Q. Are you the same Douglas L. Marx who filed rebuttal testimony in this proceeding?

A. Yes.

Q. What is the purpose of your surrebuttal testimony?

A. I respond to the rebuttal testimony of the Joint Parties witnesses Benjamin Norris and Pamela Morgan. Specifically I address assertions they made regarding the distribution system and distribution planning.

Q. Mr. Norris' rebuttal testimony includes a statement that "NEM generation occurs adjacent to the point of consumption"[1] and further implies that this avoids losses for transmission lines, substation transformers and distribution lines. What is your response?

A. That's only true if the generation occurs at the same time and produces the same quantity as the adjacent load demands. Consider the profile of net generation and load shown in Figure 1.[2] (A similar chart, titled the "3 States of Net Metering" can be found in a 2013 report by Crossborder Energy.[3]) During the midday hours, only a portion of the energy generated occurs adjacent to the point of consumption. The remaining power is exported to the distribution grid and must be transported to other points where load exists. In an area with high concentrations of rooftop solar, the level of export can be relatively high. Exported energy would be subject to losses as well as it moves across the grid.

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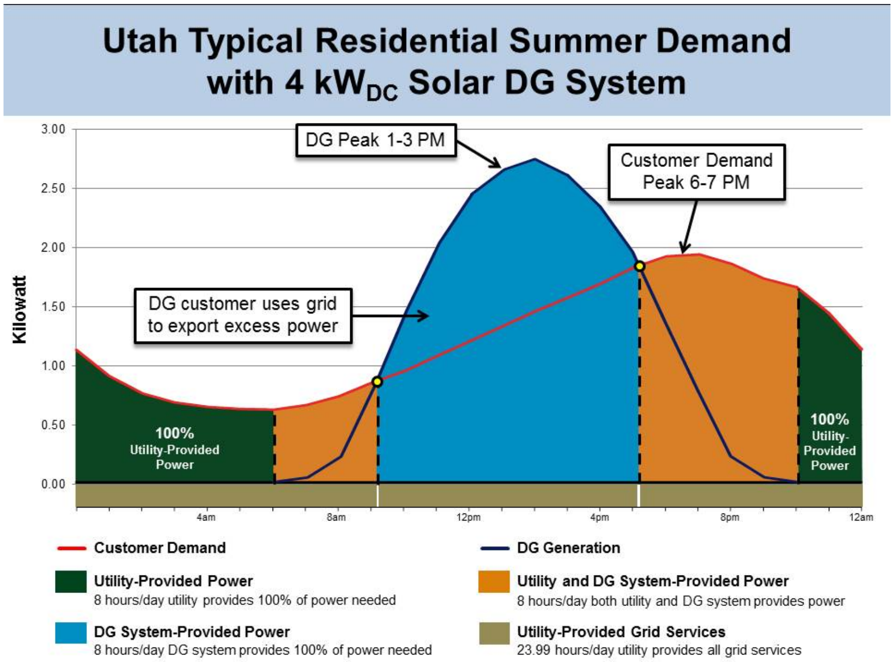
[1] Rebuttal Testimony of Benjamin Norris, page 16.

[2] This chart was included in a presentation made at the Utah Net Energy Metering Technical Workshop held on April 27, 2015.

[3] Thomas Beach and Patrick McGuire, *Evaluating the Benefits and Costs of Net Energy Metering in California*, at p.10 (2013). http://votesolar.org/wp-content/uploads/2013/01/Crossborder-Energy-CA-Net-Metering-Cost-Benefit-Jan-2013-final.pdf.

Figure 1



Q. Mr. Norris' rebuttal testimony includes a statement that "Distributed generation effectively reduces the load at the meter and the load at the distribution substation."[4] What is your response?

A. Electrical loads have two characteristics: energy and demand. Energy is a measurement of total electricity used for a period of time. Demand refers to the maximum amount of electrical energy that is being consumed at a given time. Both characteristics are applicable to generation facilities as well, whether they are centralized or distributed. In a system with rooftop solar, electrical energy will flow in both directions. For these purposes, forward energy flows will refer to energy delivered to a customer and reverse energy flows are energy received from the customer (exported to the grid). Rocky Mountain Power ("RMP" or the "Company") must design its facilities to meet the largest demand that can

[4] Rebuttal Testimony of Benjamin Norris, page 16.

reasonably be expected regardless of the direction of energy flow. Thus, when you consider the effect of reverse energy flows, the statement "distributed generation effectively reduces the load at the meter and the load at the distribution substation" is no longer true.

To illustrate, consider the average Utah residential customer. The average Utah residential customer consumes approximately 8,601 kilowatt hours ("kWh") of energy annually with a peak demand of 2.90 kW. In 2014, this peak occurred on July 13.

Now assume that a rooftop solar system is sized to produce enough energy on an annual basis for the customer to be considered net-zero. This will require a 5.65 kW_{dc} solar system to be installed. The peak solar generation, as calculated using NREL's PVWatts® online calculator, would have occurred on June 6, 2014, with a peak generation of 4.74 kW_{ac}. Figure 2 shows the customer's load profile and the gross solar production for June 6, 2014.

Figure 2

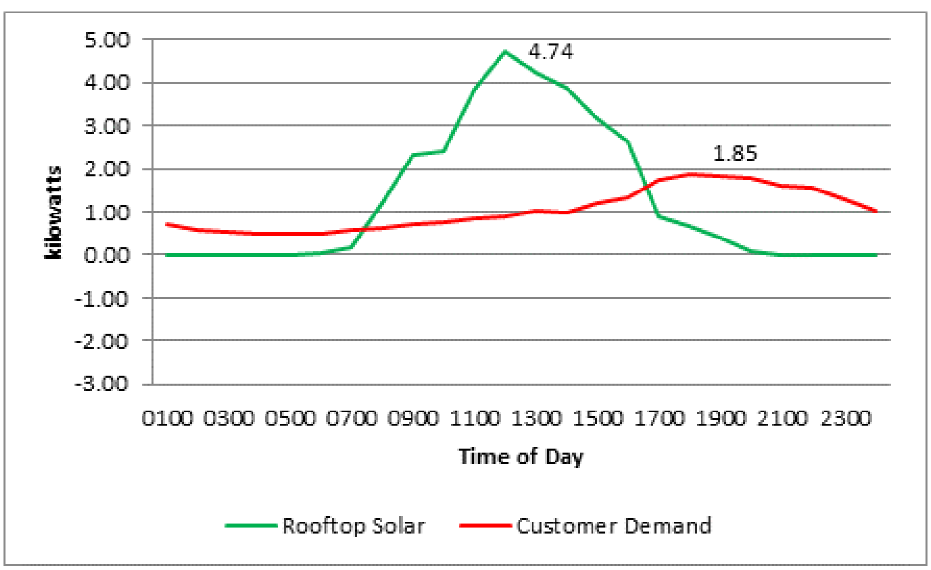
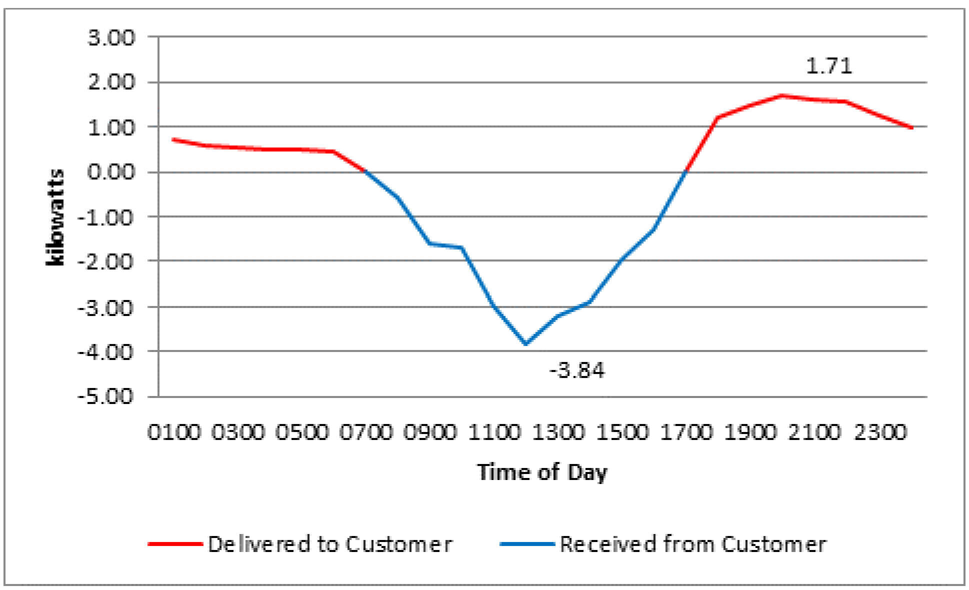


Figure 3 shows the net energy power flows that would be seen at the meter in both the forward and reverse directions. This is simply the sum of the customer's load (forward energy) and the gross generation (reverse energy). Traditionally, the customer's load demand would drive the sizing and design of the distribution facilities. Now, the net generation becomes the driving influence on sizing our local electrical facilities. So instead of planning for a peak load of 2.90 kW for this customer, the distribution system must be sized to accommodate 3.84 kW of reverse energy flow. In areas of high penetration of rooftop solar, the effect of the net generation can impact the distribution system significantly.

Figure 3



The example given above is based on the average Utah residential customer. Since this is the average, it would be expected that not all residential customers would have net generation that exceeded peak load demand. This is true. It is also true that a proportionate number of residential customers would have net generation that exceeded their peak load demand and in some cases by a significant level. The inability to forecast each individual residential customer's electrical use adds to the complexity of distribution planning. With distributed generation, the planning becomes even more complex requiring additional time, resources and diligence to design an efficient and reliable system.

Q. Mr. Norris' rebuttal testimony includes a statement that "To the extent that distributed generation is available at the time of the local load on distribution circuits, it would result in a reduction in future distribution capital investments."[5] What is your response?

A. This statement is incorrect. First, in doing our planning for future investments, the Company's designs are based on the best information available at the time. The Company cannot assume that distributed generation that the Company doesn't own or control will be installed, maintained or operated in a reliable fashion. Second, rooftop solar is not always "available at the time of local load". This is demonstrated in both Figures 1 and 2 above. Further, at the time of peak load demand, rooftop solar does little to offset load. The Company must design its facilities to meet the largest demand, forward or reverse, that can reasonably be expected at each point along the distribution system to ensure reliable service is available to all customers. This service must be provided during times of intermittent solar generation and limited generation due to cloudy days or other events. As new loads are added, either positive or negative, the distribution system will continue to evolve to handle those loads and additional investments will be required. Due to the dynamic nature of solar generation, the design and operation

[5] Rebuttal Testimony Benjamin Norris, page 17.

of the electric grid is becoming more complex and system changes will be required to continue to ensure safe and reliable electricity is delivered to all of our customers.

Q. Do you agree with Ms. Morgan's recommendation that "the Commission needs to ensure that planning and modification of the distribution system becomes transparent and subject to stakeholder and Commission input so that the capabilities of the distribution system evolve along with the needs and wants of RMP's customers."?[6]

A. The Company already works closely with local cities and communities as well as developers as we design and modify our electrical systems. This collaborative effort results in an efficient system that includes distributed generation and meets the needs and wants of our customers. The Company is very cost conscious in designing these systems to ensure our customers receive safe and reliable electricity at rates that are some of the lowest in the nation.

Q. Does this conclude your surrebuttal testimony?

A. Yes.

[6] Rebuttal Testimony of Pamela Morgan, page 13.