load on those circuits during light load periods. This, in turn, may result in power backfeeding from the distribution circuit through the substation transformer and out to the transmission system. The protection systems for the circuit, substation and transmission systems were designed for one-way power flow and cannot adequately protect or safeguard the system under reverse power flow conditions. In the event power flows from the distribution system to the transmission system through the substation transformer, overvoltage conditions may be experienced under fault conditions leading to damaged or failed equipment. As a result, investments are needed to either prevent reverse power flow, or to adequately protect the circuit, substation and transmission systems should reverse power flow occur. The Company is currently spending over $1 million for protection modifications at three substations to ensure adequate protection during reverse power flow conditions. These investments are needed solely to enable reverse power flow, and are not needed to provide service to non-generating customers.

Q. Can the rate design for prosumers be changed to better reflect the value of the service provided, while retaining the benefits of net energy metering?

A. Yes. There are a variety of ways to change the pricing of distribution services to more accurately reflect the value of DG to the grid, and the value of the grid to DG. The Company strongly believes the overarching objective of rate design should be the development of pricing for grid services that adhere to the principles of fairness, transparency and economic efficiency. Prices for regulated utility services should reflect the true cost of providing those services; bills should reflect each customer's demand for or use of those services. Only through transparent and efficient rate designs will a viable and sustainable long-term model be developed that provides sufficient revenue to support the significant investments needed to modernize the grid, while also incenting the appropriate behaviors and assuring fairness and equity among customers.

III. THE CASE FOR NET ENERGY METERING

Q. What is Net Energy Metering?

A. Under PURPA §111(d)(11)[1] 'net metering service' is defined as service to an electric consumer under which electric ***energy*** generated by that electric consumer from an eligible on-site generating facility and delivered to the local distribution facilities may be used to offset electric ***energy*** provided by the electric utility to the electric consumer during the applicable billing period (emphasis added). It is noteworthy that this definition does not suggest that electricity generated by an eligible on-site generating facility be valued at "full retail," nor

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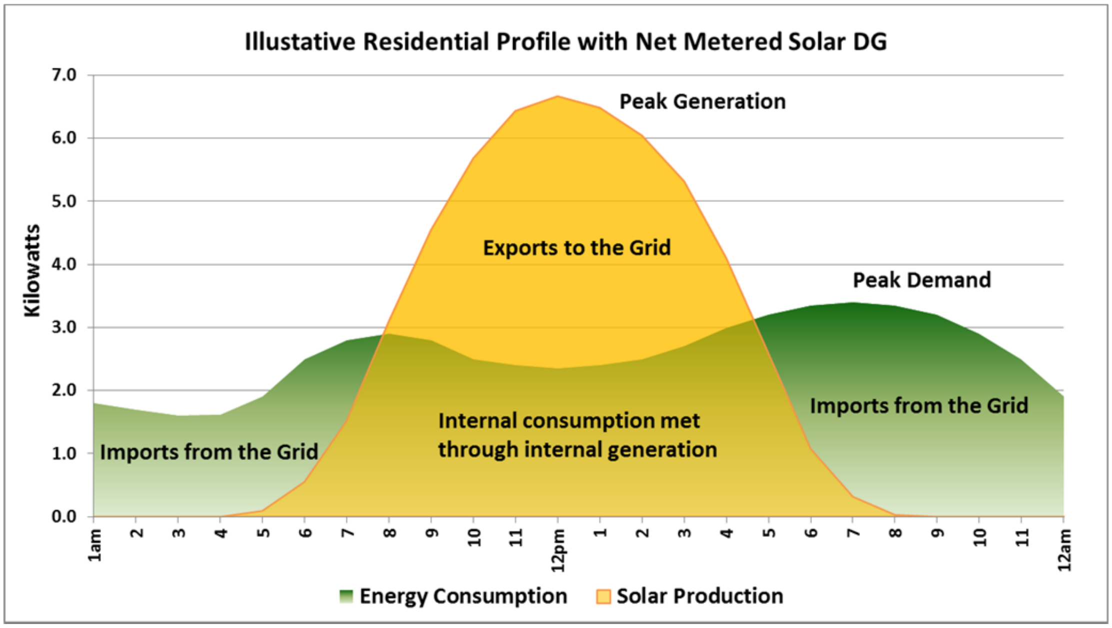
[1] Section 1251 of the Energy Policy Act of 2005 amended section 111(d) of the Public Utilities Regulatory Policies Act of 1978 (PURP A) to include three new subsections including §111(d)(11) Net Metering.

does it specify that net metering be accomplished using a single meter. It does not define net metering service as a subsidy or as a means to bypass non-energy charges (e.g., delivery charges). Importantly, net metering is defined as a "service" – one that allows customer-generators to use their own *energy* production to offset electric *energy* delivered by the utility. Unitil fully supports net metering of *energy* production, as defined under PURPA §111(d)(11), and believes net metering service is vital to the growth of customer-owned renewable energy resources.

Q. How does net energy metering work?

A. Under net energy metering, customer-generators are allowed to export electric energy to the local distribution grid to offset future energy purchases from the utility when on-site electricity generation exceeds on-site consumption. During time periods when the electricity demanded by the customer exceeds on-site electricity production, the customer consumes all of the electricity produced on-site and also consumes electricity imported from the electric grid. At times when the electricity demanded by the customer is less than on-site electricity production, the customer serves all of its demand with on-site generation and exports surplus electricity to the utility where it flows out onto the distribution system. <u>*See*</u> Figure 2. Metering is typically accomplished using a single meter capable of measuring the flow of electricity in both directions (the meter spins forward and backwards) and only the difference between energy consumed and energy produced is recorded for billing purposes. As a result, net energy metering allows customers to consume and generate electricity independently of one another and pay only the net difference.

Figure 2.



Q. How is Net Energy Metering defined in New Hampshire?

A. With regard to the existing provisions of RSA 362-A:9, the section itself is called Net ***Energy*** Metering (emphasis added), and the Company believes the clear intent of the language in the statute is to provide net *energy* metering to eligible customer-generators, consistent with the definition of net metering service under PURPA §111(d)(11). This net *energy* metering is specifically aimed at the customer's default generation supply or competitive electricity supply, and not distribution. However, section IV. (a) of RSA 362-A:9 specifies that for small facilities below 100 kilowatts, the utility shall apply the customer's net energy usage when calculating all charges that are based on kilowatt hour usage. As a result, to the extent a utility's rate design recovers its distribution cost of service through kilowatt hour energy usage, the costs of constructing, operating and maintaining the grid are not recovered from those customers who are able to displace their kilowatt hour usage with on-site generation. Those costs are instead recovered from customers without on-site generation.

Q. Why is Net Energy Metering important to the adoption of distributed energy?

A. Net energy metering is a grid-enabled energy service that offers an inexpensive way to address a number of the shortcomings of small scale clean energy resources (e.g., intermittency) by acting as a substitute for on-site energy storage and other technical requirements that would be necessary if net energy metering or an equivalent utility service were unavailable. Most small scale customer-generators are unable to synchronize their energy consumption with their electricity production, are unable to increase production to meet increased demand for electricity, and must have reliable backup for those times when the energy resource (e.g., the sun) is not available. They are intermittent resources that produce electricity when they *can*, not necessarily when it is needed. Net energy metering fulfills an essential service by reliably providing for all of the customer's energy consumption while enabling prosumers to generate as much of their own energy as they can. I would argue that without a grid connection, rooftop solar and other small scale renewable energy resources are simply not viable. This is not due to any real or perceived financial subsidy; it is due to the essential functionality provided by the grid itself. It is the grid connection that is vital to prosumers, not the net metering subsidy.

Q. Do customer-generators have alternatives to net energy metering?

A. Yes. Prosumers can accomplish the same objective of offsetting their energy consumption while realizing full retail value for their generation by installing on-site energy storage (e.g., batteries), thus eliminating the need to export surplus generation to the utility. However, energy storage is expensive and would detract significantly from the economics of clean energy projects. Grid access provides a simple and inexpensive (currently "free") alternative. Absent a grid connection, the cost of a typical residential rooftop solar installation would be greatly increased, and therefore uneconomic. Net energy metering, under current policy, is essentially a free service that allows prosumers to forego the expense of energy storage.

It is noteworthy that companies including Tesla and SolarCity have recognized that net energy metering is essentially a free energy storage service. As noted in a lengthy article highlighting the clash between net metering and storage, Mateo Jaramillo, Tesla's director of powertrain business development, was quoted as saying that net metering creates a disincentive to add energy storage, limiting the value of battery storage in many places in the U.S.

> "Net metering is essentially a free battery," Jaramillo said. "You basically sell your power back to the utility, then you just buy it back at the same rate later. So it's hard to compete."[2]

In a separate article, SolarCity spokesman Jonathan Bass was quoted as saying that SolarCity had decided not to install the Tesla Powerwall battery optimized for daily

[2] Environment & Energy Publishing (E&E Publishing, LLC), TECHNOLOGY: Net metering vs. storage creates clash between some allies, September 23, 2015 found at http://www.eenews.net/stories/1060025111

use because the battery "doesn't really make financial sense" due to regulations that allow most U.S. solar customers to sell extra electricity back to the grid.[3] A footnote attributed to this statement notes that one of the reasons Tesla's Powerwall batteries don't make sense for many U.S. customers is the policy of net metering.

Q. Why are these distinctions important?

A. In popular understanding, net energy metering has become synonymous with two things: i) a financial incentive to customer-generators that values all of their generation output at the full retail price, including any occasional excess, and ii) the practice of using a single electric meter that is permitted to turn backwards. This perpetuates a widely held misconception that the purpose of net metering is to "properly value" a customer's generation at the full retail rate (the rate at which they normally purchase electricity) while avoiding duplicative metering costs. This limited perspective on net energy metering fails to discern the true value of the net metering service and instead attempts to focus attention on the value and benefits of renewable energy as a matter of public policy. As a company, we do not dispute the value and benefits of clean energy, but we believe an affordable and reliable electric grid is essential to the wide scale expansion and adoption of distributed energy resources.

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[3] Bloomberg, Tesla's New Battery Doesn't Work That Well With Solar, May 6, 2015 found at http://www.bloomberg.com/news/articles/2015-05-06/tesla-s-new-battery-doesn-t-work-that-well-with-solar

Q. Are there other misconceptions about net energy metering that should be clarified?

A. Yes. A great deal of debate over net metering has focused on the price of the credit for "excess" energy exported to the grid (i.e., how energy not needed for internal consumption is valued), which is somewhat of a red herring. For most customers, the amount of "excess" energy is *de minimis* as most energy is only temporarily exported to the utility until it is needed, whereupon it is imported back from the grid in order to offset energy purchases from the utility. <u>All of the electricity produced</u> by customer-generators under the current net metering rate design displaces energy purchases from the utility, and hence, all such electricity production avoids paying for distribution services to the extent such services are recovered through kilowatt hour energy usage.

IV. THE VALUE OF THE GRID

Q. Why is the electric grid important to the development and adoption of distributed energy resources?

A. An interconnection with the utility gird offers a number of valuable benefits to small customer-generators that greatly reduces the installed cost of distributed renewable energy resources, including the following:

1. Balancing Service
2. Supplemental Service
3. Backup Service

4. Regulation Service

Q. What is Balancing Service?

A. As already described, small scale renewable energy producers are unable to balance their energy consumption and their electricity production. In simple terms, prosumers consume and produce their electricity independently of one another and the hours during which prosumers generate electricity do not correspond to their peak use of electricity. As a result, prosumers must have a way to "store" surplus output when it isn't needed and then draw upon stored electricity when consumption exceeds production in order to balance supply and demand. The utility system provides a service akin to energy storage by allowing prosumers to export surplus energy to the grid in much the same way that they might charge batteries, and then draw this energy back from the utility grid at a later time when it is needed. Without the ability to export electricity to the utility grid, prosumers would need to install their own energy storage (e.g., batteries) at significant cost.

Q. What is Supplemental Service?

A. By connecting to the utility grid, prosumers are able to tailor the capacity of on-site generation based solely on project economics without consideration of peak load demand or other requirements (e.g., motor starting) because on-site electricity production can be supplemented with electricity imported from the utility grid *any time it is needed*. Without this ability to supplement internally generated electricity with imports from the utility, it would be necessary to oversize generating equipment and/or increase energy storage to cover the full range of customer electricity consumption at all times of the day, month and year. For example, a typical rooftop solar installation may produce sufficient electricity to cover energy consumption during many months of the year, but it may not be able to meet air conditioning demands in the summer or heating demand in the winter. It would be uneconomic to size on-site generation to meet peak demands that may only be present for a few weeks each year.

Q. What is Backup Service?

A. As with other types of customer generation, consideration must be given to backup should a distributed energy resource fail to produce adequate output. This is especially true with intermittent resources such as solar or wind. These resources may fail to produce adequate output for a variety of reasons, including the most obvious – lack of wind or lack of sun. Calm weather or cloudy days may result in insufficient output to cover even basic household requirements. In the case of rooftop solar, panels may not produce electricity in the winter simply because they are covered in snow. The utility grid offers reliable and inexpensive backup service to supplement or replace on-site generation whenever the need should arise. Lacking a utility connection, the customer would need to install redundant or supplemental energy sources, or do without electricity.

Q. What is Regulation Service?

A. In addition to other requirements, customers need electricity service that is regulated within acceptable voltage and frequency parameters. Utilities provide electric service within a prescribed voltage range and at a constant frequency, while maintaining high AC waveform quality. Connection to the utility grid ensures that on-site voltage and frequency are stabilized to match that of the grid. Absent a grid connection, on-site controls would be needed to ensure voltage and frequency regulation and AC waveform quality.

Q. Is there evidence supporting the benefits of the grid to small scale renewables?

A. Nowhere are the benefits of the grid more evident than in current analyses of residential solar grid parity (i.e., "socket parity").[4] For example, according to a recently published report by GTM Research, 20 U.S. states have already reached or surpassed grid parity, and 42 states are expected to reach that milestone by 2020 under business-as-usual conditions. New Hampshire is identified among the 20 states that have already attained grid parity.[5] What is often overlooked by casual readers of such reports is that all of the analyses forecasting grid parity are based on grid-connected solar. None of these analyses even consider the economics of off-grid installations. Why? Because the increased cost of off-grid operation would be prohibitively expensive, and would result in a cost of electricity far greater than the utility rate. There would be no grid parity, anywhere, without a grid connection. To repeat what I said earlier, it is the grid connection that is essential to small scale renewable generators, not the net metering subsidy.

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[4] Grid parity at the retail level is sometimes referred to as "socket parity," and occurs when the average price of on-site generation is equal to the price of electricity that a consumer buys at retail from a utility. Socket parity is a term used to distinguish between grid parity at the retail level, and wholesale grid parity where utility-scale wind or solar may be able to produce electricity at an average price that is competitive with conventional generation.

[5] GTM Research: U.S. Residential Solar Economic Outlook: Grid Parity, Rate Design and Net Metering Risk found at http://www.greentechmedia.com/articles/read/Slideshow-US-Residential-Solar-Outlook-Grid-Parity-Rate-Design-and-net

Q. Are there other important benefits of a grid connection?

A. Perhaps the most important benefit of a grid connection is the one that is most often overlooked: convenience. For customers hoping to integrate new clean energy technologies, grid-connected operation is simple, reliable, and effortless. It offers seamless convenience by allowing customers to both import and export electricity *as needed*, without having to take any action, and without having to change any household behaviors. When on-site production is insufficient to meet consumer demand for electricity, the utility service is always present to provide what is needed. Off-grid operation, however, is a “lifestyle” that dominates almost every household decision; a constant effort to balance electricity needs with electricity production. Forecasting weather, scheduling home activities, storing sufficient reserves, and making choices about which uses of electricity are necessities and which are luxuries. If production fails to keep up with consumption, the off-grid prosumer does without electricity. In short, a connection to the grid is what makes small scale clean energy generation both economically viable and socially acceptable to customers.

V. VALUE OF SOLAR (OR OTHER DG)

Q. Is the Company proposing to incorporate ‘Value of Service’ in the design of alternative net energy metering tariffs?

A. No. The Company believes that a viable and sustainable long-term net metering policy will only be achieved through transparent, efficient and *cost-based* rate designs that provide sufficient revenue to support the significant investments needed to modernize the grid, while also incenting appropriate behaviors and assuring fairness and equity among customers. Net metering tariffs and rate design methodologies must adhere to long-standing and well-established ratemaking principles that recognize the importance of cost causation among homogenous rate classes when setting rates. The inherently unmeasurable, imprecise and impractical approach of deriving a customer-based “value” for electric service is one of the reasons a cost-of-service model is used for rate setting purposes. This is also why the Company fundamentally disagrees with proposals to apply a "value of solar" benefit as an offset to the cost-based services the grid provides.

While utilities provide services at rates derived from the actual cost of providing those services, proponents of "value of solar" ascribe value to benefits that are not cost-based, are not measurable or accurately quantifiable, are often forward looking such that the benefits may be realized many years in the future if at all, and do not directly correspond to the cost-based service that is being offset. The Company believes developing rates that attempt to incorporate VOS within a cost-of-service framework is fundamentally apples-to-oranges.

Q. Solar advocates have argued that the value of electricity produced from solar exceeds the compensation received under net metering. Do you agree?

A. No. However, I have not attempted to refute all of the value areas identified in the various Value of Solar studies since most of the purported benefits are not related to the utility service we provide. It is important to recognize that this argument ("the benefits of current net metering policy exceed the costs") fails to distinguish where and how any such value can be realized, or how and by whom it is compensated; a model sometimes referred to as "rough justice." As noted in a paper recently authored by Susan F. Tierney of the Analysis Group, Inc.,[6] any assessment of the value of solar or other Distributed Energy Resources (DER) should be clearly separated into the value provided to the electric system and its constituent parts (the power generation system ("G"), the high-voltage transmission system ("T"), and the distribution system ("D")); and separately, the external value to society ('S").[7] In other words, to the extent such benefits exist and are quantifiable, they should be categorized according to whether they benefit G, T, D or S. Different DER technologies may have different attributes and different impacts on and contributions to the electric system; the value of solar to the distribution system ("D") may be small relative to the value to G, T or S.

Segregating the value areas in this way is helpful because it provides a simple conceptual framework for categorizing not only the benefits of clean energy technologies, but also the revenue sources available to compensate those benefits. Value provided to the electric system and its constituent parts (D, T, and G) can be evaluated in the context of avoided costs and is well suited to traditional cost-based rate design and cost causation principals. External and societal benefits cannot be

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[6] The Value of "DER" to "D": The Role of Distributed Energy Resources in Supporting Local Electric Distribution System Reliability, Susan F. Tierney, Ph.D., Analysis Group, Inc., March 31, 2016.

[7] Id at Page ES-2.

easily quantified as avoided costs and often incorporate forward-looking assumptions that may be better compensated through other policy mechanisms such as rebates, tax credits, renewable energy certificates, and other incentives.

Value Area	**Type of Benefit**	**Compensation**
Distribution ("D")	Cost-based (e.g., capacity, losses)	Traditional Cost-Based Rate Design
Transmission ("T")	Cost-based (e.g., capacity, losses)	
Generation ("G")	Cost-based (e.g., LMP, default service)	
Society ('S")	External, Forward looking (e.g., environmental, health)	Other Policy Mechanisms

Q. Please describe how environmental and societal benefits can be addressed through policy mechanisms outside of traditional cost-based rate design.

A. I would argue that environmental and societal benefits are already being compensated outside the ratemaking process. For example, the environmental benefits of renewable energy are being compensated through Renewable Energy Certificates ("RECs"). Solar-PV installations are considered Class II sources which encompasses generation facilities that produce electricity from solar technologies and began operation after January 1, 2006. By definition, a REC is intended to compensate renewable generators for its beneficial "environmental attributes", and is *in addition to* the value of the underlying electricity itself.

Policymakers have established a comprehensive framework under the state's Renewable Portfolio Standard ("RPS") to increase the penetration of renewable energy resources by requiring each electricity provider to meet customer load by purchasing or acquiring certificates representing generation from renewable energy based on total megawatt-hours supplied. If the electricity providers are unable to meet the RPS requirements by purchasing or acquiring renewable energy certificates, they must pay alternative compliance payments (ACPs). The Inflation Adjusted ACP Rate for 2016 is $55.72 per MWh for Class II renewables. Any Alternative Compliance Payments from the utilities are used to fund a Renewable Energy Fund which in turn provides rebates for renewable energy projects including solar-PV. The program offers rebates to qualifying homeowners who install photovoltaic (PV) or wind turbine electrical generation systems 10kW or smaller. Rebate levels are $.50 per watt of panel rated power up to $2,500, or 30% of the total facility cost, whichever is less.

The costs of RECs and ACPs are already being paid for by all customers in their electricity rates and are recovered through kWh charges. To the extent net metered customers offset all or part of their electricity purchases from the utility, non-generating customers are already compensating generating customers for the societal benefits they provide. When valuing these benefits through rates or other mechanisms, there needs to be a recognition of and credit for the compensation already received through the RPS program.

Q. Are there other policy mechanisms that are intended to compensate and incentivize solar projects for their beneficial societal value?

A. Yes, at the federal level, solar projects are eligible for the solar Investment Tax Credit (ITC), which is a 30 percent tax credit for solar systems on residential (under Section 25D) and commercial (under Section 48) properties. The Section 25D residential ITC allows the homeowner to apply the credit to his/her personal income taxes. This credit is used when homeowners purchase solar systems outright and have them installed on their homes. In the case of the Section 48 credit, the business that installs, develops and/or finances the project claims the credit. This tax credit provides a dollar-for-dollar reduction in the income taxes that a person or company claiming the credit would otherwise pay the federal government. In addition, at the local level many New Hampshire communities also offer property tax exemptions for renewable energy projects.

Between the rebates available from the New Hampshire Renewable Energy Fund and the tax credits available through the ITC, solar customers are already eligible for credits totaling as much as 60% of the initial investment cost of a new net metered solar installation. In addition, those customers are eligible for solar RECs valued at roughly 5.56 ¢ per kWh if the ACP payment is used as a proxy.

Q. How is solar generation compensated for the value provided to the electric system and its constituent parts (D, T, and G)?

A. Generation is compensated under net energy metering through offsets to default service, which on average is higher than the Locational Marginal Price of electricity (LMP). Transmission is similarly compensated through offsets to default service since it is part of the default service rate and reflects the cost of transporting external generation to the local delivery system. As a result, net energy metering more than adequately compensates solar generators for the value they provide to T and G. It is in the area of distribution that the existing net metering policy fails to properly reflect the value of services provided. Because distribution service (a demand-based service) is recovered through kWh energy charges, prosumers avoid paying for a portion of the services they are receiving, in turn shifting the cost of those services onto other customers. In essence, solar generators are receiving subsidized distribution service and solar advocates employ "value of solar" arguments to justify continuing this subsidy without addressing all of the other policy mechanisms already providing compensation for the identified benefits.

As I stated earlier, the Company is seeking to clearly separate its distribution cost of service from any external, societal and forward looking benefits that the Commission may deem appropriate. I believe many of those benefits are already being compensated, at least partially, through state and federal policies aimed at promoting and expanding renewable energy. To the extent clean energy technologies offer additional benefits to customers that should be reflected in rates, those benefits should be recognized in the appropriate rate components from which such value is derived or associated and should not be monetized through the utility's distribution cost of service. As a result, the remainder of my testimony is limited to the value of solar to distribution ("D").

VI. VALUE OF SOLAR TO DISTRIBUTION ("D")

Q. In locations where the Company is making investments to increase capacity, can rooftop solar help reduce the Company's peak demand, thereby avoiding investment costs?

A. There may be opportunities for rooftop solar to reduce the Company's peak demand. However, such opportunities are location-specific and are greatly limited by the intermittent and non-coincident characteristics of solar energy. In order to properly consider the value of solar as a substitute for traditional distribution investments, it is first necessary to evaluate whether distributed solar provides the same or equivalent functionality that would be provided by the utility investment it is replacing. In that regard, in addition to cost, it is important to evaluate whether rooftop solar or other non-wires alternatives provide the necessary characteristics of availability, reliability, and long term sustainability.

Q. Please explain how availability is an important consideration impacting planning and investment decisions.

A. In order to substitute for traditional ("wires") investments, distributed generation must be available in *sufficient* amounts *when* and *where* it is needed, and in the *timeframe* needed to address capacity constraints. In the case of solar generation, production output is not dispatchable and typically does not coincide with peak consumption, making it a poor choice for meeting customer demand. To the extent there is some minimal coincidence with peak demand on a circuit, it makes little sense to install many times the needed capacity in order to achieve a small reduction in demand during peak hours as excessive penetration of solar is likely to cause more problems than it solves.[8] In addition, while rooftop solar is expanding rapidly due to net metering and attractive subsidies, these generation resources are being installed in response to customer interest, not utility need. As a result, most net metered systems are being installed in areas where the capacity has little value. Solar is generally not available in sufficient quantities, when and where it is needed, to offer a viable alternative to traditional investments.

To the extent solar DG could be better targeted to those areas where there is a locational capacity value, there is an additional challenge that must be considered – new DG capacity must be available in the *timeframe* needed to address capacity constraints. Most circuit loading concerns are highly localized in nature and result from new customer projects such as housing subdivisions, commercial development, etc. The Company rarely knows of new customer projects more than a year in advance and is often in a position of implementing system upgrades on relatively short notice to ensure adequate service while meeting customer needs. In order for solar or other forms of distributed generation to substitute for utility investments, sufficient capacity must also be available on relatively short notice to

[8] Reference example provided at page 10.

ensure adequate service while meeting customer needs. DG capacity that "could" address a capacity need is of no value if sufficient capacity cannot be achieved in the timeframe required.

Q. How is reliability different than availability?

A. Reliability refers to the ability of the generator to perform its intended or required function on demand and without failure. For an energy source to be reliable, it must be able to consistently meet electricity demands by supplying its power without interruption. In the case of solar generation, it is inherently unreliable due to its variable and intermittent nature. Cloud cover, snow cover, or other environmental conditions can result in a sudden and unexpected loss of generation output at a time when it is needed for system integrity. In order to substitute for traditional ("wires") investments, distributed generation must be able to perform at levels of reliability comparable to the utility investments it replaces or else the utility will be forced to make redundant investments to back up intermittent generation when it is unavailable. In reality, solar PV is not reliable and cannot be depended on to meet customer demand during critical peak periods and as such should be awarded little capacity value if any.

Q. Does geographic diversity address some of these concerns with intermittency?

A. Geographic diversity certainly helps to the extent systems are dispersed over a wide area. The question is how large a geographic area is needed to provide any substantive geographic diversification? In reality, the closer one gets to the customer, the less likely there will be any benefit from geographic diversity. At the customer location, there is no geographic diversity and the utility is unlikely to see any incremental savings from a solar facility. The larger the geographic area and the higher up the electric system, the more potential for "some" benefits. However, given the limited geographic areas of the Company's territories, the benefits of geographic diversity are likely to be minimal even for the system as a whole.

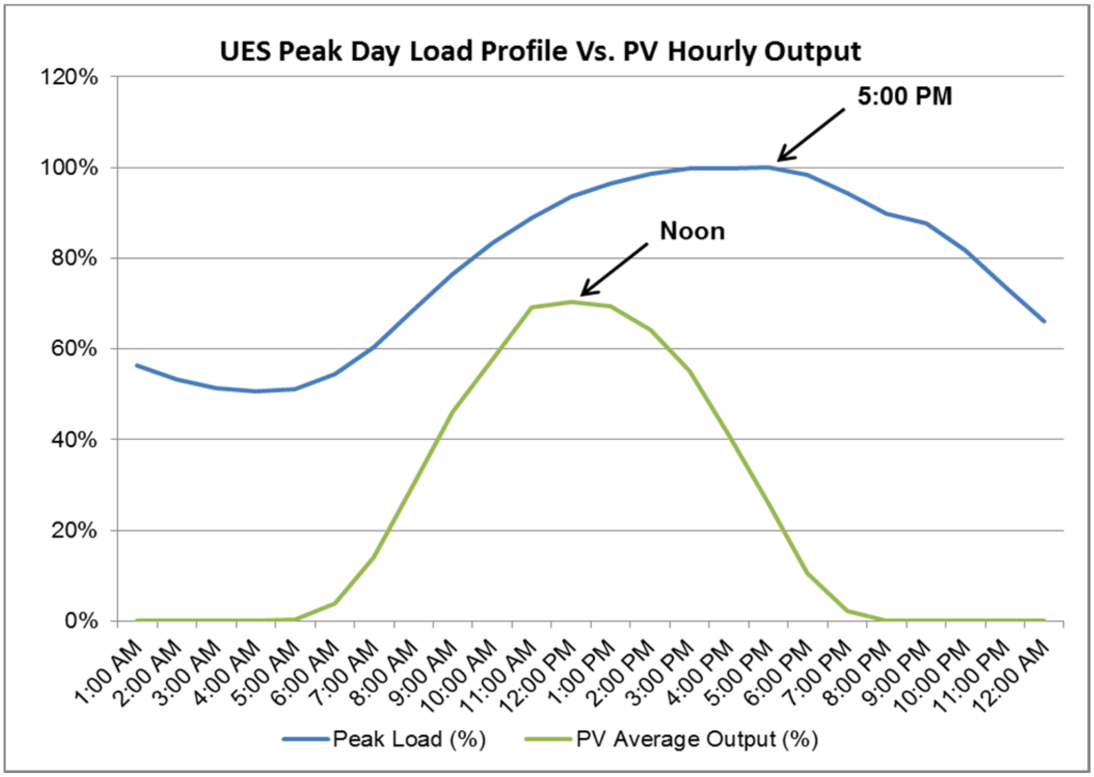
Q. Solar proponents often cite reliability as a "benefit" of solar. Doesn't this conflict with your assessment of the reliability of solar generation?

A. There is no basis to assert any distribution reliability benefits from grid-connected solar or DER. Solar does not make the grid more reliable or resilient, nor does it improve power quality in any way. Solar generation does not benefit SAIDI, SAIFI, CAIDI or any other accepted measure of reliability. When the grid goes down, all interconnected generation also goes down. In fact, as a requirement of interconnection, any power-producing inverters connected to the grid must turn off virtually instantaneously in the event of a power outage to prevent DC-to-AC inverters from back feeding power into the system. Such back feed could pose a risk to workers and could also damage equipment connected to the grid. This is recognized in both UL 1741 and IEEE 1547 which specifically require protection against unintentional islanding.

Q. You stated that peak solar production typically does not coincide with peak consumption, making it a poor choice for meeting customer demand. Can you provide evidence of this in the context of utility planning?

A. Yes. In Figure 3, I have provided the peak day load profile for our most recent New Hampshire system peaks which occurred on August 11 and 12, 2016. In Concord, temperatures reached 98 degrees on August 11th and 99 degrees on August 12th; both record highs for those dates. In the Seacoast, temperatures reached 96 degrees on both days. In addition, humidity was very high with dew points in the upper 60's and low 70's throughout this stretch. As a result, UES experienced significant demands on both days that will likely stand as the seasonal peaks for 2016. The hourly loads were slightly different on each day so I took the average of the hourly demands over these two days to develop a representative 24-hour load profile for UES for the peak day. As shown in Figure 3, demands peaked late in the day at 5:00 PM and persisted well into the evening. On a percentage basis, demand was 98.3% of peak at 6:00 PM and 94.5% of peak at 7:00 PM. As a result, solar production at the time of peak provides only limited coincident output (demand reduction) and is rapidly declining thereafter, offering very little coincidence at later hours.

Figure 3.



Q. Even if solar is not entirely coincident with the demand peak of the local distribution system, isn't there still a capacity benefit at the time of peak?

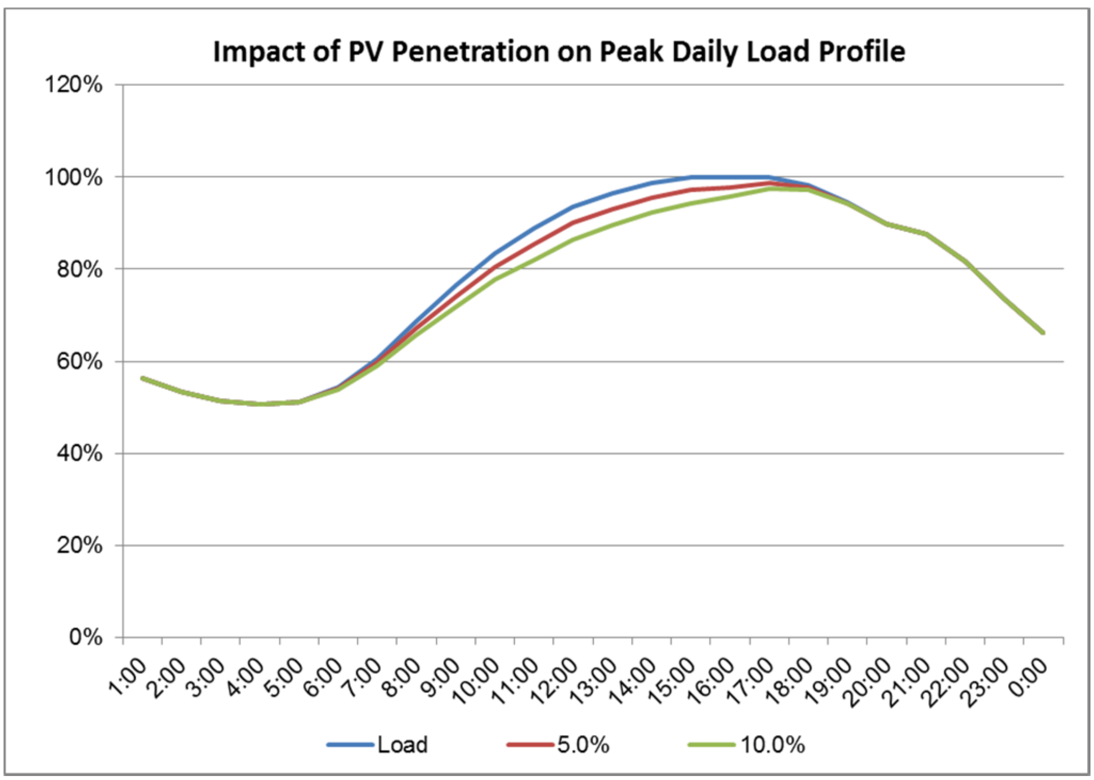
A. Yes, there is a small reduction in peak demand at time of peak. However, as penetration of solar-PV increases, it is important to recognize that two things occur:

1. While there is a small reduction in peak demand associated with solar production, as penetration increases the time of peak is shifted to later in the day when peak demand is only slightly lower. A peak that originally occurred at 5:00 PM may now be shifted to 6:00 PM or 7:00 PM.

2. As penetration of solar PV increases and the peak is shifted to later in the day, solar production has less and less coincidence with peak demand. Ultimately, solar production will not contribute to any reduction in peak demand beyond 7:00 PM regardless of penetration.

To summarize, while increased solar DG may slightly reduce peak demand, the magnitude of any such reduction is limited because the demand peak is shifted to later hours where there is less and less coincidence. As solar penetration increases, the peak-hour demand ultimately shifts to the final daylight hour when solar DG is no longer generating or contributing to peak reduction. As a result, the capacity value of solar DG solar diminishes with increased penetration. I have shown this in graphically Figure 4.

Figure 4.



Q. What do you conclude from this analysis?

A. Given that our system loads persist well into the evening and demand is still at 98.3% of peak at 6:00 PM and 94.5% of peak at 7:00 PM, this suggests that solar production has the potential to shave, at most, a few percent off our system peak even at very high levels of penetration. This is evident in Figure 4.

Q. Do you have any examples demonstrating why you believe solar production is not a good alternative to traditional investment for meeting customer demand?

A. Yes. One such example would be a new substation recently placed into service in the Seacoast area. This substation, known as Kingston Substation, is currently included in the Company's rate request in DE 16-384. As described in testimony of Kevin E. Sprague, and in discovery, Kingston substation consists of two parallel 60 MVA transformers feeding four 34.5kV sub-transmission lines that supply various distribution substations. These distribution substations, in turn, provide service to the towns of Atkinson, Plaistow, Newton, Kingston, Danville, East Kingston, and portions of Exeter, Kensington, Hampton Falls and South Hampton. Kingston Substation is expected to serve a total area load of approximately 70 MVA with fully redundant transformer capacity. The total cost of the substation is estimated at $11.75 million. If solar DG were considered as a "non-wires" alternative to Kingston Substation the question might be posed:

"If $11.75 million were spent on new solar DG, would the resulting coincident solar production be sufficient to avoid the investment cost of the substation project?"

The answer to this question is a resounding "no."

If the money spent on the substation were instead spent on new solar DG, I estimate that $11.75 million would be sufficient to fund roughly 3.4 MW to at most 4.5 MW of new solar capacity depending on the mix of residential, commercial and utility-scale solar.[9] However, it is important to recognize that this is simply the installed capacity and not the production output coinciding with peak demand. Consistent with the UES peak day load profile shown in Figure 3, demand in the Kingston area also peaks at 5:00 PM and persists well into the evening. The Seacoast area load is at 99.3% of peak at 6:00 PM and 95.7% of peak at 7:00 PM. During the time period when the Kingston area experiences the heaviest demand, solar output on average would be at 26% or less of the installed capacity. As a result, $11.75 million in new solar capacity would yield (at most) approximately 1 MW of demand reduction at peak. This reduction in peak demand is very small in comparison to the total area load being served and is only a fraction of the incremental capacity needed. On a cost comparison basis, demand reduction is achieved at an installed cost of about $11,750 per kW of coincident output. In comparison, the substation is designed to serve an area load of 70 MW with full redundancy corresponding to an installed cost of about $168 per kW of capacity. New solar is approximately 70 times more expensive as a capacity option, and is not comparable in terms of availability and reliability. If costs were normalized to provide equivalent reliability, the disparity would be far more dramatic.

Q. In addition to availability and dependability, how does long term sustainability affect planning does and investment decisions?

A. In order for the utility to plan on and rely on distributed resources including solar generation, this supply must be available and sustainable over the long term. Most

[9] Based on assumed installed costs of $3.50 per watt for residential rooftop solar and $2.60 per watt for utility-scale solar.

utility investments are long term investments that will be capable of meeting customer demand for many years, if not decades. In some cases, as with Kingston Substation, it takes many years of planning to accomplish a significant capacity addition, and once installed, will be expected to reliably meet customer demand without failure for decades. Whether solar generation can reliably deliver output to the distribution system over the long term remains to be seen. Whether the design life of a solar facility is equivalent to the design life of a transformer or other traditional investment is another question. Photovoltaic panels experience degradation resulting in loss of efficiency and a reduction in rated power output at a predictable rate over time. However, there is limited data supporting the expected life expectancy of the panels and inverters being installed today.

Q. Advocates of solar have suggested that distributed solar installed on the distribution system can reduce maintenance costs and extend the life of utility plant. Can this improve the long-term sustainability of the distribution system?

A. There is no basis to assert any life extension of distribution equipment resulting from grid-connected solar or DER. If anything, grid-connect solar is more likely to increase the duty on certain equipment, thereby shortening life and increasing maintenance costs. First, it’s important to recognize that most equipment on the distribution system is entirely static (no moving parts) and the expected life of most utility plant has no relationship to voltage, current, demand or electric system characteristics. Poles, crossarms, guy wires, and other plant are entirely structural in nature and do not even come directly in contact with the electrified part of system.

Electrical components such as insulators, wire, and cutouts are rated for the voltage and current they carry and their expected life is not determined by loading or loading variability as long as they operate within design parameters, and they generally require no maintenance. Certain types of equipment, however, do have moving parts and the maintenance required and the life expectancy of the equipment is a function of how frequently they are called upon to operate. This includes reclosers, regulators and breakers. Regulators in particular are likely to operate far more frequently if significant penetration of solar DG is present on a circuit because they will need to operate in response to the constant variability in PV output.

Q. Please summarize your testimony with respect to the value solar brings to the distribution system.

A. I don't believe solar DG provides any measurable or verifiable benefits to the distribution system. If anything, solar DG is as likely to increase costs as decrease costs. Solar generation is a poor substitute for traditional "wires" investments because it cannot provide the needed characteristics of availability, reliability and sustainability. Attempting to substitute traditional distribution investment for DG investment in order to claim "value" to the grid is both misguided and counterproductive to established policy goals.

As I have emphasized throughout this testimony, connection to an affordable and reliable electric grid is essential to the expansion and adoption of distributed renewable energy. Without a grid connection, small scale renewable energy is neither economically viable nor operationally palatable to customers. Furthermore, the ability to seamlessly integrate all types and sizes of electrical generation and other DER using simplified interconnection processes will be one of the cornerstones of a modernized grid. As such, utility investments to maintain a robust and reliable grid while improving DG hosting capacity and increasing grid intelligence are extremely important to the New Hampshire Energy Strategy if consumers are to be empowered to manage their energy use by taking full advantage of the information, market mechanisms, energy efficient technologies, diverse fuel sources, and transportation options available to them. Substituting investment in the distribution system for investment in DER is likely to reduce reliability and hosting capacity, and will likely hinder efforts to expand small scale renewable energy.

VII. RECONCILING POLICY OBJECTIVES WITH RATE DESIGN

Q. Given the success of net metering policy as a means to encourage the adoption of small scale energy generation, why is a change in rate design needed?

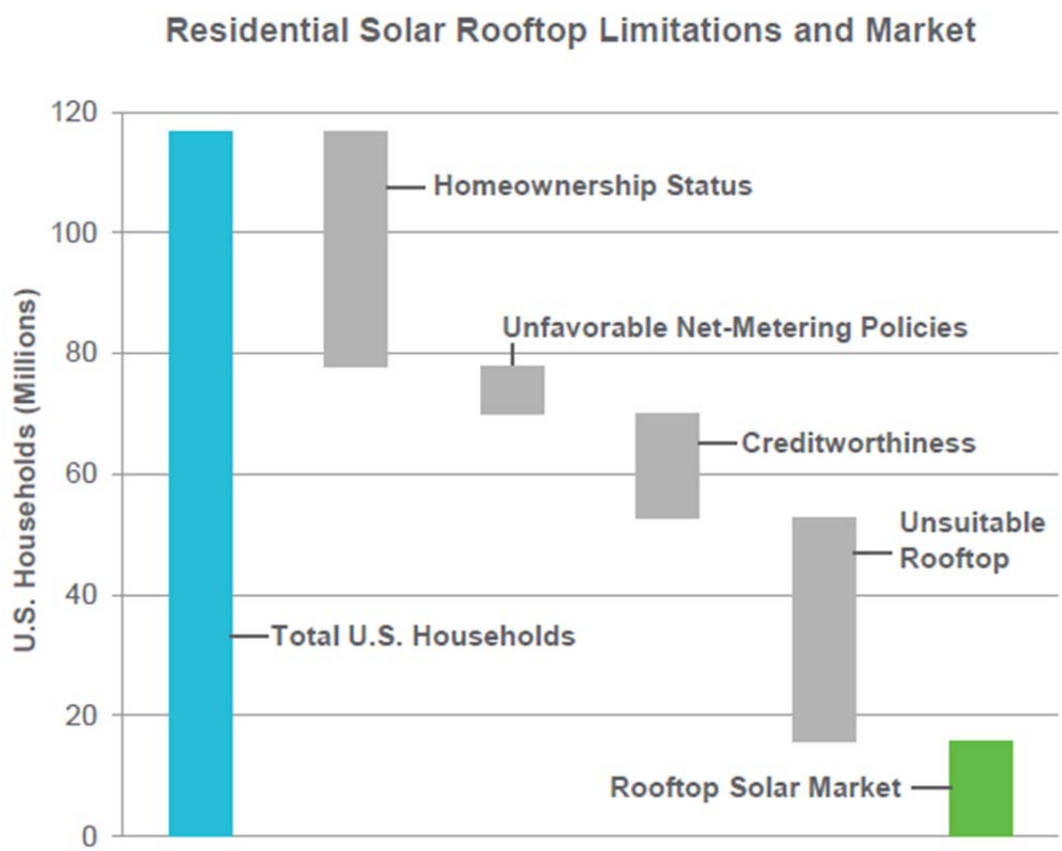
A. Until recently, customer adoption of rooftop solar and other technologies was inconsequential, and the investments that might be needed to address increased penetration of DG were not a concern. Cross-subsidies and cost-shifting were not significant in magnitude and the impact on non-generating customers was small. However, as these new technologies gain widespread acceptance and DG penetration increases, this will no longer be the case. At higher penetration levels, it will become necessary to invest in upgrades to the electric system in order to accommodate the increase in distributed resources. Under existing rate designs, these upgrades will be recovered not from those customers with distributed generation (cost causers), but from the non-generating customers. Issues of cost recovery in the context of grid modernization, especially the recovery of those investments needed to accommodate increased penetration of DG, will exacerbate concerns over cross-subsidies between consumers and prosumers.

Q. Even if cross-subsidies exist, don't all customers have equal opportunity to make choices that allow them to take advantage of net energy metering?

A. No. In fact the opposite is true. According to a recent report from GTM Research, most households in the United States are unable to install rooftop solar due to limitations that include home ownership (e.g., rental), credit worthiness, and unsuitable rooftop (e.g., orientation or shading). As noted in a related article by Vox, "[y]ou can't install rooftop solar if you rent, own a condo, have poor credit, or have a rooftop that's shaded or faces the wrong way."[10] According to this analysis, only about one in seven U.S. households are suitable for solar, even in locations with favorable net metering policies. *See* Figure 5.

Figure 5.

[10] Vox: Here's how to get solar power if you don't own a roof, June 25, 2015 found at http://www.vox.com/2015/6/25/8846507/community-solar



Source: ScottMadden, GTM Research, Vox found at http://www.scottmadden.com/insight/community-solar-overview-of-an-emerging-growth-market/

Q. Why does this matter?

A. It suggests that net metering service is not equally available to all customers, and may in fact favor a small subset of customers who a) are homeowners, b) have good credit, and c) whose homes face in the right direction. While rooftop solar is not the only renewable technology to qualify for net energy metering, it is likely that other technology alternatives face similar limitations. The Company supports net *energy* metering as an important grid-enabled utility service for prosumers and believes it is important that net metering service be designed so that the large majority of customers who do not have this choice are not subsidizing a small subset of customers who do.

Q. Are there other considerations underscoring the need for rate design changes to improve the transparency of the net metering service?

It is important to recognize that policies designed to create incentives also create unintended consequences, and may result in perverse incentives that are contrary to the stated interests of the policymakers. Rate designs that incentivize one technology may do so at the expense of others. Moreover, short-term incentives can have long-term consequences. As I have already described, the ability to connect to a reliable electric grid is essential to the long-term adoption and growth of distributed renewable energy. It will be necessary to modernize the grid in order to integrate all types and sizes of electrical generation and storage systems using simplified interconnection processes and universal interoperability standards to support a "plug-and-play" level of convenience. As such, rate designs that favor specific technologies at the expense of others or that discourage needed investments or encourage the wrong investments may be contrary to the long-term interests of distributed renewable energy.

Q. Do you have any examples of current net metering policy incentivizing the wrong technologies, or having undesirable long-term consequences?

A. I have already alluded to one consequence of current net metering policy. Net metering in its current form acts as a disincentive to energy storage. Energy storage is widely seen as vital to the modernization of the electric grid, both to improve efficiency, reliability, and service quality, and to address the intermittency of clean energy resources. Ultimately, electrical energy storage technologies that are located in proximity to electrical load and distributed generation will help to defer the costs of transmission and distribution investment by better integrating intermittent generation and enabling peak shaving while achieving an efficient, secure and modern electrical grid. Unfortunately, energy storage will not be installed at the prosumer level if net metering policies offer a no-cost alternative. If current rate designs remain in place over the long term, utilities may need to invest in utility-scale storage systems in order to accommodate higher penetration of distributed energy, and non-generating ratepayers will effectively pay for those investments. In the alternative, utilities may invest in less costly alternatives to energy storage based on traditional least cost planning principals, thereby treating the symptoms and not the cause.[11] Incentivizing the wrong technologies in the short term may result in undesired outcomes and inefficient allocation of resources over the long term.

Q. Are there other compelling reasons to modify the current rate design for net metering service?

A. Yes. The current rate design for net energy metering is not transparent or efficient, and does not send appropriate price signals to customers. For example, prosumers may be incentivized to oversize a system and “bank” the overproduction to supply power during those times in the future when the panels aren't producing since there

[11] To provide one example, high penetration of distributed generation at the distribution level may result in reverse power flow during light load periods, which must be addressed through investments on the utility system. Changes to substation protection systems and relaying to *accommodate* reverse power flow are less costly than utility scale energy storage to *prevent* reverse power flow.

is no economic consequence for doing so. Prosumers can receive full retail credit delivering excess production to the grid during low price off-peak months such as May and October in order to consume extra energy during expensive months like July and August. Similarly, without appropriate price signals, customers have little incentive to install energy storage or demand response technologies to balance on-site energy consumption with on-site electricity production in a way that reduces demand on the T&D system. Under the current rate design for net energy metering, customers have little incentive to change their behavior in a way that provides benefits to the grid or to other customers, thereby forgoing many of the benefits often cited in value of solar studies.

Q. Why is it important that the rate design for net metering service be addressed now? Can't it wait until the issues you have described are more evident?

A. The current rate design for net energy metering is unsustainable, and the longer the rate design issues persist the more difficult it will be to address the cost-shifting and cross-subsidies in the future. Non-generating customers will pay for grid investments solely benefitting prosumers. As more customers choose clean energy technologies to supplement their on-site needs, a dwindling number of customers will be paying for the grid. Ironically, this will increase the volumetric energy rate for all customers, thereby raising rates for non-generators and increasing the incentive (subsidy) for prosumers. Grandfathering of prosumers who install clean energy systems under early net metering rate designs will exacerbate concerns over fair and equitable cost allocation.

VIII. UNITIL'S DER RATE DESIGN PROPOSAL

Q. What is Unitil proposing in order to address the rate design issue that you have described?

A. As described in testimony of Witness Overcast, Unitil proposes a three-part rate design that includes a demand charge for new Domestic customers who install distributed generation after the Company has reached its net metering capacity cap. This demand charge would recover only a portion of the Company's *distribution* cost-of-service and does not include transmission, generation, system benefits or other non-by passable charges. In developing this rate, the Company seeks to clearly separate the utility's cost of service from any external, societal and forward looking benefits that the Commission may deem appropriate.

Q. Why is a multi-part rate with a demand charge appropriate?

A. All customers connected to the utility system must be provided sufficient capacity to meet their peak load requirements irrespective of any on-site generation. The utility grid and the customer's service connection must be sized to deliver all of the customer's electricity needs at all hours of the day, and over all days, weeks, and months of the year. Due to generation intermittency and hourly load characteristics, a prosumer's peak demand for electricity may be no different than a traditional consumer, and the distribution facilities needed to serve this class of customers are essentially identical to the facilities serving non-generating consumers. Under current rate designs, however, prosumers and traditional customers pay very different amounts for identical demands on the distribution system. A demand charge allows the Company to appropriately charge prosumers for their use of the distribution system while continuing to allow net metering of energy purchases. Such a rate design is fully consistent with net energy metering, and with net metering service as defined under PURPA §111(d)(11).

Q. Is a three part rate with a demand component "fair" to the prosumer?

A. Yes. Customer demand is a metered quantity and the Company is proposing a 15-minute integrated demand reading that will be captured by the Company's advanced metering ("AMI") system. As a result, prosumers will pay only for their actual (measured) use of the distribution system and will be billed appropriately for the distribution facilities needed to serve their peak load requirements. As described in Witness Overcast's testimony, a multi-part rate also provides efficient price signals while correctly reflecting matching and cost causation principles. By sending appropriate price signals to prosumers, the Company's proposed rate design will encourage them to consider electricity demand when sizing generating equipment and better manage on-site energy usage. For example, prosumers would for the first time have an incentive to install on-site energy storage to better manage on-site energy generation and consumption.

Q. When will the new three-part rate take effect?

A. The new rates will take effect as soon as the Commission approves a new alternative net metering tariff. HB 1116 revised RSA362-A:9 to increase the "cap" on net energy metering (the total rated generating capacity owned or operated by eligible customer-generators) from 50 megawatts to 100 megawatts, with the additional 50 megawatts allocated to the state's 3 investor-owned electric distribution utilities. The 50 megawatts of additional capacity will be made available to eligible customer-generators until such time as alternative net metering tariffs approved by the Commission become available.

Q. Please explain the rate design rationale for this rate and how this rate is calculated.

A. Please refer to the expert testimony of H. Edwin Overcast, with Black & Veatch Management Consulting, LLC. This testimony fully describes the economic and rate design rationale for this rate; in addition, this testimony presents the new demand rate and explains its derivation.

IX. CONCLUSION

Q. Please summarize your testimony.

A. I have described the value of the grid, and explained why net energy metering or an equivalent utility service is important to the adoption and expansion of distributed energy. I have also explained why the service and functionality provided by the electric grid is vital to prosumers and is much more important than the economic subsidy of current net metering policy. Other key takeaways from my testimony include the following:

- New Hampshire's 10-Year State Energy Strategy envisions a future in which consumers are empowered to manage their on-site energy use and identifies various mechanisms to encourage small scale energy generation including expansion of the state’s net metering policy.

- The Company believes current policies and advances in distributed energy technologies are giving rise to a new and distinct class of customers who use the utility system differently than traditional consumers. These “prosumers” represent a class of customers unlike full requirements customers.

- Net energy metering should be viewed not as a subsidy, but as an important grid-enabled energy service that substitutes for on-site energy storage and other technical requirements. Connection to the electric grid greatly reduces the upfront investment cost of distributed energy.

- Prosumers use more grid services than traditional consumers despite lower net energy consumption because they use their utility service to both import and export electricity (two-way power flow). The distribution system was not designed for bi-directional power flow.

- New technologies and investments will be needed to accommodate growth of this new class of customers, and these investments may not benefit non-generating consumers. Under existing rate designs, non-generating customers will pay for grid investments solely benefitting prosumers.

- The hours during which prosumers generate electricity typically do not correspond to their peak use of electricity. As a result, a prosumer’s peak demand for electricity may be no different than a traditional consumer. Under current rate designs, prosumers and full requirements customers pay very different amounts for identical demands on the distribution system.

- The Company believes that an alternative net metering tariff should be developed from transparent, efficient and *cost-based* rate designs that provide sufficient revenue to support the significant investments needed to modernize the grid, while also incenting appropriate behaviors and assuring fairness and equity among customers.

- The Company is proposing a three-part rate design that includes a demand charge for new Domestic customers who install distributed generation after the Company has reached its net metering capacity cap. This demand charge will allow the Company to appropriately charge prosumers for their use of the distribution system while continuing to allow net metering of energy purchases.

- A multi-part rate will provide efficient price signals, encouraging prosumers to consider electricity demand when sizing generating equipment and better manage on-site energy usage. Prosumers would for the first time have an incentive to install on-site energy storage to better manage on-site energy generation and consumption.

Q. Does this conclude your testimony?

A. Yes, it does.