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

Rebuttal Testimony of
Tim Woolf

On The Topic of
The Benefit-Cost Framework for Net Energy Metering

On Behalf of
Utah Clean Energy, the Alliance for Solar Choice, and Sierra Club

September 8, 2015

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, title, and employer.

A. My name is Tim Woolf. I am a Vice President at Synapse Energy Economics, located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. On whose behalf are you testifying in this case?

A. I am providing evidence on behalf of Utah Clean Energy, the Alliance for Solar Choice, (TASC) and Sierra Club (together the "Joint Parties").

Q. What is the purpose of your rebuttal testimony?

A. The purpose of my rebuttal testimony is to respond to the direct testimonies presented by Rocky Mountain Power (RMP), the Office of Consumer Services (OCS), and the Division of Public Utilities (the Division).

2. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Q. Please summarize your primary findings regarding the net energy metering (NEM) benefit-cost frameworks proposed by other parties in this docket.

A. RMP's proposal conflates the two issues of cost-effectiveness and rate design, and therefore does not provide the Commission with the information needed to make important decisions regarding NEM. Further, the Company's proposal conflicts with the NEM statute, conflicts with the Commission's orders in this docket, and conflicts with conventional benefit-cost analysis (BCA) for both demand-side and supply-side electricity resources in Utah.

I agree with the way that the OCS has framed the relationship between cost-effectiveness analysis and rate design: the two should be considered separately. I also agree with several elements of OCS's proposal for a long-term cost analysis. However, I do not agree that the lost revenues should be considered as a cost in the long-term analysis. I also disagree with the short-term analysis proposed by OCS. A rate impact analysis would provide much more meaningful information on the impacts of non-NEM customers.

The Division's proposal confuses cost-effectiveness with rate design, in much the same way that RMP's does. Also, the Division's proposal does not provide sufficient detail regarding how all the relevant impacts of NEM would be treated.

Q. Please summarize your illustrative cost impact and rate impact analyses.

A. In my direct testimony, I presented an illustrative rate impact analysis to demonstrate how such an analysis can be performed. In my rebuttal testimony below, I provide a parallel cost impact analysis to demonstrate how both analyses can be used together. My illustrative cost impact analysis suggests that, under current rate designs, NEM is likely to be highly cost-effective in Utah, with net benefits ranging from tens of millions to perhaps a billion dollars, in terms of reduced revenue requirements across all customers. My rate impact analysis suggests that under some scenarios NEM will cause rates for all customers to decline, while in others it will cause rates to increase at a very modest rate.

Q. Please summarize your primary recommendations.

A. I continue to stand by all of the recommendations provided in my direct testimony. In particular:

- The Commission should reiterate that a benefit-cost analysis should be conducted separately from rate design determinations, and clarify that rate design alternatives should be considered in light of the results of the benefit-cost analysis.

- The Commission should require that the NEM cost impact analysis be based on the net present value of revenue requirements (PVRR), consistent with the conventional practice of evaluating all types of supply-side and demand-side resources in Utah.

- The Commission should clarify that lost revenues from distributed generation resources should not be included in the cost impact analysis in any way.

- The Commission should require that a rate impact analysis be used to indicate the extent to which customers who do not install distributed generation resources might be harmed by those that do.

3. REBUTTAL OF ROCKY MOUNTAIN POWER TESTIMONY

Summary of RMP's Proposal

Q. Please summarize RMP's proposal for a cost-benefit analysis for NEM.

A. The Company's proposed benefit-cost framework has two parts:

- Part one considers the excess energy of the NEM customer's PV system, i.e., the energy that is generated by the PV system that exceeds the customer's electricity demand.[1] For this part of the NEM generation, the PV is viewed as a supply-side resource. The benefits of this generation would be valued at the same avoided cost as

[1] Clements Direct Testimony, page 2, line 40

those used for the PURPA contracts for utility-scale PV resources, which currently is roughly 5 c/kWh.[2] The costs of this generation would be valued at the retail rate that the NEM customer would avoid by the PV generation, which for residential customers would currently range from 8 to 14 c/kWh.[3]

- Part two considers the remainder of the energy generated by the NEM customer's PV system, i.e., during those hours when the PV system is generating less than the customer's electricity demand.[4] The costs and benefits for this part of the PV generation would be assessed using the Company's existing cost of service model.[5] NEM customers would be assigned a separate rate class from other customers, and the cost of service model would be applied to the new NEM class. RMP claims that using a cost of service study would allow the Company to "assign costs to NEM customers based on how they use the utility system."[6]

The Company claims that both parts are necessary for the benefit-cost analysis, and both parts are necessary for rate design.[7]

Q. Does the Company provide any initial results of its proposed benefit-cost framework?

A. Yes. With regard to part one of RMP's proposed framework, Witness Clements notes that NEM under the current rate design is not cost effective, because the costs (which should

[2] Clements Direct Testimony, page 4, line 74
[3] Clements Direct Testimony, page 4, lines 77 - 78.
[4] Clements Direct Testimony, page 2, lines 36 - 39.
[5] Clements Direct Testimony, page 3, lines 45 - 48.
[6] Steward Direct Testimony, page 3, lines 64 - 65.
[7] Clements Direct Testimony, page 2, lines 39 - 40.

be based on the retail rates avoided by NEM customers of 8 to 14 c/kWh), exceed the benefits (which should be based upon the PURPA avoided costs for utility-scale PV of roughly 5 c/kWh). The Company claims that "this conclusion dictates that the rate structure for the net metering program be modified to better align costs and benefits for excess energy."[8]

Q. Does the Company offer recommendations on rate design?

A. RMP recommends that NEM customers be assigned to a separate rate class, which is a rate design issue. The Company notes that part two of its framework, which applies to the separate rate class, "will be carried out in a future ratemaking proceeding and combined with the then-current result of the first part of the framework to establish a fair rate structure for NEM customers."[9]

Q. Do you agree with RMP's proposal?

A. No, I do not. RMP's proposal conflates the two issues of cost-effectiveness and rate design, and therefore does not provide the Commission with the information needed to make important decisions regarding NEM. Further, the Company's proposal conflicts with the NEM statute, conflicts with the Commission's orders in this docket, and conflicts with conventional benefit-cost analysis for both demand-side and supply-side electricity resources in Utah.

[8] Clements Direct Testimony, page 5, lines 99-103.
[9] Clements Direct Testimony, page 5, lines 101 - 103.

Q. What do you think would be the outcome of adopting RMP's proposal?

A. First, adopting the Company's proposal will not provide the critical information necessary to assess the costs and benefits of NEM in Utah. Second, if RMP's proposal were to be adopted, then (a) customers would have much less financial incentive to install PV; (b) there would be little, if any, new PV systems installed on customers' premises; (c) millions of dollars of electricity cost savings (in terms of present value revenue requirements) would be forgone; (d) the nascent PV industry would leave Utah for better opportunities in other states; and (e) the objectives of the NEM statute would not be met.

RMP Conflates Rate Design and Cost-Effectiveness

Q. Why do you say that RMP has conflated rate design and cost-effectiveness?

A. Part two of the Company's proposed framework is explicitly based on rate design issues. It requires NEM customers to be placed in a separate rate class, which is a rate design issue. It also requires the costs and the benefits of NEM to be determined within a cost of service framework, which is used to inform rate design and is not used to inform cost-effectiveness. The Company is clear that the objective of part two of its framework is to "assign costs to NEM customers based on how they use the utility system."[10] Assigning costs to customers is one aspect of rate design; it is not relevant for determining cost-effectiveness.

[10] Steward Direct Testimony, page 3, lines 64 - 65.

Q. Is there anything wrong with combining rate design and cost-effectiveness in the same analysis?

A. Yes. Benefit-cost analyses have a different goal than cost of service analyses and rate design. The ultimate goal of a resource benefit-cost analysis is to determine whether a utility should invest in, implement, or otherwise support a particular resource. The goal of a cost of service study is to determine how to allocate costs among customer classes, and to inform rate design for each customer class.

By combining the benefit-cost analysis with rate design, the Company's proposal will not achieve the ultimate goal of benefit-cost analyses, which is to provide the (statutorily required) information necessary to decide how to implement or support NEM. Even worse, the Company's proposal will provide information that is misleading, because it does not reflect the way that costs and benefits will actually be incurred under NEM in Utah.

Q. Please describe why RMP's proposal will provide information that is misleading and will not provide the information necessary to decide how to implement or support NEM.

A. As described in my direct testimony, the cost impact analysis for NEM should include all the costs and benefits that will affect customer revenue requirements over the long term. It is standard practice throughout the electricity industry to analyze costs and benefits of electricity resources based on the present value of revenue requirements. This is how the costs and benefits of electricity supply-side and demand-side resources are evaluated in the context of integrated resource planning (IRP) in every jurisdiction that I am aware of.

It is also how the costs and benefits of ratepayer-funded demand-side resources are evaluated in many states, including Utah.

One of the most significant problems with the Company's proposal is that *it does not analyze or present the costs and benefits in terms of present value of revenue requirements*.

Q. Please explain why part one of RMP's proposal does not rely upon the present value of revenue requirements to determine costs and benefits.

A. Part one of the Company's proposal applies to what the Company refers to as the "excess generation." However, the Company's proposal does not recognize how excess generation will actually be treated under NEM in Utah, in terms of *revenue requirements*. The NEM statute requires that any excess generation from a distributed PV system in one monthly billing period be automatically rolled over to the next billing period. This means that, for the purposes of costs imposed on the electricity system, there will be no excess generation in any one hour or any one month. In other words, *the Company will not incur any additional costs in terms of revenue requirements from NEM in any one hour or month*.[11]

The only way the Company could incur additional costs, in terms of revenue requirements, from the NEM program, is at the end of the annual billing cycle when unused credits must be accounted for. For this excess generation, if there is any, the Company will create a NEM credit equal to the amount of generation times the

[11] Perhaps with the exception of costs for integration of PV, as described in my direct testimony on line 327. RMP's proposal does not account for these costs, so they are not relevant to this point on RMP's proposal.

customer's retail rate. This is the only time throughout the whole process where the Company might have to increase revenue requirements to make a payment for NEM.

However, the NEM statute does not require that the NEM credits for excess generation be used to make payments to the host customer, as implied by the Company's proposal. Instead, the NEM credits will be used to offset the cost of the discounted rate that is offered to low-income customers. What that means in practice is that the NEM credits for excess generation will be used to *reduce the revenue requirements* that would have been recovered from customers to pay for the discounted low-income rate. Therefore, the NEM credits for the excess generation *will not increase revenue requirements at all.* This means that there are no costs associated with the NEM excess generation in Utah.

On the other hand, there is no question that there will be benefits from the excess generation. These benefits will be equal to the costs of generation, transmission, and distribution avoided by distributed generation, as described in more detail in my direct testimony,[12] and the direct testimony of Joint Parties Witness Norris.

To summarize, in terms of revenue requirements, the excess generation credits from an annual billing cycle, will require essentially no costs and will provide significant benefits. This means that excess generation from NEM in Utah will always be cost-effective. This conclusion is exactly the opposite of the conclusion reached by Witness Clements,[13] which indicates just how misleading the Company's proposal can be.

[12] Woolf Direct Testimony, page 17, lines 329 - 344.
[13] Clements Direct Testimony, page 5, lines 99-99.

Q. Please explain why part two of RMP's proposal does not rely upon the present value of revenue requirements to determine costs and benefits.

A. Part two of the Company's proposal is based entirely on the results of a cost of service study for a rate class of NEM customers. A cost of service study reveals little to nothing about the costs and benefits of a resource, in terms of revenue requirements. In the Company's own description, the revenue requirements are determined first, and then costs are allocated across classes, and cost of service studies are used "as a guide to inform the decisions on the amount of revenue to be collected from each class and the resultant rate structures."[14]

I see this focus on a cost of service study to be a fundamental flaw in part two of the Company's proposal. This part of the analysis will not provide any information regarding the conventional measure of costs and benefits: the present value of revenue requirements. As described above, information regarding the present value of revenue requirements is necessary to decide whether an investment or a resource will benefit customers and is in the public interest.

[14] Clements Direct Testimony, pages 9-10, lines 209-215.

Q. RMP notes that the Commission has required that only costs and benefits that "accrue to ratepayers of the utility" and "impact the utility's cost of service" should be included in the framework to determine NEM costs and benefits. Does this mean that the framework must be based on a cost of service study?[15]

A. No. I interpret the "impact on the utility's cost of service" and the costs and benefits that "accrue to ratepayers" to be the same thing as revenue requirements. The revenue requirements reflect the utility's costs to serve customers and they reflect the costs and benefits that affect ratepayers. Using the impacts that affect the utility's actual costs of service is very different from using a cost of service study to allocate costs.

Q. Does part two of RMP's proposal contain other fundamental flaws?

A. Yes, part two contains several fundamental flaws. First, I am not aware of any state or province that uses a cost of service study as the basis for determining cost-effectiveness of an electricity or gas resource option. RMP's proposal for part two is completely contrary to standard industry practice.

Second, a cost of service study only looks at the impacts of costs for a single year or test year. It is widely recognized that cost-benefit analyses for a particular resource should use a long-term study period that is at least as long as the operating life of the resource in question. In the case of PV resources, the benefit-cost analysis should include at least 20 years. Again, RMP's approach is completely contrary to standard industry benefit-cost analysis ("BCA") practice.

[15] Clements Direct Testimony, page 9, lines 199-202.

Third, one of the key goals of a cost of service study is to determine how to allocate costs among customer classes. However, benefit-cost analyses are not concerned with cost allocation among customer classes. Different types of supply-side resources (generation, transmission, distribution), and different types of demand-side resources (energy efficiency, demand response, distributed generation) can all have different implications for cost allocation across customer classes, but these implications are not considered in benefit-cost analyses. Again, RMP's approach is completely contrary to standard industry BCA practice.

Fourth, the Company's proposal will, by design, result in a NEM rate design that ensures that there are no negative impacts on non-participants.[16] But this is not the objective of benefit-cost analysis. The objective of the benefit-cost analysis, as stated by the statute, and as stated by the Company several times, is to identify the impacts on electricity customers, including non-participants. This is very different from the goal *of eliminating all negative impacts* on non-participants. As I describe in my direct testimony, the goal of eliminating all negative impacts on non-participants, i.e., attempting to avoid any inequity between customers, (a) is not a standard that is applied to other electricity resources, and (b) can result in perverse outcomes that are not in the customers' interest

[16] Clements Direct Testimony, page 19, lines 432-433 The Company asserts that the PURPA avoided cost methodology requires that customers be indifferent to PURPA purchases. (Direct Testimony of Clements, page 18, lines 413-413.) However, this is not an explicit requirement of the PURPA avoided costs; it happens to be an outcome of the way PURPA defines avoided costs. Also, PURPA avoided costs do not apply to demand-side resources that raise this issue of inconsistent impacts between program participants and non-participants. The Company also asserts that the NEM statute requires a "customer indifference" approach. (Direct Testimony of Clements, page 19, lines 432-434.) However, this is a misrepresentation of the very quote from the NEM statute that RMP presents; the statute requires that the costs and benefits to non-NEM customers be assessed, but not that non-NEM customers be completely indifferent to NEM.

or the public interest.[17] Further, to the extent the Commission does want to consider the impact on non-participants *after* it has completed the benefit-cost analysis, the rate impact analysis I presented in my direct testimony provides for that consideration.

Fifth, the Company's proposal to use a cost of service study does not account for the benefits that distributed PV generation provides to the electricity system in terms of avoided costs (energy, generation capacity, transmission, or distribution) for the distributed PV generation that is subject to part two. As described in the Company's testimony, the cost of service study will indicate the "benefits" to some customers associated with different cost allocation approaches,[18] but these do not include the real benefits of the PV generation: the reduction in revenue requirements as a result of the avoided costs.

Q. Please return to the question of why RMP's proposal will not provide an indication of the actual costs and benefits of NEM.

A. It is not entirely clear how the Company proposes to combine the results of parts one and two of its proposal to determine the costs and benefits of NEM. Witness Clements uses the results of part one to conclude that the current NEM structure results in costs that exceed the benefits. However, this does not address the ultimate question in this case, because (a) the results of part one do not rely on sound BCA practices, as described above, and (b) the results of part two are not yet factored into the analysis. The PV generation that would apply to part two of the Company's proposal could be a significant

[17] Woolf Direct Testimony, page 13 – 14, lines 270 - 279
[18] Clements Direct Testimony, page 11, lines 250-255

portion, perhaps the majority, of the total PV generation. To exclude that portion of the PV generation when assessing costs and benefits makes no sense and has not been justified by the Company.

In sum, by not providing the results of the analysis in terms of present value of revenue requirements, the Company's proposal does not provide the Commission, or stakeholders, the information that is typically used, and that is critically necessary, to determine whether NEM is cost-effective and in the public interest.

Q. Does RMP's proposal provide an indication of the costs and the benefits to non-participants in the NEM program?

A. No. Assessing the costs and benefits of NEM on non-participants is clearly one of the requirements of the NEM statute. However, the Company's proposal says nothing about the costs and benefits to the non-participants of the current NEM rate design. What the Company's proposal does, in effect, is to modify the NEM rate design (in part two) to ensure that NEM customers do not shift any costs at all to non-participants (without regard for actual costs or benefits).

This is not the same as estimating the costs and benefits to non-participants. The Company's proposal does not answer the critical question here, which is: "What are the costs and benefits of the current NEM policy, with the current rate design, for all customers and for non-participants?" The Company's proposal does not answer the critical follow-up question either, which is: "How would a modified rate design affect the costs and benefits to all customers and to non-participants?" This is the critical question that is implied by the NEM statute where it states that the Commission must "determine a

just and reasonable charge, credit, or ratemaking structure, including new or existing tariffs, in light of the costs and benefits."[19] The Company's proposal will not provide the information to answer either of these required questions.

Q. What is the best way to demonstrate the costs and benefits of NEM to all customers, including non-participants?

A. As described in my direct testimony, it will be necessary to conduct two analyses: (a) a cost impact analysis, based on revenue requirements, to indicate the impacts across all customers; and (b) a rate impact analysis to indicate how rates will change as a result of NEM.

The Company's proposal fails to recognize the critical fact that the primary impacts on non-NEM customers will be experienced through rate impacts. The avoided costs of the PV generation will put downward pressure on rates, and the recovery of revenue requirements over reduced sales will put upward pressure on rates. As indicated in the rate impact analysis presented in my direct testimony, and presented again here in Section 7, NEM might lead to higher or lower rates, depending upon whether the avoided costs determined for distributed solar are higher or lower than the retail rates. This sort of rate impact analysis is the best way to indicate the costs and benefits of NEM to non-participants.

[19] Utah Code Ann. § 54-15-105.1

Q. Is RMP's proposal consistent with the NEM statute?

A. No. The NEM statute is clear that the rate design should be considered *in light* of the cost-benefit results. In order to consider rate design in light of the BCA results, the rate design analysis should not be part of the BCA, and it certainly should not be used to define the outcome of the benefit-cost analysis results as the Company's proposal does in part two.

Q. Is RMP's approach consistent with the Commission's order in this docket?

A. No. The Commission has stated that the purpose of this docket is to:

> [P]erform a cost-benefit analysis and determine whether the benefits of the net metering program will exceed the costs ("Step One"). Second, the Commission is to determine a "just and reasonable" ratemaking structure in light of the results of the analysis performed in the first step ("Step Two"). As discussed above, the purpose of this phase of the docket is to create an analytical framework to accomplish Step One.[20]

The Commission is very clear that this portion of the docket is to identify a framework for assessing the costs and benefits of NEM, separately from the question of how to design rates. Once a BCA framework for NEM is established, it can be used (in the next phase of this docket) to evaluate current rate designs, as well as alternative rate designs that might result in better impacts on customers, including non-NEM customers. The Company's proposal, by conflating cost-effectiveness with rate design, (a) does not provide the BCA framework that the Commission has asked for, and (b) has unilaterally

[20] Utah Public Service Commission, Order re: Conclusions of Law on Statutory Interpretation and Order Denying Motion to Strike, Docket No. 14-035-114, July 1, 2015.

predetermined what the rate design should be without a proper understanding of the costs and benefits of the current rate design or alternatives to it.

RMP Incorrectly Dismisses the DSM Benefit-Cost Framework

Q. On what grounds does RMP dismiss the demand-side management (DSM) benefit-cost framework as not relevant for the purpose of NEM benefit-cost analyses?

A. The Company provides several reasons why the DSM BCA framework should not be used for the NEM BCA framework. I address each in turn below.

Q. What is the first point that RMP uses to dismiss the DSM benefit-cost framework?

The Company claims that "the traditional DSM tests are useful tools for determining whether a program should be offered for acquiring cost-effective resources, but they are not designed for setting rates."[21]

Q. Do you agree with this point?

A. No. On the contrary, this remark from RMP makes it perfectly clear that the Company has confused and conflated cost-effectiveness with rate design. The Commission's orders in this docket are very clear that (a) the objective of this phase of the docket is to assess the costs and benefits of NEM, i.e., to determine the extent to which NEM is a cost-effective resource; and (b) rate design issues are to be addressed separately from the BCA issues, in the next phase of this docket.

[21] Steward Direct Testimony, page 13 line 252.

It makes no sense for the Company to dismiss the DSM benefit-cost framework on the grounds that they are only appropriate for determining cost-effectiveness, when determining cost-effectiveness is the only objective of this phase of the proceeding. Similarly, it makes no sense to dismiss the DSM benefit-cost framework on the grounds that they are not appropriate for setting rates, when setting rates is not the objective of this phase of the proceeding.

Q. What is the second point that RMP uses to dismiss the DSM benefit-cost framework?

The Company claims that DSM is different from NEM because generally DSM "participants receive a one-time financial incentive for the measures that they take in addition to bill savings for reduced usage. In contrast, the primary incentive for net metering is conferred to participants through a bill reduction and offset to full retail rates for excess output."[22]

Q. Do you agree with this point?

A. No, not at all. First, it is not accurate to say that customers participate in DSM programs only because of the financial incentive offered by the utility. The primary reason that customers adopt efficiency measures is to offset their energy costs, which is the same reason that motivates most customers to install PV systems. Second, even if it were accurate to make this distinction, it would not justify rejecting the Utility Cost Test, i.e.,

[22] Steward Direct Testimony, page 14, lines 267 - 268.

where the costs and benefits are defined by PVRR, which is the conventional way throughout the utility industry to assess the costs and benefits of electricity resources.

Q. What is the third point that RMP uses to dismiss the DSM benefit-cost framework?

The Company claims that "[w]hile both distributed generation and DSM reduce the energy requirements for a customer, they are fundamentally different in that their reduced usage may not align with the peak."[23]

Q. Do you agree with this point?

A. No, not at all. Again, it is not accurate to make the blanket distinction that DSM and PV are fundamentally different in terms of whether their reduced usage aligns with peak. Many efficiency measures save energy during peak hours; for example, efficient air conditioners. Also, there may be times when PV systems generate power outside of the system peak, e.g. in the morning and early afternoon. And again, even if it were accurate to make this distinction, it would not justify rejecting the Utility Cost test, i.e., where the costs and benefits are defined by PVRR, which is the conventional way throughout the utility industry to assess the costs and benefits of electricity resources.

Q. Are you recommending that the DSM cost-effectiveness tests be used to assess the costs and benefits of NEM in Utah?

A. No, not entirely. I recommend that NEM be evaluated on the basis of the present value of revenue requirements, which is the standard practice for evaluating electricity resources in general, including in the context of IRP. A benefit-cost framework based on the

[23] Steward Direct Testimony, page 14, lines 272 - 274.

present value of revenue requirements is consistent with the Utility Cost Test that is used in Utah to evaluate the cost-effectiveness of DSM. This consistency supports the logic of using such a framework for NEM as well, but that is very different from saying that all the DSM tests must be used in evaluating NEM.

Q. Please summarize your points on whether and how the DSM benefit-cost framework could be applicable to NEM.

A. As stated throughout my direct testimony and this rebuttal testimony, the only way to provide meaningful information on the costs and benefits of NEM is to put them in terms of revenue requirements. This metric will provide an indication on the actual impacts across all customers, and is consistent with standard industry practice for evaluating the costs and benefits of electricity resources.

The Utility Cost Test that is used in Utah to evaluate the cost-effectiveness of DSM is based on this same concept of accounting for all costs and benefits that will affect revenue requirements. Therefore, my NEM BCA proposal is completely consistent with the way that DSM resources are evaluated in Utah, as it should be. The Company's proposal is completely inconsistent with DSM evaluation in Utah, yet the Company has provided no compelling evidence as to why this should be so.

4. REBUTTAL OF OFFICE OF CONSUMER SERVICES TESTIMONY

Q. Please briefly describe the OCS proposal for evaluating the costs and benefits of NEM.

A. In sum, OCS recommends two analyses to evaluate the costs and benefits of NEM: a long-term analysis to assess the costs and benefits to the utility, and a short-term analysis to assess the costs and benefits to non-participating customers.[24]

OCS's proposal for a long-term analysis is comparable to, and attempts to achieve the same objective, as my recommendation for a cost impact analysis, with one key difference that I will describe below. OCS's proposal for a short-term analysis is comparable to, and attempts to achieve the same objective, as my recommendation for a rate impact analysis—again with some key differences that I will describe below.

Q. Do you agree with the way that OCS has characterized the relationship between benefit-cost analysis and rate design?

A. Yes. The OCS is clear that the analysis of the costs and benefits of NEM "should be completed as a standalone step or analysis prior to the process of setting just and reasonable rates."[25] OCS also states that if the benefit-cost analysis does not show that NEM provides net benefits, then "those results should be brought back to policy makers for additional consideration."[26]

[24] Beck Direct Testimony, page 3, lines 52 - 56
[25] Beck Direct Testimony, page 3. lines 62 - 63
[26] Beck Direct Testimony, page 4. lines 70 - 71

I agree with this interpretation of the NEM statute, as well as the Commission's orders in this docket. This is a critical point that the Company has confused, leading to a proposal with several fundamental flaws, as described above.

Q. Do you agree with OCS's proposed NEM benefit-cost framework?

A. There are several elements of OCS's proposal that I agree with, but there are also several important elements that I do not agree with. I will describe the OCS's long-term and short-term proposals separately.

Q. Please describe your views regarding OCS's proposal for a long-term analysis of NEM costs and benefits.

A. There are several elements of OCS's proposal for a long-term analysis that I agree with. These include the following:

- I agree with OCS that "the study length should be long enough to capture growth in net metering penetration, and life cycle impacts on capital investment costs. This study period length is typical of what is used for any resource planning study."[27]
- I agree with OCS that the long-term cost impact analysis should be based on revenue requirements.[28] As I describe above and in my direct testimony, revenue requirements is the key metric that is used throughout the electricity industry to indicate costs and benefits to customers.

[27] Hayet Direct Testimony, page 12, lines 269 - 272.
[28] Hayet Direct Testimony, pages 16-17, lines 359 - 369.

- I agree with OCS that the long-term cost impact analysis should present the results in terms of the present value of revenue requirements.[29] Again, converting the revenue requirements to present value dollars is the conventional metric used to evaluate supply-side and demand-side resources.

- I agree with OCS that the long-term analysis should include the following types of benefits: "avoided energy, capacity, transmission, and distribution costs, as well as avoided transmission and distribution ("T&D") line losses." [30] I have not evaluated all of the details proposed by OCS for how these benefits should be calculated, but I generally agree with the types of benefits listed.

- I agree with OCS that the long-term analysis should include program administration, integration of the net metered resources, and increased distribution costs caused by the distributed generation energy. [31] I have not evaluated all of the details proposed by OCS for how these costs should be calculated, but I generally agree with the types of costs listed.

However, there is one key element to OCS's proposal for a long-term analysis that I do not agree with: I do not agree that lost revenues should be considered a cost in this analysis.

[29] Hayet Direct Testimony, page 7, 153 - 157.
[30] Hayet Direct Testimony, page 7 line 163 - 165.
[31] Hayet Direct Testimony, page 7 line 161 - 163.

Q. How does Witness Hayet include lost revenues in his long-term analysis?

A. In Witness Hayet's illustrative example, he begins by estimating that NEM will reduce revenue requirements across all customers by roughly $1 million.[32] Then he estimates the impacts on non-NEM customers as a result of embedded fixed cost being shifted to them from NEM customers.[33] These embedded fixed costs do not require any new revenue requirements, and in fact are not new costs at all. They represent the recovery of existing fixed costs that is needed as a result of the lost revenues from NEM generation. Including these so-called "costs" turns the net benefit of $1 million to a net cost of $1.9 million.[34]

Q. Please explain why you do not agree with OCS about treating lost revenues this way in the long-term analysis?

A. In my direct testimony, I explain in detail why lost revenues should not be included in the cost impact analysis (i.e., the long-term analysis to indicate the costs and benefits of NEM across all customers). In sum, the lost revenues should not be used in the cost impact analysis because (a) the lost revenues do not increase revenue requirements and therefore should not be included in a revenue requirement analysis; (b) the lost revenues are derived from fixed costs that are embedded in rates and will be incurred in both the future scenario without NEM and the future scenario with NEM, and therefore should not be included in only the scenario with NEM; (c) including lost revenues in the analysis is misleading and does not provide the information necessary to determine cost-

[32] Hayet Direct Testimony, page 17, Table 1 and lines 367-369.
[33] Hayet Direct Testimony, page 17, Table 1 and lines 369-375.
[34] Hayet Direct Testimony, page 18, lines 388-389.

effectiveness; (d) including lost revenues in the analysis will not result in the lowest costs to customers; and (e) including lost revenues in the analysis in an attempt to eliminate customer inequity can lead to perverse results, where significant benefits are foregone in order to avoid *de minimus* rate impacts.[35]

I agree with OCS that it is the lost revenues that result in a shifting of costs from NEM customers to non-NEM customers.[36] However, the purpose of the long-term revenue requirements analysis (i.e., the cost impact analysis) is to indicate the impacts of NEM across all customers; not to indicate the impacts on any one subset of customers. The impacts of cost-shifting on non-NEM customers, if any, can be analyzed using a rate impact analysis. To include the lost revenues as a cost in the cost impact analysis provides misleading results that do not indicate either the impacts across all customers or the impacts on non-NEM customers.

Q. Please describe your views regarding OCS's proposal for a short-term analysis of NEM costs and benefits.

A. OCS's proposal for a short-term analysis is intended to assess the impacts on non-NEM customers.[37] Thus, the goal of OCS's short-term analysis is consistent with the goal of my recommendation for a rate impact analysis. However, the short-term analysis proposed by OCS suffers from some fundamental flaws, and should not be used as an indication of the impacts on non-NEM customers.

[35] Woolf Direct Testimony, pages 9- 11, lines 165-230.
[36] Hayet Direct Testimony, page 16, line 350 - 351.
[37] Hayet Direct Testimony, page 13 lines 302-304.

Q. Please describe the flaws of OCS's proposal for a short-term analysis of NEM costs and benefits.

A. The impacts of NEM on non-NEM customers are driven by the increased rates that are required to recover fixed costs over fewer sales. Therefore, the most meaningful way to demonstrate the impacts of NEM on non-NEM customers is through a long-term rate impact analysis, such as the one that I have proposed.

OCS's proposal does not properly present the impacts on non-NEM customers for two reasons. First, the OCS's proposal for a short-term analysis only includes the costs and benefits over the short term—in fact, only over a single year. Distributed PV systems can provide long-term benefits, to NEM and non-NEM customers, in terms of reduced generation, transmission, and distribution capacity costs over a long term. A short-term analysis will not capture these long-term benefits, and will therefore understate the net benefits to NEM and non-NEM customers.

Second, a proper rate impact analysis can put rate impact results in terms of the percent increase in rates, or increases in c/kWh, in order to provide results that are easily understandable, meaningful, and not misleading. The impacts of NEM on non-NEM customers are not driven by increased costs (as represented by increased revenue requirements), but rather by having to recover fixed costs over fewer sales. Thus, the second flaw with OCS's proposal is that the short-term analysis puts the results in terms of increased costs, rather than in terms of the percent increase in rates, or increases in c/kWh, which can be misleading.

Q. Witness Hayet has provided an illustrative example of the short-term NEM analysis that OCS is proposing. Do you have any comments on his illustrative example?

A. Yes, I have some very general comments. First, I cannot comment on the validity of Witness Hayet's assumptions, because he has not provided sufficient information describing how they were determined. His assumptions regarding the energy savings from NEM, the revenue requirements required from all customers, and the avoided capacity costs of NEM are not fully described, and Witness Hayet points out that they are approximations that are only for illustrative purposes.[38] Consequently, the Commission should not interpret any of the results as an indication of the costs and benefits for all customers or for non-NEM customers.

Second and more importantly, Witness Hayet's analysis does not provide results in a way that can be meaningfully interpreted by the Commission or others. In Table 3 of his testimony, he presents the total cost increases to non-NEM customers over three different scenarios, in terms of millions of dollars. However, without putting these results into the context of customer rates and bills, which is how customers will be affected, it is difficult to interpret what the results mean. What does it mean for non-NEM customers if their costs increase by $1.9 million in the base case? How does this compare with the total benefits to all utility customers from NEM?

Witness Hayet does report that non-NEM residential customers might have to pay $9 per month more as a result of NEM. This is an example of a useful metric that puts the rate impact into a meaningful context. However, this result does not tell the whole story. This

[38] Hayet Direct Testimony, page 27, lines 552 - 555

result is for the high PV growth case, which assumes 40% growth in PV installations. If this amount of PV were to be installed on the RMP system, then the net benefits across all customers would be significant, on the order of hundreds of millions, perhaps billions, of dollars.[39]

Presenting the customer bill impact from the other two scenarios shows a very different picture. Using Witness Hayet's own analysis, the base case scenario and 20% growth scenario suggest that non-NEM customers might experience monthly bill increases of roughly $0.2 and $1.72, respectively.[40] I do not mean to suggest that I support these results, for reasons described above. I present them here to indicate the importance of putting any such results in the proper context.

5. REBUTTAL OF DIVISION OF PUBLIC UTILITIES TESTIMONY

Q. Please summarize the Division's proposal for evaluating the costs and benefits of NEM.

A. The Division recommends that the costs and benefits of NEM be evaluated using a cost of service framework.[41] However, it does not provide much detail on which types of costs and which types of benefits would be included in this framework, or much detail regarding the methodology used for comparing costs.

[39] See Section 6 for a discussion of the net benefits of NEM under assumptions of different penetration rates. Witness Hayet's high PV growth case assumes that roughly 13 percent of residential customers would install rooftop PV. This level of penetration is higher than my Ten Percent Penetration scenario, suggesting that the net benefits of Witness Hayet's high PV growth case could be higher than those in my Ten Percent Penetration scenario, generally speaking.

[40] Hayet Direct Testimony, Exhibit OCS-2.2.

[41] Davis Direct Testimony, page 5, lines 78-80.

The Division recommends that two studies be prepared: one that does not account for excess generation and one that does.[42] According to the Division, a comparison of the two studies would indicate the benefits of NEM.[43] The Division adds that "other costs" not captured in this comparison can be evaluated separately.[44] However, the Division is not clear what these other costs are or how they would be evaluated.

Q. Do you agree with the Division's proposal?

A. The Division's proposal does not provide sufficient detail for me to comment on it in any depth. However, I have a few general comments.

Q. Do you agree with Division's recommendation that the costs and benefits of NEM should be evaluated using a cost of service framework?

A. No. As described above in Section 3, a cost of service study is not appropriate for evaluating costs and benefits of resources. The Division seems to be confusing cost-effectiveness with rate design, the same way that RMP does.

One of the Division's primary recommendations is that "the Commission should adopt a type of cost of service framework for determining how to apportion costs and benefits to net metering customers."[45] In addition, the Division notes that "[a] cost of service study is generally a starting point for establishing what set of costs and revenues are appropriately assigned to each group of customers."[46] Further, the Division rejects the

[42] Davis Direct Testimony, page 7, lines 106-116.
[43] Davis Direct Testimony, page 7, lines 116-117.
[44] Davis Direct Testimony, page 7, lines 118-120.
[45] Davis Direct Testimony, page 5, lines 78-80.
[46] Davis Direct Testimony, page 6, lines 88-90.

use of a DSM test framework, because it "does not believe that a DSM test framework will readily lead to the development of a reasonable rate structure."[47]

In all of these cases, the Division is mixing up rate design with cost-effectiveness. The purpose of cost-effectiveness analyses is to determine the benefits and costs of a particular resource across all customers, in order to help decide whether to invest in, implement, or support that resource. Cost-effectiveness analyses are not intended to "apportion costs and benefits," or to assign costs to groups of customers, or to be used to develop a reasonable rate structure. The Division's recommendations apparently are more driven by rate design objectives than cost-effectiveness objectives.

Q. What is the problem with mixing up cost-effectiveness and rate design?

A. As described in Section 3 of my testimony, conflating cost-effectiveness and rate design will not provide the information required by the NEM legislation and needed by the Commission. It will not indicate the costs and benefits to all customers, and potentially not even the costs and benefits to non-NEM customers. Even worse, it might provide information that is misleading or incorrect.

Further, conflating cost-effectiveness and rate design is not consistent with the NEM statute, which clearly requires that the two issues be addressed separately. Before any decisions are made on rate design, the Company, the Commission, and the stakeholders need to review the NEM costs and benefits, to all customers and to non-NEM customers, of the current rated design. Then, in light of those results, the Commission should

[47] Davis Direct Testimony, page 6, lines 84-85.

consider whether to keep the current ratemaking structure or whether alternative ratemaking options are warranted.

Q. The Division recommends that the benefits and costs of NEM account for the allocation of costs from PacifiCorp to Utah customers.[48] Do you agree?

A. Yes. The NEM benefit-cost framework should account for the all the costs and benefits that will affect the revenue requirements of RMP's Utah customers. The allocation of costs from PacifiCorp to Utah customers can have a significant impact on the revenue requirements allocated to Utah, and this should be accounted for in any NEM benefit-cost analysis. Given that the amount of costs allocated from PacifiCorp to Utah customers is based upon both Utah's peak demand and energy sales, I would expect that NEM generation would help reduce the amount of costs that are allocated from PacifiCorp to Utah customers.

Q. Do you account for the impact that NEM will have on the allocation of costs from PacifiCorp to Utah customers in your cost impact and rate impact analyses described below?

A. No, I do not account for these impacts because my analysis is a relatively simple, illustrative analysis. Any NEM cost-benefit analysis conducted by the Company should properly account for the impacts that NEM will have on the allocation of costs from PacifiCorp to Utah customers.

[48] Davis Direct Testimony, pages 3 – 4, lines 42 - 47

6. ILLUSTRATIVE COST IMPACT ANALYSIS

Background

Q. Please describe the role of a cost impact analysis and a rate impact analysis.

A. As described in my direct testimony, a complete assessment of the cost-effectiveness of NEM requires a cost impact analysis and a rate impact analysis. The cost impact analysis indicates the impacts across all customers, in terms of the long-term present value of revenue requirements, while the rate impact analysis indicates the impacts on non-NEM customers, in terms of increased rates.

Q. Did you provide an illustrative analysis in your direct testimony?

A. Yes, I provided an illustrative rate impact analysis in my direct testimony. At that time I placed priority on the rate impact analysis over a cost impact analysis, because cost impact analyses are common-place and widely understood in electricity industry cost-effectiveness contexts, while rate impact analyses are much less common and less well understood.

Q. Why are you providing a cost impact analysis at this time?

A. The direct testimonies of the Company, OCS, and the Division indicate that there is a lot of confusion among the parties regarding the conventional methodology for analyzing the costs and benefits of an electricity resource, i.e., conducting a cost impact analysis. Further, Witness Hayet presents an illustrative short-term analysis of NEM costs and benefits that is fundamentally different from the cost impact analysis that I recommend.

For these reasons, I believe that it is important to present an illustrative cost impact analysis to demonstrate how my recommendations can be applied in practice, and how

they differ from the other parties. As with my illustrative rate impact analysis, my cost impact analysis is prepared using several high-level approximations for some of the key inputs. A more comprehensive cost impact analysis should be conducted to provide more accurate impacts of the NEM costs and benefits, after the Commission has ruled on the framework and input assumptions.

Methodology and Assumptions

Q. Please describe how you prepared an illustrative cost impact analysis for net energy metering in Utah.

A. I developed a workbook model for this purpose. Exhibit TW-6 provides a print-out of the key elements of the workbook.

My cost impact and rate impact analyses are essentially the same analysis. They use the same methodologies, input assumptions, and time period. The only difference between the two is the way results reported. The cost impact analysis presents cost impacts in terms of present value of revenue requirements, while the rate impact analysis presents rate impacts in terms of cents/kWh and percent increase in rates.

Here are the key elements of the cost and rate impact analyses:[49]

- The analyses cover a study period of 20 years.
- The analyses are applied to the residential rate class.

[49] For more detail, see Woolf Direct Testimony, pages, 20 - 24, and lines 397 - 487

- The analyses compare hypothetical scenarios: one assuming that no new PV is installed over the study period (the Without-PV scenario), and another assuming a certain amount of PV is installed due to NEM (the With-PV scenario).

- For each scenario, the analyses include a forecast of utility sales, costs, and rates for the study period. A comparison between the two scenarios reveals the difference in sales, costs, and rates caused by NEM.

- The calculations are based on the assumption that rates are adjusted every year to account for reductions in electricity sales as a result of the DGPV.[50]

- I assume an illustrative range of avoided costs, from $60/MWh to $120/MWh, in levelized terms.

- I assume an illustrative range of PV penetration levels; one case where 5 percent of customers install PV over 10 years (the Five Percent Penetration scenario), and another case where 10 percent of customers install PV over 10 years (the Ten Percent Penetration scenario).

Q. Did you change any assumptions from those used in your direct testimony?

A. For the purpose of the cost impact analysis, I made a simplistic assumption about program administration costs and the costs that may be required to integrate PV onto RMP's electricity grid. I assume that these costs would be $5/MWh for each MWh of PV generation. I have no information regarding what these cost might actually be. I include

[50] This assumption tends to overstate the actual rate impacts, potentially by a significant amount. In those years without a rate case, there will be no increase in rates as a result of savings from NEM customers.

these illustrative costs in my analysis to indicate that there may be such costs associated with NEM and how they would be included in the analysis.

This assumption regarding these PV costs will affect the rate impact analysis as well as the cost impact analysis. Therefore, my rate impact estimates presented here are slightly different from those of my direct testimony. But the difference is immaterial.

Q. Are there any differences between the cost and the rate impact analyses?

A. Both analyses used the same methodologies, inputs, and assumptions to compare the costs, sales, and rates of the With-PV to the Without-PV scenarios. In the cost impact analysis, the lost revenues are not included, because they do not affect revenue requirements. In the rate impact analysis, lost revenues are included, because that is how lost revenues affect ratepayers—by increasing rates.

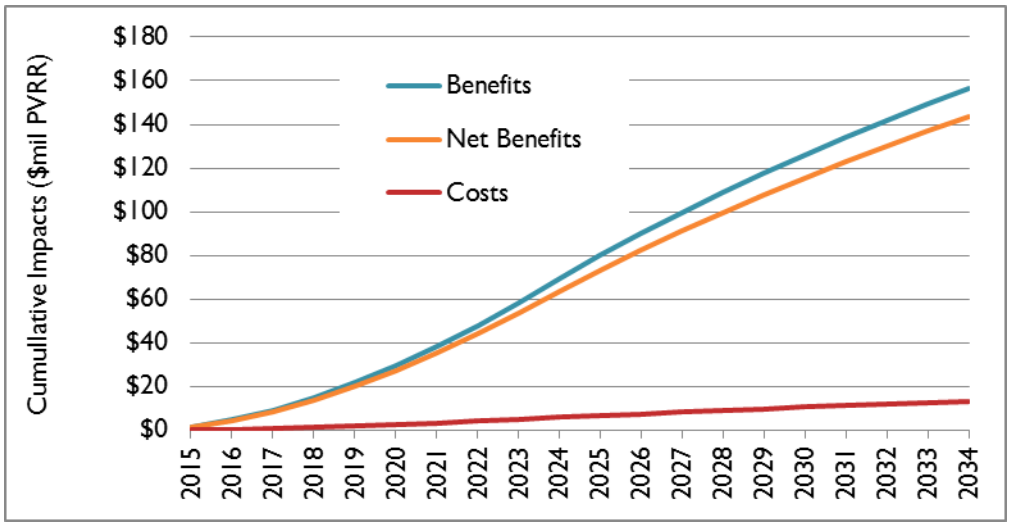
Summary of Results

Q. Please summarize the results of the cost impact analysis for the Lower Avoided Cost and Five Percent Penetration scenario.

A. Figure 1 presents the NEM costs, benefits, and net benefits for the Lower Avoided Cost and the Five Percent Penetration scenario. The results are presented in terms of cumulative present value revenue requirements, which means that each year indicates the cumulative present value of costs and benefits up through that year. The cumulative costs, benefits, and net benefits for the entire study period are presented in 2034, the last year. For this scenario, the cumulative net benefits of NEM for the entire study period are estimated to be roughly $143 million PVRR.

As indicated, the costs of NEM are quite small relative to the benefits because they include only the costs associated with program administration and PV integration on the grid. The benefits include all of the avoided costs, which are assumed to be $60/MWh in this case.

Figure 1. Cost Impact Results, Lower Avoided Costs, Five Percent Penetration



Q. Please summarize the results of your cost impact analysis for the other scenarios that you analyzed.

A. The results of all scenarios analyzed are summarized in Table 1. For each of the scenarios analyzed, the table presents the cumulative PVRR results for the Without-PV relative to the results for the With-PV scenario. The net benefits are simply the benefits less the costs, and the benefit-cost ratio is simply the benefits divided by the costs.

Table 1. Results of the Illustrative Cost Impact Analysis: Cumulative PVRR

	Five Percent Penetration		Ten Percent Penetration	
	Lower Avoided Costs	Higher Avoided Costs	Lower Avoided Costs	Higher Avoided Costs
PVRR Without PV ($ Mil)	$10,082	$10,082	$10,082	$10,082
PVRR With PV ($ Mil)	$9,939	$9,482	$9,795	$8,882
Net Benefits ($ Mil)	$143	$600	$287	$1,200
Benefit-Cost Ratio	12	24	12	24

This illustrative analysis indicates that the net benefits of NEM (in PVRR) might range from tens of millions of dollars to over one billion dollars, depending upon the scenario. It also indicates that the benefit-cost ratio of NEM will range from a low of 12 to a high of 24. In other words, for every ratepayer dollar (in revenue requirements) spent on NEM, there will be roughly 12 to 24 dollars savings (in reduced revenue requirements) across all ratepayers.

Q. Your analysis suggests that NEM will be very cost effective under each scenario analyzed. Why are the results so favorable toward NEM?

A. This cost impact analysis indicates that NEM is very cost-effective because behind-the-meter PV generation is provided to the utility at a very low cost. Aside from program administration and PV integration costs, the PV power is essentially provided for free. The host customers incur the vast majority of the resource cost by installing the PV system with their own funds. This is a simple fact that often gets obscured in all of the complex debates regarding cost allocation, cost of service, and rate design.

Q. Your analysis suggests that NEM will be highly cost-effective under a range of different assumptions, because most of the NEM costs are born by the host customer. Is this the end of the story?

A. No. The cost impact analysis presents the NEM costs and benefits for all customers as a whole, but it says nothing about the impacts on non-NEM customers. As with all benefit-cost analyses, the cost impact analysis does not address cost allocation or cost shifting that might occur between customers. That is why I recommend that the cost impact analysis be supplemented with a rate impact analysis. I show how this can be done in the following section.

7. THE ULTIMATE GOAL: ASSESSING BOTH COSTS AND RATES

Q. How should both the cost impacts and rate impacts be considered together?

A. Table 2 presents a summary of the results of my cost and rate impact analyses. The net benefits and the benefit-cost ratios are taken from Table 1. The annual and cumulative rate impacts are described in my direct testimony.[51]

[51] Woolf Direct Testimony, pages 20 - 29, lines 397-549. The rate impacts presented here are slightly different than those in my direct testimony, because these updated rate impacts account for the administration and integration costs of NEM. The updated cost and rate impact analysis is presented in Exhibit TW-6.

Table 2. Results of the Illustrative Cost and Rate Impact Analyses

	Five Percent Penetration		Ten Percent Penetration	
	Lower Avoided Costs	Higher Avoided Costs	Lower Avoided Costs	Higher Avoided Costs
Net Benefits ($ Mil)	$143	$600	$287	$1,200
Benefit-Cost Ratio	12	24	12	24
Annual (year-to-year) Rate Impact	0.2%	-0.01%	0.4%	-0.1%
Cumulative Rate Impact by 2024	1.8%	-0.7%	3.7%	-1.4%

In the scenarios with high avoided costs, there are likely to be significant NEM net benefits across customers as a whole, in the range of $600 to $1,200 million; and the rates are likely to be *reduced* by NEM. In these cases, there is no question that NEM will be beneficial for all customers, including non-NEM customers.

In the scenarios with low avoided costs there are still significant net benefits across customers as a whole from NEM, in the range of $143 to $287 million; but the rates may increase leading to increased bills for non-NEM customers. These results provide the most direct indication of the extent to which cost-shifting might affect non-NEM customers. In these cases, the Commission must strike a balance between the opportunity to reduce costs across all customers, and the potential for increased rates.

- In the Five Percent Penetration scenario, the benefit-cost ratio of 12 and the net benefits of $143 million must be considered against an annual rate impact of 0.2 percent for 10 years.

- In the Ten Percent Penetration scenario, the benefit-cost ratio of 12 and the net benefits of $287 million must be considered against an annual rate impact of 0.4 percent for 10 years.

In these scenarios where rates are expected to increase, the Commission generally has two options. It could decide to keep the current rate structures in place, on the grounds

that the modest rate impacts are acceptable relative to the net benefits. Or it could consider alternative ratemaking options.

8. RECOMMENDATIONS

Q. Please summarize your primary recommendations.

A. I continue to stand by all of the recommendations provided in my direct testimony. In particular:

- The Commission should find that a benefit-cost analysis should be conducted separately from rate design determinations, and clarify that rate design alternatives should be considered in light of the results of the benefit-cost analysis.
- The Commission should require that the NEM cost impact analysis be based on net present value of revenue requirements, consistent with the conventional practice of evaluating all types of supply-side and demand-side resources in Utah.
- The Commission should clarify that lost revenues from distributed generation resources should not be included in the cost impact analysis in any way.
- The Commission should require the Company to conduct a rate impact analysis to indicate the extent to which customers who do not install distributed generation resources might be harmed by those that do.

Q. Does this conclude your rebuttal testimony?

A. Yes, it does.