Before the Public Service Commission of Utah

In the Matter of the Investigation of the Costs and Benefits of PacifiCorp's Net Metering Program	**Docket No. 14-035-114** Vote Solar Exhibit 1.0 (DT)

DIRECT TESTIMONY OF RICK GILLIAM

ON BEHALF OF

VOTE SOLAR

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QUINN EMANUEL URQUHART
& SULLIVAN LLP
Jennifer M. Selendy
Daniel P. Mach
51 Madison Avenue, 22nd Floor
New York, NY 10010
Telephone: (212) 849-7000
Email: danielmach@quinnemanuel.com

WOOD BALMFORTH LLC
Mary Anne Q. Wood (USB#3539)
Stephen Q. Wood (USB# 12403)
60 East South Temple, Suite 500
Salt Lake City, UT 84111
Telephone: (801) 366-6060
Email: swood@woodbalmforth.com

Attorneys for Vote Solar

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INTRODUCTION

Q: Please state your name and business address.

A: My name is Rick Gilliam. My business address is 590 Redstone Drive, Suite 100, Broomfield, CO 80020.

Q: By whom are you employed and in what capacity?

A: I am the Program Director, DG Regulatory Policy for Vote Solar, a non-profit organization working to foster economic opportunity and mitigate climate change by bringing solar energy into the mainstream. Since 2002, Vote Solar has engaged in state, local and federal advocacy campaigns to remove regulatory barriers and implement key policies needed to bring solar to scale. Vote Solar is not a trade organization, nor does it have corporate members. Vote Solar has approximately 140 members in Utah, many of whom are customers of Rocky Mountain Power (RMP).

Q: On whose behalf are you testifying?

A: I am testifying on behalf of Vote Solar.

Q: Please provide your professional experience and qualifications.

A: I have been with Vote Solar since January of 2012 overseeing policy initiative development and implementation particularly as it relates to distributed solar generation or "DSG." Prior to joining Vote Solar, my regulatory and policy experience included five years in the Government Affairs group at Sun Edison, one of the world's largest solar developers at the time, as a manager, director and eventually vice president; twelve years with Western Resource Advocates as Senior Policy Advisor; and twelve years in the Public Service Company of Colorado (PSCo or the Company) rate division as Director of Revenue Requirements. Prior to that, I spent six years with the Federal Energy Regulatory Commission (FERC) as a technical witness (engineer). All told, I have nearly 40 years experience in utility regulatory matters.

I have a Masters Degree in Environmental Policy and Management from the University of Denver in Denver, Colorado, and a Bachelor of Science Degree in Electrical Engineering from Rensselaer Polytechnic Institute in Troy, New York. My curriculum vitae is appended to this testimony as Vote Solar Exhibit 1.1.

Q: Have you testified previously before this Commission?

A: Yes, I have (in Docket Nos. 01-035-10 and 99-035-10). More recently, I testified in RMP's most recent rate case Docket No. 13-035-184 on the solar surcharge proposed by RMP, the case which ultimately led to the filing of the compliance filing at issue in this proceeding. I have also testified in proceedings before the Arizona Corporation Commission, the Public Utilities Commission of Colorado, the Idaho Public Utilities Commission, the Nevada Public Utilities Commission, the New Mexico Public Regulation Commission, the Wisconsin Public Service Commission, the Wyoming Public Service Commission, and the Federal Energy Regulatory Commission.

PURPOSE AND SUMMARY OF TESTIMONY

Q: What is the purpose of your testimony?

A: The purpose of my testimony is to address the requests by RMP to segregate residential customers with rooftop solar resources into a new customer class, and to impose a new rate structure and design that amounts to a large new fixed charge for rooftop solar customers. In addition, I will introduce the other Vote Solar witnesses and the topics addressed in their testimony.

Q: Please summarize your testimony.

A: In my testimony, I provide some background information and relevant resources for the Commission to consider in evaluating the proposals by RMP. I then challenge RMP's proposals and requests in this proceeding beginning with the mischaracterization of the attributes of residential rooftop solar customers that results in its recommendation to segregate this subset of residential customers into a separate rate class. My testimony, along with the analyses performed by Dr. DeRamus, demonstrates that rooftop solar customers load characteristics are not significantly different from those of the general body of residential customers and provide no basis for separation of this group. Moreover, segregating customers into subclasses of service based upon the type and extent of customer-side-of-the-meter energy technologies is unprecedented, could lead to other subdivisions of the residential class (e.g. type of air conditioning equipment used), would be detrimental to other DER technologies, and potentially harm low-income customers.

I then show that the RMP proposed rate design is inappropriate, discriminatory, and tantamount to a straight fixed-variable rate structure. It is my view that RMP has not provided evidence that the current low levels of penetration of rooftop solar in RMP's residential customer groups, particularly taking into account the results of the cost and benefit analysis performed by Mr. DeRamus, justify a major change in rate design and structure under Utah Code § 54-15-105.1 at this time.

Specifically, I discuss the concerns and problems with the use of a demand charge, notably its lack of connection with cost causation, and its inability to provide an actionable price signal to customers. I recommend rejection of RMP's proposed demand charge structure. In addition, RMP's proposal to shift distribution cost recovery to the monthly customer charge runs afoul of cost recovery principles (the customer charge recovers the cost of *connecting* to the grid, but not the grid itself) and results in a 150% increase. This increase is not justified and should be rejected under any circumstance.

In recognition of the concerns of the utility and other stakeholders about the recent growth rates of residential solar customers however, I recommend that if any changes are made to the Net Energy Metering (NEM) program in Utah, the Commission should adopt a principle of gradualism to ensure that an abrupt shift in rates does not cause adverse effects on NEM customers, Utah ratepayers generally, and to the public policies of the state of Utah. Vote Solar proposes a series of structural changes that reflects the principle of gradualism by phasing in the evolution of the NEM program. I propose three phases, or groups of NEM customers, based upon the timing of the solar customer's interconnection application. The three groups would be current NEM customers, transitional solar customers, and future solar customers. I recommend that the first group be subject to a continuation of the current rate structure, including the netting of excess energy under existing net metering policy and crediting customer's exports at the residential retail energy rate and allowing for carry-forward of net excess energy to future months, for a reasonable period of time to ensure that customers who committed substantial investments based on existing policies are not subject to economic hardship. The transitional solar customers are those residential customers that submit an application for interconnection after the current customer group is closed.[1] These customers would be subject to a "net billing" arrangement in which netting of self generation with consumption is limited to the monthly billing period, and any net excess generation at the end of the month is compensated at a rate tied to the total aggregate retail rate or "TARR" (total residential revenue divided by total residential kWh sales for most recent calendar year) that declines over time based on the penetration levels of residential solar experienced by RMP in its Utah service territory. Under Vote Solar's proposal, this percentage of TARR would decline as certain milestones of distributed solar penetration are achieved to address the uncertainty regarding the underlying cause of recent growth rates, i.e. whether normal or a "gold rush" based upon anticipated policy changes in this proceeding and the phase out of the state tax credit. If penetration continues to grow to the 20% (of the 2007 peak load) overall NEM cap established by the Commission, the compensation for monthly net exports should decline to a minimum floor rate. I believe a reasonable floor is essential to fairly compensate rooftop solar customers for the minimum benefits provided by their distributed solar resources under a high penetration scenario. This mechanism acts as a throttle on the economics for customers seeking to deploy rooftop solar, mitigating concerns the Commission might have over rapid adoption of solar and the potential future impacts of a very high level of residential distributed solar on the grid.

[1] Specific dates defining the three groups of customers are discussed in more detail below.

Finally, I believe that a long-term rate design should be piloted during this period, refined and implemented at a future date for future customers, based on information gathered during that period. To provide sufficient time to evaluate alternative rate designs, I recommend that the Commission target 2025 for the implementation of this new rate design. Based on the current state of knowledge, I recommend a time-of-use (TOU) rate structure, with consideration for low-income customers, be evaluated through one or more pilot programs between the close of this proceeding and 2025. In late 2023 to early 2024, RMP should consult with stakeholders and file a proposal for a TOU rate structure including pricing and time periods and any other details necessary for its implementation the following year. I recommend this be the mandatory structure for all residential customers

I believe this staged set of recommended changes properly phases in any changes to the current net metering program and addresses the concerns of RMP and other stakeholders, while continuing to provide an opportunity for customers to determine their own energy future. At the same time, the solar industry will continue to have a market in Utah as the economics for customers will change in a predictable and sustainable fashion for the foreseeable future.

Q. Do you have any other recommendations for this Commission?

A. Yes. Stakeholders in Utah have spent the last several years addressing issues and concerns related to rooftop solar generation and net metering. But distributed solar generation is one of a myriad of new technologies that are changing or will change the way we think about energy production, its use and fungibility. Efficiency technologies have been around for some time and continue to improve. Other distributed energy resource (DER) technologies including demand response, storage, electric vehicles, and combined heat and power are continually improving in cost-effectiveness, and have the potential to make energy services for all customers more efficient and more affordable. Indeed, while some DER technologies generate energy on-site and reduce consumption of grid-supplied energy, others consume energy (e.g. replacing gasoline vehicles with electric), some provide ancillary services, and still others can shift the timing of consumption. Combined, new technologies have the potential to flatten consumption profiles of utility customers, or even to reduce consumption specifically during higher cost hours.

RMP's proposal in this proceeding would effectively put an end to the rooftop solar industry in Utah, as similar proposals have done in Nevada and in the territory of Salt River Project in Arizona. I urge the Commission to keep in mind that rooftop solar is the first of many technologies that utilities may believe, on the surface, is detrimental to their current business model. This Commission must guard against reactionary responses to new technologies as they become available (such as proposing new charges or new rate structures for each new technology), and balance a viable market for rooftop solar (and other DER technologies) with a financially viable utility.

Vote Solar's proposal in this proceeding provides this balance.

INTRODUCTION TO THE CHARACTERISTICS OF DISTRIBUTED SOLAR GENERATION AND NET METERING

Q: What is distributed solar generation or DSG?

A: DSG is solar electric generation (usually photovoltaic or PV) connected to the utility grid in relatively small sizes at the distribution level. Most often DSG is located on-site at a customer's premises, a.k.a. "rooftop solar," although in some states Community Shared Solar (CSS) is gaining popularity. CSS projects are larger, somewhat more centralized PV systems connected to the distribution grid from which retail customers acquire ownership shares or subscriptions, and pay a delivery charge in most cases to receive the power. For example, RMP's subscription solar program embodied in Tariff Sheet 73 is an example of a community solar project. Customer-sited rooftop solar DSG is most often deployed under a net metering arrangement, as it is on RMP's system.

The amount of energy generated at any one time can be (1) zero (at night), (2) less than the consumption of the host customer, or (3) more than the host customer's consumption. In the third case, electricity generated by the on-site DSG leaves the premises and supplies neighboring customers. It is this aspect of net metering, the export component, that is unique in comparison to other behaviors or vehicles customers may use to reduce consumption from the utility.

Q: Please describe the solar generation exported off site.

A: Exported energy reduces the loading on the local distribution grid by supplying locally generated energy to a neighboring retail customer. This happens instantaneously and typically such energy flows to neighboring customers who are on the same secondary circuit, without passing through any transformers. The flow of this energy causes no incremental cost to the utility. Nor does it impose any burden of grid management on the utility. Indeed, the utility has no control over the flow, is not required to re-dispatch it in any way, and is generally unaware that it has happened. For example, if a customer is generating 5kW with its system but is only using 4 kW, the other kilowatt leaves the home and serves the non-solar neighbor. The utility only sees a load at that point in time on the circuit (if it is metered), but does not know the mix of loads and generation sources, nor that the total load on the circuit has been reduced by 5kW. Moreover, the extra kilowatt reduces the load on the distribution system at a time of generally higher utility costs in the middle of the day – a benefit for all.

Next door, the neighboring non-solar customer sees nothing different. She does not know whether the electricity she is consuming came from the utility or her solar neighbor. Either way, she pays full retail price for the electricity to the utility. Thus the utility recovers full retail revenue for solar electricity that is exported to the neighbor.

HISTORY OF THIS PROCEEDING AND INTRODUCTION OF WITNESSES

Q: Please describe the history of this proceeding?

A: The relevant history of net metering begins in 2002 with the passage of House Bill 7. The Utah legislature authorized the NEM program based on its express finding that the NEM program would promote Utah's policy of favoring residential solar energy generation: "The bill strikes a fair balance between the ***need to encourage consumer generation*** and the electrical corporations' need to plan for various load levels." Jan. 31, 2002 Testimony of Bill Sponsor Representative Gordon Snow Introducing Bill HB0007, "Net

Metering of Electricity."[2] This finding highlights the goal of state policy to not simply allow customer generation, but to encourage it. This view is consistent with the concept of providing energy choices to the citizens of Utah so that each is empowered to determine their own future when it comes to energy.

In 2014, Senate Bill 208 (Utah Code Annotated § 54-15-105.1) ("SB 208") was passed and signed into law. The Commission has described the two components as Subsection One and Subsection Two, as follows:

- Subsection One:

  Determine, after appropriate notice and opportunity for public comment, whether costs that the electrical corporation or other customers will incur from a net metering program will exceed the benefits of the net metering program, or whether the benefits of the net metering program will exceed the costs; and
- Subsection Two:

  Determine a just and reasonable charge, credit, or ratemaking structure, including new or existing tariffs, in light of the costs and benefits.

In the Commission Order[3] concluding the RMP GRC in progress at the time of passage of SB208, the Commission rejected a net metering facilities charge proposed by RMP based on a lack of adequate evidence, concluding that "the testimony and comments (both written and verbal) provided in this proceeding fall short of providing the Commission the substantial evidence necessary to make the determinations required under Utah Code Ann. § 54-15-105.1(1)"[4] (Order at 58-59). The Commission went on to conclude the better course is for stakeholders to "gather and analyze the necessary data, including the load profile data that is foundational to this analysis, and present to us their results and recommendations in a future proceeding." (Order at 67). The Commission

[2] http://utahlegislature.granicus.com/MediaPlayer.php?clip_id=9778&meta_id=437046.
[3] Docket No. 13-035-184 Report and Order, Issued August 29, 2014.
[4] Subsection one of SB208.

then established this docket in which to examine the costs and benefits of PacifiCorp's net metering program (Order at 69).

The instant proceeding began with a technical conference on November 5, 2014, and was followed by a series of technical conferences and workshops in 2015 in which stakeholders met and discussed matter relevant to SB208 and the Commission's August 2014 Order. Hearings were held in October 2015 and the Commission issued an Order on November 10, 2015 ("Nov 2015 Order") to which RMP's compliance submittal of November 9, 2016 responds.

Q. Please explain your understanding of the Commission's Nov 2015 Order.

A. The Commission's Nov 2015 Order established a general framework for assessing the costs and benefits of net metering. The Order essentially requires PacifiCorp (RMP) to submit two costs of service – one with and one without – net metering customers. Additionally, the Commission required the Company to utilize a test period in these studies "commensurate with the test period in PacifiCorp's next general rate case." (Order at 7, 8 and 16). The Commission has since defined "commensurate" to mean "corresponding in size, extent, amount, or degree."[5] Finally, the Commission was clear as to the treatment of excess energy: "In preparing the ACOS, PacifiCorp should not assign a price or value to the net metering customers' excess energy other than as recognized in the net power cost analysis. We will consider issues related to how net metering customers should be credited or compensated for their excess energy when we take up the Statute's rate setting implications under Subsection Two." (Order at 9). "The

[5] Consolidated Order Denying Dispositive Motions, February 23, 2017, page 10.

framework … leaves some details unspecified" and "some issues remain to be resolved." (Order at 4).

Q. Please describe the requests of RMP in this proceeding.

A. On November 9, 2016, RMP submitted a compliance filing responding to the Commission's Nov 2015 Order that included its actual cost of service (ACOS: including net metering) and its counterfactual cost of service (CFCOS: no net metering) studies, and a separate NEM breakout cost of service based on calendar year 2015. The Company requests[6] the Commission:

(1) Find that the CFCOS, the ACOS, and the net metering breakout cost of service study ("NEM Breakout COS") are compliant with and fulfill the November 2015 Order;

(2) Find, based on the cost of service analyses, that the costs of the net metering program under the current rate structure exceed its benefits;

(3) Find, based on the cost of service analyses, that the unique usage characteristics of net metering customers justify segregating them into a distinct class;

(4) Determine that the current rate structure for net metering customers is unjust and unreasonable because it does not reflect the costs imposed on and benefits contributed to the system, and unfairly shifts costs from net metering customers to other customers;

(5) Approve, as just and reasonable, the Company's proposed Schedule 136, Net Metering Service, with modifications to net metering service and Schedule 5, Residential Service for Customer Generators, which includes a three-part tariff structure that reflects the costs and benefits that net metering customers impose on and contribute to the system; and

(6) Approve a waiver of Utah Admin. R. 746-312-13, pursuant to Utah Admin. R. 746- 312-3(2) for changes to the application fee, as explained in more detail [therein].

Q. Please describe the subject matter of the witnesses Vote Solar presents in this proceeding.

[6] Compliance Filing, page 2.

A. Dr. David DeRamus presents testimony on behalf of Vote Solar addressing the three costs of service (CFCOS, the ACOS, and NEM breakout), the costs and benefits of the net metering program, and the data underpinning the usage characteristics of net metering customers. He also discusses the effect of the Company's proposals on its financial risk. In addition, Dr. DeRamus addresses the benefits to all customers of a more competitive marketplace that allows customers to choose different energy savings and supply options, and fosters innovation. Finally, he addresses concerns with the RMP proposed rate design and discusses alternative options.

PROBLEMS AND CONCERNS WITH THE RMP SUBMITTAL AND PROPOSALS

Q. Please provide an overview of the errors Vote Solar has found with the RMP submission that is the subject of this proceeding.

A. RMP's filing raises many substantive and policy concerns for Vote Solar. Dr. DeRamus and I will address the following:

1. Data and analytical errors and inconsistencies within the cost of service studies, including the failure of RMP to demonstrate that current rates do not adequately recover the cost of service from residential rooftop solar customers;
2. Overstatement of the costs and understatement of the benefits provided by net metering customers;
3. Failure of RMP to take into account the financial "de-risking" that occurs as a result of the effect of its rate proposals on its revenue stream;
4. The general failure of RMP to consider the benefits of customer choice and innovative technologies that provide improved service at a lower cost;

5. The failure of RMP to adequately demonstrate that the subgroup of residential customers with rooftop solar have characteristics materially different than those of other subgroups or the residential class as a whole, resulting in a lack of justification for a separate rate class.
6. The failure of RMP to demonstrate that demand charges for residential rooftop solar customers are just and reasonable; and
7. The failure of RMP to demonstrate that the fixed monthly charge it proposes for NEM customers is just and reasonable.

<u>A. Rooftop solar customers should not be segregated into a separate rate class.</u>

Q. Please explain why you believe RMP has failed to justify the segregation of rooftop solar customers into a separate rate class.

A. RMP bases its justification of segregating this group of rooftop solar customers on three basic rationales: the usage characteristics of rooftop solar customers differ from other residential customers, NEM customers use the grid more than other customers because they both import and export electricity, and peak solar generation does not coincide with the time of the Company's peak load thus has a modest ability to reduce peak load.[7]

Q. Please describe the bases for the usage characteristic differences identified by RMP.

A. The difference in usage characteristics is described in detail in the Company's testimony (Steward at 325-374), and can be summarized as the following two discrete items:

[7] Direct Testimony of Gary Hoogeveen, lines 189-195.

- Customers with rooftop solar have a different load profile but not necessarily a different peak demand requirement (lines 325-328), and their reduced usage also results in lower load factors than for other residential customers (lines 341-343); and
- Net metering customers use the system differently [than low-use customers] since they use the energy grid to both receive and to export energy (lines 357-361).

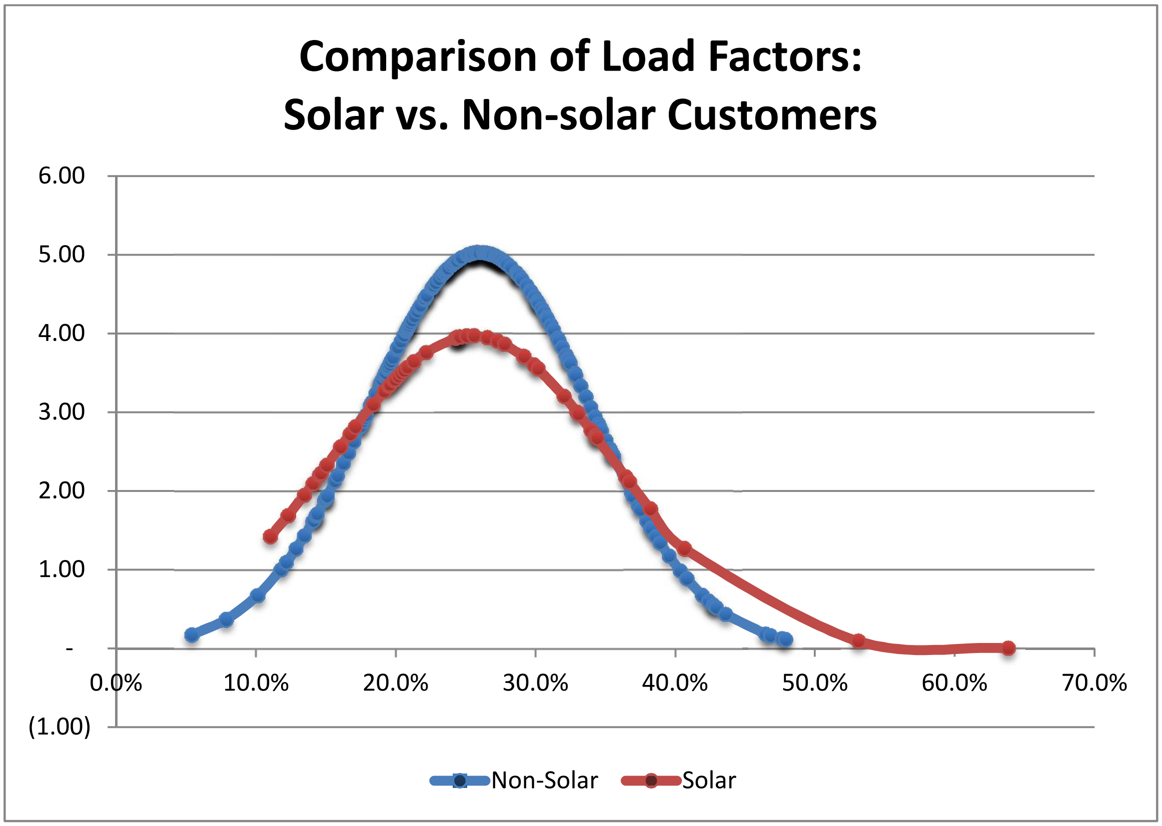
The Company's first point addressing the relationship between customer consumption and maximum demand relates to cost allocation. Because fixed costs are allocated on the basis of the aggregated class demand at the time of the system peak demand, reduced usage without reduced demand (i.e. lower load factors) could result in the same fixed cost responsibility to the group of customers, but with fewer kWh to spread those costs over, resulting in a rate increase, all else equal. In other words, lower load factor customers generally cost more to serve than higher load factor customers.

Q. Are the load factors for rooftop solar customers different than the load factors for residential customers in general?

A. No, they are not. RMP provided load factor data in response to discovery from the DPU.[8] The load factors for the general body or residential customers, as represented by the 196 load research customers, and those for the 52 rooftop solar customers (for which data is available) is depicted in Figure 1 below and evaluated further in the testimony of Dr. DeRamus.

[8] Response to DPU4-3.

Figure 1: Comparison of Load Factors



The range of load factors for solar customers is not significantly different than the range for non-solar customers. This relationship is born out by the adjusted NEM breakout cost of service developed by Dr. DeRamus which demonstrates that the cost to serve rooftop solar customers is not meaningfully different than the cost to serve non-solar customers.

These two factors clearly demonstrate that the usage characteristics of solar customers, particularly how such characteristics may affect utility costs and cost allocation, are not very different than non-solar customers.

Q. Please describe your evaluation of RMP's assertion that rooftop solar customers use the system differently than other residential customers.

A. The Company notes that solar customers "use the energy grid not only to receive energy from the Company's facilities, but also to export energy they produce to the Company's system."[9] This matter of physics, in and of itself, does not result in any additional costs particularly at the current low penetration rate.

However, the Company describes concerns[10] it has during certain times of year when solar generation is relatively high and customer usage may be low, e.g. the springtime as follows:

> To handle the higher level of energy flow experienced in the spring months, the local distribution system must be sized to accommodate the greater of the two values. Consequently, the system may be sized up to 30 percent greater than normal. In a few cases, the reverse power flow could approach 50 percent more as compared to the customers' peak load demand.
>
> If a customer installs the level of rooftop solar required to offset all of their energy usage, including conversion of their gas appliances and gasoline vehicles to electric, the magnitude of exported energy demand can be much greater and the reverse flow effect becomes even more dramatic.

Q. Has the Company demonstrated that it has sized the distribution system to accommodate loads 30% greater than normal?

A. No, it has not. In fact it appears the 30% figure refers to a later discussion in the Company testimony addressing the absolute value of energy flowing into and out of the customer's premises for a net-zero customer (Marx at 110-116). The Company claims it must "manage" a 134% higher level of energy on behalf of the customer.[11] In reality, the

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[9] Steward at 359-361.
[10] Marx at 73-81.
[11] Note that the 134% (line 113) derived by Mr. Marx is the result of dividing the absolute value of the two way flow, 11,558 kWh, for a net zero solar customer by the typical non-solar customer consumption of 8,601 kWh. The former figure is not 134% higher than the latter, but only 34% higher.

Company does not manage the excess energy but rather the energy flows to the nearest load, likely a neighbor on the same secondary system. The Company does not provide any data supporting its assertion that "reverse flows" exist at the point where they might affect Company infrastructure – at the secondary transformer, nor does it establish any significant number of rooftop solar customers who have sized their systems for *net-zero* consumption of grid-supplied energy.

Q. Has the Company experienced reverse power flows approaching 50% of the customer's peak load demand?

A. The Company has provided no data to support that assertion.

Q. Does the typical solar customer of RMP size their PV system to offset 100% of their annual load?

A. No, it does not. Thus, RMP's 30% "reverse flow" figure is a hypothetical example based on a type of customer that is rare and not representative of a typical NEM customer.

Q. If additional equipment is required to accommodate distributed generation, who pays for it?

A. The NEM customer whose system necessitates the equipment pays, not the utility or other residential customers. Mr. Marx states additional equipment may be required to accommodate increasing levels of distributed generation (lines 84-91). Mr. Marx notes later that "[i]f the engineering review shows that system issues will occur, in accordance with applicable Commission rules, the customer must pay for the necessary corrections before her application is approved and before we will interconnect the generation system."

Q. How often does the excess energy that is not used immediately on-site cause reverse power flows at the secondary transformer?

A. The Company has provided no data to demonstrate the degree, if any, to which exports cause reverse power flows from the secondary system.

Q. If the exported energy doesn't typically leave the secondary distribution system, where does it go?

A. As noted above, in most cases the excess energy from one solar home flows to serve the nearest load, most likely within the secondary distribution system. RMP is paid by the customer receiving the solar-generated energy at the regular retail rate which includes the fixed costs of production, transmission, and distribution. Each residential secondary circuit serves a small number of customers, generally fewer than 10. Thinking of the secondary circuit as a system comprised of loads and resources, the sum of solar generation from the solar home(s) would have to exceed the total consumption of all the homes on that circuit in order for reverse power flows to occur beyond the transformer. There are hypothetical situations that can be devised that would achieve such an outcome, but hypotheticals are not grounded in the reality necessary and appropriate when we are discussing in this proceeding the alleged need for major rate structure changes that could decimate the solar industry. The bar for such demonstrated evidence should be high.

Q. Are there other reasons why rooftop solar customers should not be segregated into a separate class?

A. Yes. When the NEM breakout cost of service is corrected to exclude behind the meter consumption of on-site generated solar energy as a cost as Dr. DeRamus has done, the cost of service analysis shows that rooftop solar customers pay approximately the same proportion of the utility's total costs as do other non-solar residential customers. This is not a surprising outcome given the correlation of the load factors between solar and non-solar customers. As a result, there is absolutely no cost basis for segregating rooftop solar customers into a separate class with a separate and punitive rate structure.

B. Rooftop solar customers should not be subject to demand charges.

Q. Please explain RMP's proposed rate structure for rooftop solar customers.

A. RMP is proposing a three part rate structure based on its belief that such a structure accounts for the unique load characteristics of residential rooftop solar customers, ensures solar customers pay their fair share of fixed costs for infrastructure and backup grid reliability, and matches the costs to the customers that cause them.[12]

The proposed structure reflects a much higher monthly fixed customer charge, a demand charge based on the highest 60 minutes of use during on-peak hours during the month, and a much smaller energy charge with no differentiation for consumption. RMP's proposal compares to the current rates as follows:

[12] Hoogeveen 201-205.

	Residential Rate Schedule 1	**Proposed Rate Schedule 5**
Monthly Customer Charge	$6.00	$15.00
Energy Charge		3.8143 ¢/kWh
May-Sept		
1st 400 kWh	8.8498 ¢/kWh	
Next 600 kWh	11.5429 ¢/kWh	
All Add'l kWh	14.4508 ¢/kWh	
Oct-Apr		
1st 400 kWh	8.8498 ¢/kWh	
All Add'l kWh	10.7072 ¢/kWh	
Demand Charge		$9.02 per kW

Q. Does the Company provide adequate support for the 150% increase in the monthly customer charge?

A. No. The Company indicates that "[t]he monthly customer charge of $15.00 is designed to recover costs related to customer services and certain components of the distribution system, specifically service lines, meters, and line transformers."[13] It suggests that rooftop solar customers "place additional burdens and reliance on these local facilities since they use them for both taking service from the Company and to export their excess generation output to the grid." (Steward 477-479). RMP goes on to say "it would not be appropriate to reflect local distribution costs in the energy credit received by net metering customers for excess energy." (Steward 484-486). In other words, the rationale for including transformers in the customer charge is to assure that rooftop solar customers continue to pay for these transformers even when their excess energy would otherwise reduce their energy charge and thus their bill.

Q. Why is this justification inadequate, in your opinion?

[13] Steward 403-405

A. Energy generated by rooftop solar that exceeds the host customer's use flows to a neighbor's house rarely if ever moving upstream past the transformer. Therefore, it reduces the loading on the transformer (and other upstream facilities) and extends the equipment's life. This benefit is shared by all residential customers, but is not reflected in the proposed rate structure. Instead, RMP assigns a pro-rata share of these facilities regardless of how much or how little the solar customer uses them.

Moreover, under the Company's proposed rate structure, the credit received by the NEM customer would not include anything other than variable expenses. The customer would receive no credit for any benefit of reduced loading on the facilities at issue. At the same time, as the neighboring customer that physically consumes the solar-generated energy pays the utility for its consumption, included is the full retail rate times the energy received from the solar neighbor. Thus the Company receives compensation for any excess energy at the retail rate, including the embedded costs of generation, transmission, and distribution, but under its proposal here would only pay the solar generating customer a fraction of that amount.

There is no need to include the cost of "certain components of the distribution system" in the monthly service charge and indeed would produce a windfall for the Company. This change should be rejected.

Q. Do you agree the proposed rate structure ensures solar customers pay their fair share of fixed costs for infrastructure and backup grid reliability, and matches the costs to the customers that cause them?

A. No, I do not. As demonstrated above, the residential class is comprised of a diverse set of customers, each with its own unique load characteristics from which the rooftop solar customers' profiles do not differ significantly. The Company's rationale, if true, could be said to apply to every individual residential customer.

If the Company believes that demand charges ensure payment of a fair share of fixed costs, then the same reasoning would hold true for all residential customers. Put another way, a rate structure that purportedly matches costs with the customers that cause them as the Company argues would, in theory, be equally effective for more accurate revenue collection from the general body of residential ratepayers. RMP's proposal of such a rate only for NEM customers suggests that it recognizes the punitive nature of a demand charge, and seeks to impose it solely on NEM customers to discourage DSG adoption.

Q. Does RMP suggest that the demand charge structure be applied to any residential customers other than rooftop solar customers?

A. No, it does not.

Q. Do you support demand charges for the general body of residential ratepayers?

A. No, I do not. RMP proposes to measure maximum demand over a 60 minute interval (Steward 549) during the Company's on-peak periods of 3:00 to 8:00 p.m. during the months of May to September, and 8:00 to 10:00 a.m. and 3:00 to 8:00 p.m. during the months of October through April, for non-holiday weekdays. (Steward 416 to 420). This amounts to approximately 100 hours per month in the summer and 140 hours per month in the winter. The Company also points out that about 63% of its costs are demand related. (Steward Table 5 @ 375) Thus, nearly two-thirds of a customers bill will be tied to a single unspecified hour out of 100 each month, or 1%, in the summer time while in the winter it is 1 out of 140 hours. Each customer's bill is enormously impacted by its load in whichever random 60 minute period its maximum billing demand occurs, regardless of any coincidence with the peak demand of the system. Because a customer's individual peak billing demand can occur during any of the 100 or 140 hours per month and not necessarily during the hour when system costs are greatest or system peak demand is highest, the demand charge does not reflect cost causation.

Q. **Please explain why RMP's proposed demand charge does not reflect cost causation.**

A. Because of their diversity in energy usage, customers' individual non-coincident maximum loads, even if limited to specific bands of hours, would only occur at the same time as the peaks on the system as a whole, or at the same time as peaks on the local distribution system, by chance or coincidence.

Q. Doesn't the limitation to on-peak hours increase the likelihood that customers will respond to the demand charge, and reduce their usage during those periods, and in turn utility costs?

A. It is quite possible a customer might work hard to reduce consumption during the applicable times, but it would need to be vigilant every non-holiday weekday during the specified hours. It would only take a single mistake by the customer to ruin an otherwise diligent effort on behalf of the customer, resulting in a large demand charge for the entire month. For example, having a few friends over on a warm Friday night could result in a new peak demand.

Moreover, without additional in-home technologies, a customer would not know if it set a new peak demand and therefore could not effectively respond to the price signal the Company says a demand charge would create. And even if the customer does establish a high demand early in the month, she cannot let down her guard as there is no guarantee she may not set an even higher demand later in the month. Alternatively, if the customer believes it set its peak demand early in the month upon which two-thirds of its bill will be based, she may be complacent about trying to minimize consumption during peak hours for the rest of the month. These unintended consequences can exasperate the efforts of utilities to keep consumption and costs down during peak periods.

Q. The Company indicates that the proposed rates provide a price signal to customers to encourage more efficient use. Do you agree?

A. No. For a charge to be an effective price signal, a customer must have foreknowledge of the signal, i.e. when it will occur, <u>and</u> the ability to respond through behavioral or technological means. Many residential customers have limited choice or control over when they use appliances. For example, electric furnaces and water heaters can consume significant levels of electricity, with common models drawing 10.5 kW and 4.5 kW, respectively. Air conditioners draw from 2 kW for a one-ton capacity model to as much as 9 kW for a five-ton model. In addition, common hair dryers typically draw 1 kW and often more; the average microwave or toaster oven can draw 1 kW; and an electric kettle can draw 1 kW.

While families may be able to understand *how* this peak demand occurs, school and work schedules may allow little flexibility to do anything about the timing of consumption.

Further, some of these devices are designed to be automatically controlled by thermostats that would be difficult to override on a short-term basis to avoid demand charges. The Company says that both staggering and reducing appliance use during on-peak periods responds to the price signal. (Steward 447-449). These behavioral suggestions do not respond to the demand price signal, but rather to the peak time periods themselves.

Q. Has the Company considered TOU energy rates for rooftop solar customers?

A. Yes, it has. It rationalizes not using TOU rates because rooftop solar customers would be "over-compensated for their excess energy." (Steward 563-564). However, the point of TOU rates is to more closely reflect the higher utility costs during on-peak periods and send the signal that the value of reducing energy consumption is higher. Therefore, any additional energy put on the secondary system for consumption by neighboring customers clearly has greater value, and should be compensated at the higher rate. This will be discussed in more detail in Vote Solar's proposed forward-looking rate structure.

Q. Does the Company make other suggestions as to how customers may be able to respond to its proposed demand charge rate?

A. Yes. The Company suggests the following opportunities for rooftop solar customers to respond to its demand charge proposal:

> In the short run, customers can modify their behavior so that their peak usage occurs at the same time as their generation. In the long run, customers can invest in resources that better match the timing of the peak usage. For example, they could install solar panels that are more westerly facing to produce more energy in the afternoon and early evening, which better aligns with the Company's peak, providing more benefit by reducing overall demand. (Steward 449-454)

However, these suggestions don't recognize real world realities. Does the Company really believe that rooftop solar customers should stay home during the middle of the day in order to do laundry, dishes, vacuum, cook, and dry their hair simply to use self-generated energy during peak solar generation hours? Few customers have the flexibility in their schedules to do so. Does it really make sense to shift consumption to the middle of the day when utility costs are higher for everyone, rather than the middle of the night? No, because that would increase demand during an already high-load period. DSG excess energy exports would be better used to reduce overall load during this time.

And in the long run example, is the Company suggesting that customers re-orient their homes so that the roof itself faces more westerly? Or to prop up one side of each panel to face somewhat more westerly (necessitating spreading out the panels to accommodate the shading that will now take place)? These suggestions are nonsensical and demonstrate at best a lack of understanding and at worst a contempt for its retail customers that install rooftop solar systems.

Indeed, the National Association of Regulatory Commissioners (NARUC) discusses the advantages of demand charges:

> Theoretically, one of the main advantages of demand charges seems to be the greater revenue certainty, especially for certain forms of non-coincident rates, which improves the chances for full recovery of a utility's authorized return. This is mainly due to the costs being recovered based on individual peaks, which are relatively inelastic as compared with the overall volume of usage, which can vary greatly from year-to-year, largely due to weather, energy efficiencies and building standards, and customer behavioral changes. In this way, these rates can reduce risk for the utility.[14]

[14] NARUC DER Manual, November 2016, page 102, footnotes excluded.

Therefore, it seems the use of demand charges is good for utility revenue stability and reduced risk, but not so good for the customer with relatively inelastic demand.

Q. Has the Company proposed how it will educate its customers about the new rate structure and opportunities for responding and reducing bills?

A. No. This is an important point. RMP has set forth no plan for educating its customers that would be subject to these new charges about how to respond in order to both reduce their bills and utility costs beyond a vague statement that "[t]he Company will work with interested parties to develop information for Schedule 5 customers to help them understand the rate structure and how changes in their usage will influence their bill" (Steward 598-600) and noting its belief that rooftop solar customers "are typically more sophisticated energy customers." (Steward 430-431). This contention is also without evidentiary support.

NARUC notes "[o]pponents and proponents of demand charges both agree that significant customer education is key if implementing these rates and that regulators should employ pilot programs or shadow billing over a multi-year rollout." [15]

RMI[16] points out that "[w]hile it's possible that, if customers are sufficiently educated about a demand charge rate, they will reduce peak demand in response, no reliable studies have evaluated the potential for peak reduction as a result of demand charges."

Q. Aren't demand charges in common use today?

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[15] Id. page 99.
[16] A Review Of Alternative Rate Designs Industry Experience With Time-Based And Demand Charge Rates For Mass-Market Customers; Rocky Mountain Institute, p. 76, May 2016 download at: www.rmi.org/alternative_rate_designs

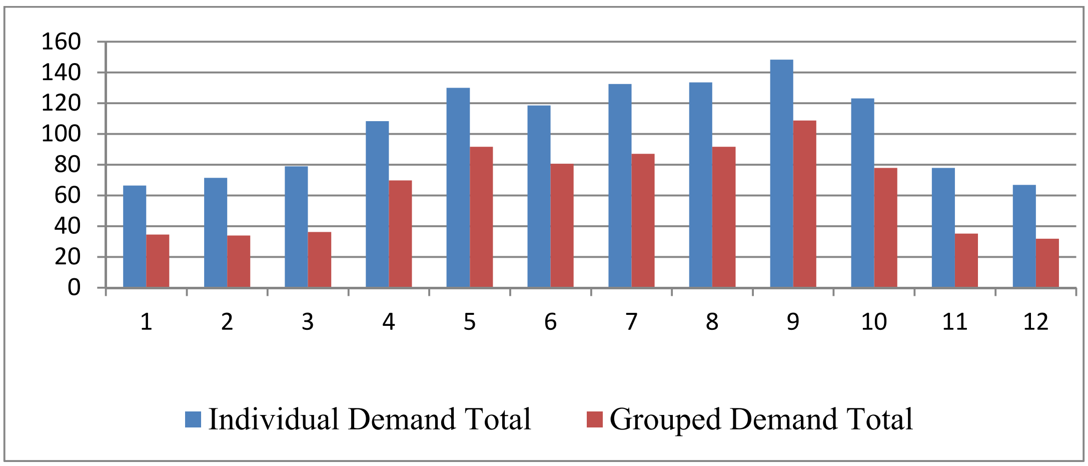
A. Not for residential customers. Demand charges have historically been applied to large commercial and industrial customers, but very rarely and generally only voluntary for residential customers. RMI (2016) identified only 25 demand charge rates offered to residential customers, and none of them were large investor-owned utilities implementing mandatory demand charges for residential or small commercial customers.

Many such large commercial and industrial customers are served through a single meter, and often a dedicated transformer or transformer bank. For very large industrial customers, there is typically a dedicated distribution circuit or even distribution substation. For these larger customers, load diversity, i.e. the differences in timing of the use of electrical equipment, occurs on the customer's side of the meter, such as when copiers, fans, compressors, and other equipment cycles on and off in a large office building. Additionally, larger customers frequently have facility managers whose job is to assure facility costs are minimized, including utility costs (energy, water, gas, etc.).

For residential consumers, there is also load diversity – but it occurs on the <u>utility's</u> side of the meter as customers in different homes and apartments connected to the same transformers and circuits use power at different moments in time. The point is that the type of rate design that is appropriate for industrial customers, who may have a dedicated substation or circuit and individuals dedicated to minimizing costs and therefore managing industrial or commercial processes, is <u>not</u> necessarily appropriate for residential customers who share distribution components down to and including the final line transformer.

For example, because many apartments are served through a single transformer and meter bank, what actually matters to system design is not the individual demands of each apartment, but the combined (diversified) loads of the building or complex. **Figure 2**, below, shows how the sum of individual apartments' maximum hourly demands in one apartment building (in the Los Angeles area) compares to the combined maximum hourly demand for the complex:

Figure 2: Individual vs. Grouped Demand Total



Source: RAP Demand Charge Webinar, Dec. 2015

Q. Are demand charges an appropriate rate design for residential customers of any type?

A. No. Imposition of demand charges on residential customers runs counter to the ratemaking principles of simplicity, understandability, public acceptability, and feasibility of application.

Also, demand charges are not tied to cost causation, in that there is no evidence that demonstrates a one-hour demand charge, even one limited to the 100 defined peak hours, has any effect on the actual system peak. As NARUC puts it: "Demand charges themselves can represent significant cost shifting, so regulators should be extra cautious in their development and implementation, ensuring they understand the implications of the charges for their jurisdictions and the rate's advantages (and disadvantages) over alternatives."[17] It summarizes considerations of demand charges as follows:

> Finally, as mentioned before, regulators should be cautious if implementing demand charges to protect a utility's revenue recovery for the distribution grid is the goal, especially if the DER benefits to the grid are not accounted for in any way. In the example of combining demand charges with an NEM rate, the regulator may simply be layering one proxy, or imperfect solution, over another without addressing the underlying threats and opportunities for their distribution system. Implementing large or non-coincident peak demand charges for an entire residential or small commercial rate class to counter perceived cost shifting from a limited set of actors would most likely be a disproportional response if adoption rates are low or under, say, 10 percent. (NARUC 2016, p. 108)

Without the ability to effectively respond to the demand price signal, the demand charge simply becomes another fixed charge, about which the customer can do little. This explains why the Company notes that the structure will reduce the likelihood that system costs will be under-recovered[18] – because the rooftop solar customer would continue paying costs for which it is no longer responsible.

Q. Are there other rate designs and structures that would be more effective in connecting customer load characteristics with utility cost causation?

A. Yes. Rates that differentiate between on and off-peak periods in total, i.e. time-of-use rates, provide better and more effective price signals. RMI indicates that time-varying energy charges are more effective at reducing peak demands than are demand charges. (RMI 2016) Additionally, the Brattle Group reported a peak load reduction of less than

[17] NARUC 2016, pages 98-99.
[18] Steward 436-438.

2% for residential demand charges, compared with reductions as great as 40% for critical peak pricing time-varying energy rates.[19] Thus, if the goal of a new rate design is to provide more effective price signals, i.e. signals that are actionable by the customer while being tied to cost causation, TOU rates fit the bill far better than demand charges.

VOTE SOLAR PROPOSAL FOR RATE DESIGN AND COMPENSATION FOR ROOFTOP SOLAR CUSTOMERS OF RMP

Q. Please explain Vote Solar's residential rooftop solar compensation and rate design proposals.

A. Vote Solar proposes to segment the residential rooftop solar customers of RMP based on the vintage of each customer's interconnection application ("Application"), treating each group in accordance with the cost recovery concerns that have been raised by RMP about the recent rapid growth of residential rooftop solar, while maintaining fair treatment of current customers and a sustainable market.

I propose to divide residential rooftop solar customers into three distinct categories based on the date of application. The first group would be current customers, defined as those who have submitted or will submit, an Application on or before a date that is subsequent to the final order in this proceeding. Given the hearing dates in this proceeding and allowing time for the Commission to issue an Order and the clock to run on requests for reconsideration, I recommend a cutoff date of December 31, 2017. The second group I identify as transitional customers and define as those who submit an Application after

[19] Presentations of Ahmad Faruqui and Ryan Hledik, EUCI Residential Demand Charge Summit, 2015.

December 31 of this year, but on or before December 31 of 2024. The third group are those I refer to as future customers who submit an Application after December 31 of 2024.

Q. What treatment do you propose for the first group of current customers, i.e. those who submit an Application on or before December 31, 2017?

A. In recognition of the benefits already provided to the grid by current customers, some of whom have been rooftop solar customers for as long as 15 years, Vote Solar proposes that these current customers continue to operate under the current net metering regime per Electric Service Schedule 135. In other words, each customer would remain on its existing residential rate (Schedule 1, 2, or 3), and would be able to net excess generation against future consumption within the billing period. Any net excess generation remaining at the end of the month would carry forward to the following month and offset the customer's consumption in that month. Once each year, at the end of March, net excess generation would be zeroed out.

Q. How long would these customers be able to remain on Schedule 135?

A. The period for which current customers would remain on Schedule 135 is 20 years, i.e. until December 31, 2037. While this period is well below the life of the typical PV system, it should be long enough to accommodate the payback period for most customers. Indeed, those customers that submitted their Application several years ago when prices of rooftop solar resources were higher would get the benefit of a longer period of time under the Schedule 135 regime.

Q. How does Vote Solar's proposal for current customers compare with the proposal of RMP?

A. Our proposal is similar to that of the Company, with the exception of the cutoff date and the length of time a current customer could remain on Schedule 135. RMP addressed current customers as follows:

> The Company supports keeping the current net metering customers on the existing net metering program and their current rate schedule. We acknowledge that current customers made investments based on the current structure and respect the customers' need for reasonable certainty for recovery of their investments. The Company expects this issue to be considered in a future proceeding.[20]

The Company also notes that transitioning current customers to a new schedule would be operationally and administratively challenging given that these customers generally do not have meters capable of billing under the proposed rate structure.

Q. **What treatment do you propose for the next group of customers, i.e. those who submit an Application after December 31, 2017?**

A. For the transitional group of customers, those customers that submit an Application after December 31, 2017 but before December 31, 2024, I propose the following:

- Remain on their existing residential rate schedule 1, 2, or 3 applicable to all [net] *deliveries* of energy from RMP;
- Exports from the transitional customer be netted *within* the billing month against consumption;

[20] Hoogeveen, 224-228.

- Net exports at the close of the monthly billing period compensated at a rate that declines as penetration of rooftop solar within the residential class increases.

Q. Why would transitional customers remain on their current rate schedule?

A. RMP has not demonstrated that rooftop solar customers have significantly different usage characteristics than do non-solar customers, nor that solar customers are not paying their full cost of service for their deliveries, or at least as much as the non-solar customers are paying. Additionally, RMP has not shown any incremental costs resulting from the deployment of rooftop solar to date for which rooftop customers are not paying. Thus, despite assertions from RMP to the contrary, there are no additional costs nor is there a cost shift to be addressed by segregating residential solar customers into their own rate class.

Q. Please describe your proposal for exported energy from residential rooftop solar systems.

A. In discussions with the Company and other parties, I have heard the concern that net excess energy generated in one month, or a series of months, should not be carried forward to another season. For example, some have expressed the view that excess energy generated in the spring when loads and energy prices are generally lower (and solar generation is above average), should not be credited against summer loads when energy costs are higher.

While I believe that the amount of residential rooftop solar generation is presently small, and this concern is minor at this point, I recognize that solar penetration is likely to increase over time. In the interest of offering possible solutions to the concerns raised, I suggest that reconciling energy balances monthly instead of annually can mitigate this concern. Therefore, I propose to allow netting of energy only within the billing period, and any net excess energy that remains after such netting be compensated at a rate that recognizes the value of the excess energy.

Q. How do you propose to recognize the value of the monthly net excess energy?

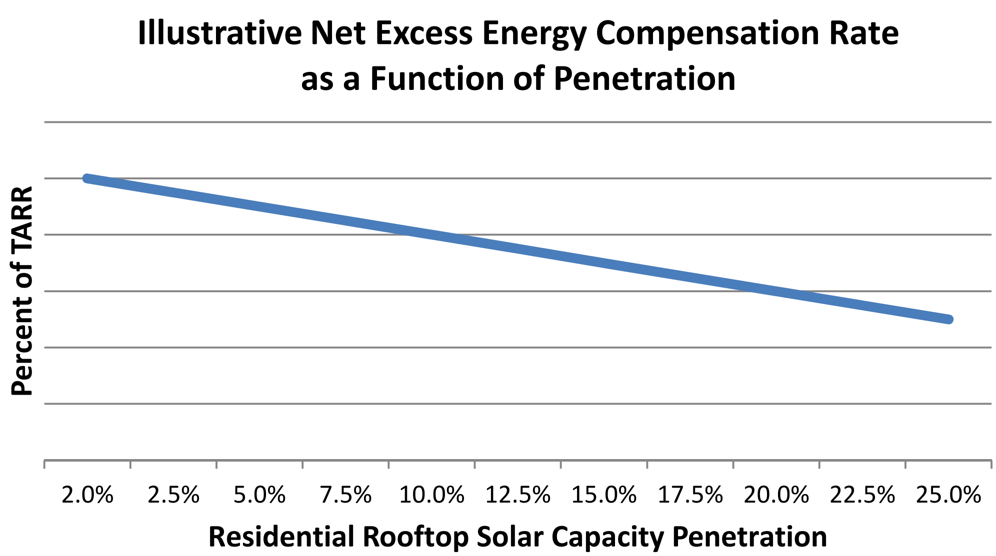
A. Again in the spirit of offering solutions and a means of addressing the concerns raised by RMP regarding the recent rapid growth of residential rooftop solar, I propose a declining compensation rate for net excess energy tied to increases in residential rooftop solar penetration. This type of mechanism will act as a throttle on the growth rates and potentially a limiter on individual system size. While the compensation rates should be supported by and consistent with the value analysis performed by Dr. DeRamus, because the benefits of distributed solar tend to be lumpy, i.e. the savings tend to come in large amounts at discrete times, smoothing the declining compensation rate creates a glidepath to a future sustainable market for both solar and non-solar customers of RMP.

Q. How would you develop a glidepath?

A. The glidepath should begin with current compensation rates, i.e. retail rates, and aim towards a “soft landing” rate that represents the minimum value rooftop solar provides at the maximum NEM penetration allowed. The maximum NEM penetration presently is the Commission's NEM cap of 20% of the 2007 RMP peak load.[21] RMP estimates the NEM cap would be reached in 2035.[22]

The current compensation rate varies depending on the consumption of the customer due to the effect of the tiered pricing system. In order to simplify the calculation, I propose the compensation rate be based on a percentage of the total aggregated retail rate or "TARR" for the residential class as a whole (excluding the revenue associated with the customer charge). The glidepath is depicted for illustrative purposes in **Figure 3**:

Figure 3: Residential Rooftop Solar Capacity Penetration



The final step is to specify discrete steps for rate changes as a function of penetration rates. Larger steps, e.g. 5%, would reduce the number of rate changes required but each change would be somewhat larger, while the granularity of 2.5% steps may help to

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[21] A 2016 NREL Assessment provides another point of reference for solar potential in Utah: The annual generation potential for small buildings is about 25%, Technical Report NREL/TP-6A20-65298, Table 3, January 2016.

[22] See testimony of Vote Solar witness Dr. David DeRamus, Figure 1, page 8.

minimize fire sale activity in the market. These options are depicted in **Figure 4** and **Figure 5** below:

Figure 4: Illustrative Net Energy Compensation Rate Framework – 2.5% Steps

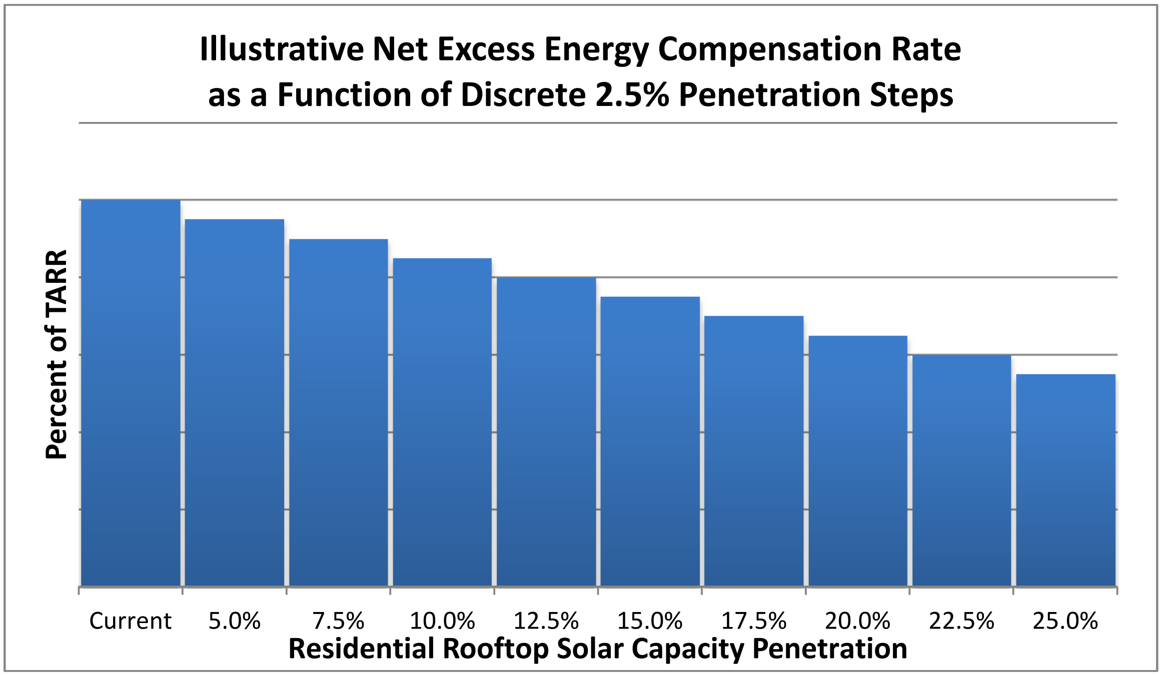
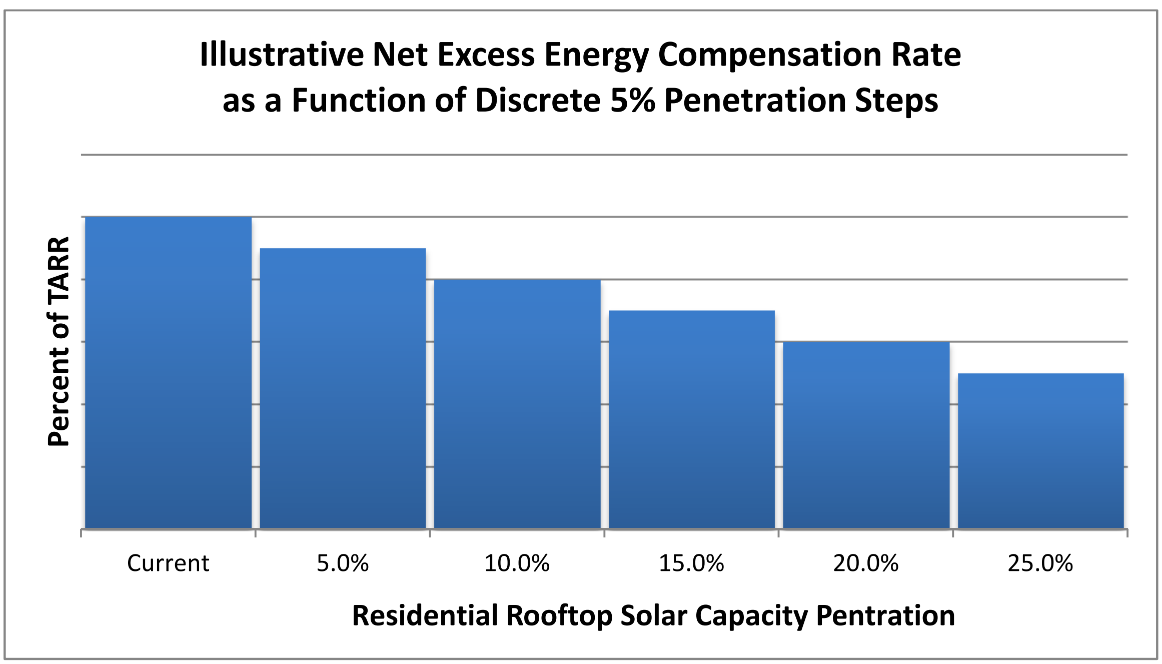


Figure 5: Illustrative Net Energy Compensation Rate Framework – 5% Steps



Q. How frequently would you adjust the TARR?

A. The TARR would be updated annually by RMP via a brief filing with the Commission on May 1 based upon the prior year's residential revenue and sales. Data from the FERC Form 1 may be used for simplicity and transparency. Upon approval by the Commission, the compensation rates would be adjusted.

Q. Would a transitional customer's compensation rate change over time, as penetration thresholds are reached?

A. No. Rooftop solar customers would retain the same percentage of TARR as their excess energy compensation rate.

Q. Do you have any other proposals for the transitional period?

A. Yes. During the transition period, I propose that RMP implement a pilot program to evaluate the effects of a TOU rate structure for residential solar and non-solar customers alike. There are similar pilot programs going on around the country, notably in Colorado, from which RMP can learn.

Q. Please describe the structure of the rates for future residential rooftop solar customers.

A. The Company has clearly expressed the desire in its filing to change the current rate structure based upon the effects of reduced consumption. In a nutshell, RMP complains that reduced consumption does not necessarily result in reduced utility costs. Much of the rationale the Company uses to justify its proposed three part rate including demand charges is an effort to reconcile this disconnect between sales and costs. And as pointed out during my evaluation of demand charges herein, rate structures that tie utility costs to time periods achieves the objectives of RMP without the potentially draconian impacts on rooftop solar (or any other) customers.

Therefore, I propose a TOU pricing model for future customers. TOU rates, if designed properly, will reduce utility costs as customers consume less during the higher cost on-peak periods. I recommend TOU rates become effective at the beginning of 2025 for future solar customers as well as for non-solar customers. TOU rates provide actionable price signals from which all customers can benefit.

While it is too early to provide much specificity to the details of a TOU rate proposal, I recommend the use of tiered energy rates within the temporal blocks of a TOU structure commensurate with the tiered rate that exist currently. This will provide protection for vulnerable customers, e.g. low-income and those on a fixed income, that may not be able to modify their consumption patterns.

Q: Does this conclude your testimony?

A: Yes.