BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of the Investigation of	**)**	**Docket No. 14-035-114**
the Costs and Benefits of PacifiCorp's	**)**	**Direct Testimony of**
Net Metering Program	**)**	**Philip Hayet**
	)	**On Behalf of the**
	)	**Utah Office of**
	)	**Consumer Services**

July 30, 2015

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Philip Hayet. My business address is 570 Colonial Park Drive, Suite 305, Roswell, Georgia, 30075.

Q. PLEASE STATE YOUR OCCUPATION, EMPLOYMENT, AND ON WHOSE BEHALF YOU ARE TESTIFYING.

A. I am a utility regulatory consultant and Vice President of J. Kennedy and Associates, Inc. (Kennedy and Associates). I am appearing on behalf of the Office of Consumer Services ("Office").

Q. WHAT CONSULTING SERVICES ARE PROVIDED BY KENNEDY AND ASSOCIATES?

A. Kennedy and Associates provides consulting services related to electric utility system planning, energy cost recovery, revenue requirements, regulatory policy, and other regulatory matters.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND APPEARANCES.

A. My qualifications and appearances are provided in Hayet Direct - Exhibit OCS-2.1. I have participated in numerous PacifiCorp and Rocky Mountain Power (or the "Company") cases involving power costs, acquisitions, and avoided costs over the past 15 years. Most recently, I filed testimony in Docket No. 14-035-140, which resulted in Commission approved capacity contribution values for wind and solar resources that will be used in developing Qualifying Facilities ("QF") avoided cost payments.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to discuss the Office's recommendations regarding the framework that should be used to determine the costs and benefits of PacifiCorp's net metering program, and to analyze whether costs shifted to the Company and its other customers are offset by the benefits that net metering customers provide. I also present the results of an evaluation that I conducted of a sample of non-net metered residential load shapes that the Company supplied.

Q. WHAT LED TO THIS PROCEEDING BEING INITIATED?

A. In the most recent rate case, Docket No. 13-035-184, The Public Service Commission of Utah ("Commission") declined to implement the net metering facilities charge that PacifiCorp requested because it decided that further study of PacifiCorp's net metering costs and benefits was needed. The Commission opened this docket for that purpose, and to ensure that any changes to the rate would comply with the following provision from Utah Code Ann. § 54-15-105.1, which is the law guiding the Commission's consideration of net metering charges. The code states:

> *The governing authority shall:*
>
> *(1) 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*
>
> *(2) determine a just and reasonable charge, credit, or ratemaking structure, including new or existing tariffs, in light of the costs and benefits.*
>
> (Order issued November 21, 2014, Docket No. 14-035-114, at page 1)

Q. WHAT APPROACH HAS THE COMMISSION TAKEN TO CONDUCT THIS INVESTIGATION?

A. The Commission determined that this investigation would have to be conducted in stages, with the first being a technical conference at which PacifiCorp would present its plan for performing a load research study focused on residential net metered customers. PacifiCorp held its technical conference on November 5, 2014, and it stated at the time that it would complete its load research study by September 2015.

The Commission stated that it intended to make a decision by the third quarter of 2015 regarding an analytical framework for determining whether the benefits of the Company's net metering program exceed the costs. This is the subject of the current proceeding, and pursuant to the Commission's request, stakeholders have thus far been collaborating on developing an evaluation framework by participating in a series of technical conferences.[1] The Commission also permitted comments to be filed on February 6, followed by reply comments on February 20.

The Commission stated that after the costs and benefits framework was determined, the analysis and calculations would be performed in a general rate case or other proceeding, in which the Commission would examine the:

> …costs and benefits that result from applying data to the approved analytical framework, as such results are presented by interested parties, and ultimately make the required determination under Utah Code Ann. § 54-15-105.1(2) (*i.e.*, whether a charge, credit or other ratemaking structure is just and reasonable in light of the costs and benefits of the net metering program).
>
> (Order issued November 21, 2014, Docket No. 14-035-114, at page 2)

Q. DID THE COMMISSION PROVIDE GUIDANCE REGARDING THE ISSUES IT BELIEVED WERE IMPORTANT TO CONSIDER IN ESTABLISHING AN

[1] Technical conferences were held on April 27, May 12, June 25, and July 8.

APPROPRIATE FRAMEWORK THAT IT COULD APPLY TO EXAMINE NET METERING COSTS AND BENEFITS?

A. Yes, it did on two occasions. In its November 21, 2014 Notice of Comment Period and Scheduling Conference, the Commission noted that the analytical framework that it would use to evaluate PacifiCorp's net metering program would include "the types of analyses that must be performed, the components of costs and benefits to be included in the analyses, and the sources and time period of data inputs."[2] Furthermore, in that notice, the Commission invited parties to file comments on whether traditional costs and benefits tests, such as the utility cost test, could be applied to examine the costs and benefits of PacifiCorp's net metering programs, whether the analysis used to examine costs and benefits is consistent with the statutory definition of the net metering program, and whether the types of analyses used would have to vary depending on whether the type of net metered customers was residential or non-residential.[3]

Q. WHAT ADDITIONAL GUIDANCE DID THE COMMISSION PROVIDE?

A. On March 9, 2015, after considering stakeholder comments, the Commission issued a notice to clarify certain issues including the topics it thought would be appropriate to consider in the remaining technical conferences. The Commission reiterated its interest in determining whether traditional demand side management ("DSM") costs and benefits test equations could be adapted for use in evaluating PacifiCorp's net metering program, or whether some other type of evaluation, such as a PURPA avoided cost analysis, or an IRP analysis could be used. The Commission stated that "Those issues seem necessary to establishing an appropriate

[2] Commission's November 21, 2014 Order at 2.
[3] Initial comments were filed on February 6, 2015, and reply comments were filed on February 20, 2015.

framework we could subsequently apply to examine the net metering costs and benefits and consider any future rate design proposal."

Q. WHAT IS YOUR POSITION REGARDING THE USE OF TRADITIONAL DEMAND-SIDE MANAGEMENT COST BENEFIT TESTS TO EVALUATE PACIFICORP'S NET METERING PROGRAM?

A. In its Reply Comments filed February 20, 2015, the Office stated its position that traditional DSM tests are not appropriate for the analysis that needs to be performed in order to comply with the requirements of Utah Code Ann. § 54-15-105.1. Subsection 1 of the statute requires a costs and benefits analysis, evaluating the impact to both the utility and other customers. The Commission clarified that the term "other customers" refers to non-net metering customers in their capacity as ratepayers, and does not refer to "their broader capacity as residents or citizens of Utah".[4] I believe that considerable importance needs to be attached to consideration of costs and benefits impacts on "other customers", and I believe that the proper analysis of cost impacts on other customers requires evaluating shorter term costs that are typically calculated as part of a cost of service study found in a rate case. The Commission appears to agree with this as it stated in its July 1 Order in this proceeding that "…the Commission interprets Subsection One of the Statute to require the Commission to perform a cost of service analysis that weighs the costs and benefits of net metering."[5] Therefore, the Office believes that traditional DSM tests, which are typically developed in studies over a long term planning horizon, would not be appropriate for the Commission

[4] Order Re: Conclusions of Law on Statutory Interpretation and Order Denying Motion to Strike, July 1, 2015, page 13.
[5] Ibid at 11.

to use to measure potential costs that are shifted to "other customers" as a result of the current design of PacifiCorp's net metering program.

With regard to evaluating cost and benefit impacts on the utility, the Office acknowledges that with adequate adjustments a form of a DSM cost/benefit test could be used to measure those impacts on the utility. In fact, I will propose an evaluation for the impact of costs and benefits on the utility that uses some of the same principles of evaluating costs and benefits as the standard DSM tests. However, the Office believes that it would be inappropriate and potentially misleading to call this test a modified form of any DSM test and prefers that a name be used for the analysis that specifically refers to it as a net metering costs and benefits analysis.

Q. WHAT IS YOUR POSITION REGARDING THE USE OF EXTERNAL COSTS AND BENEFITS IN EVALUATING PACIFICORP'S NET METERING PROGRAM?

A. I do not believe that costs and benefits should extend to all factors that could conceivably be considered to impact net metering. Some parties often argue that consideration should be given to include external costs and benefits such as health impacts, and social and environmental benefits. I disagree, as I do not believe that external costs and benefits can be easily quantified and verified, and should not be included in the framework. This view is consistent with the Commission's recent Order that indicated:

> .…any cost or benefit not reasonably subject to quantification and verification will be of little use in conducting the Step One analysis and, therefore, unlikely to find a place in the final framework to be established in this docket. Parties advocating for the inclusion of any particular cost will bear the burden of establishing it will increase the utility's cost of service, and parties seeking to include any particular benefit will bear the burden of demonstrating it will decrease the utility's cost of service.
>
> (Order issued July 1, 2015, Docket No. 14-035-114, at page 16)

II. FRAMEWORK TO DEVELOP A COSTS AND BENEFITS ANALYSIS

Q. HOW WOULD YOU PERFORM A COSTS AND BENEFITS ANALYSIS OF PACIFICORP'S NET METERING PROGRAM ON PACIFICORP OR OTHER CUSTOMERS, CONSISTENT WITH THE STATUTORY REQUIREMENTS DISCUSSED ABOVE?

A. The procedure I would follow would include identifying the appropriate costs and benefits to use in the analysis, determining the appropriate time period for the analysis, which could vary depending on the study objectives, computing the net benefits by subtracting the costs from the benefits, and calculating a net present value of the net benefit results.

Q. WHAT COSTS AND BENEFITS WOULD YOU INCLUDE IN THE ANALYSIS?

A. I would include only the measurable and quantifiable costs and benefits that PacifiCorp has been incurring and receiving as a result of implementing the net metering program. The costs I would consider for inclusion would be program administration, integration of the net metered resources, increased distribution costs caused by the distributed generation energy, and lost revenues. The benefits would include avoided energy, capacity, transmission, and distribution costs, as well as avoided transmission and distribution ("T&D") line losses. As mentioned above, external costs and benefits such as health impacts, and social and environmental benefits should not be included in the analysis.

Q. HOW WOULD YOU DEVELOP THE COSTS FOR USE IN THE ANALYSIS?

A. Below, I provide recommendations for developing the costs to use in the costs and benefits analysis. Some of these recommendations will require PacifiCorp to conduct studies that can be reviewed by Stakeholders.

i) Program Administration Costs – This includes costs associated with assessing and setting up new customers, and may include engineering support to evaluate potential impacts on the distribution system. This also includes any billing and customer support requirements necessary to support the net metering customers. I recommend PacifiCorp perform an analysis to determine all administrative program costs incurred in supporting net metering customers. Also, to the extent that net metering customers cause PacifiCorp to incur additional meter related costs associated with installing new bi-directional meters at each net metering customer site, those additional costs should be included as part of the administrative costs.

ii) Integration Costs – Intermittent renewable resources such as solar Photovoltaic ("PV") rooftop generation may require utilities to maintain additional operating reserves to account for variability in the output of the intermittent resources, which can result in increased power plant cycling, and an increased need for operating reserves (regulating and flexible reserves). The need for additional operating reserves will increase as the penetration of intermittent distributed generation resources increases. For purposes of an initial cost/benefit analysis, I recommend PacifiCorp use the same solar integration cost as it derived for use in developing Schedule 38 Avoided Cost payments, which is currently set to $2.83/MWh for fixed tilt solar resources.[6]

iii) Distribution Costs – It is often asserted that net metering offers the potential for avoiding distribution network costs; however, it is also possible that utilities would incur increased distribution network costs due to the altered power flows that occur on the distribution system. The impact of the power flows from net metering customers could

[6] Commission Review and Clarification Order in Docket 12-035-100, October 4, 2013, at 14.

result in a utility having to install additional voltage controls and to increase some conductor sizes to accommodate the distributed generation. However, these costs are difficult to analyze, and may not be significant, therefore, for purposes of an initial cost/benefit analysis, I recommend that this cost should be ignored, unless it can be easily and cost effectively determined.

iv) Lost Revenues – Residential customers primarily pay for PacifiCorp's fixed and variable costs through rates designed based on energy charges. When net metering customers purchase less energy, PacifiCorp incurs lost revenues. Lost revenues that relate to fixed costs are not avoidable, and are ultimately charged to the remaining non-net metering customers in the next rate case. The shift in lost revenues should be included in an analysis of impacts on non-net metering customers. These lost revenue fixed costs should be developed based on an evaluation of PacifiCorp's most recent cost of service study.

Q. HOW WOULD YOU DEVELOP THE BENEFITS FOR USE IN THE STATUTORY ANALYSIS?

A. Below, I provide recommendations for developing the benefits to use in the costs and benefits analysis.

i) Avoided energy costs – Net metering customers can provide a benefit by allowing the utility to avoid producing energy using its highest variable cost resources. As a result, net metering energy can help to reduce the utility's fuel requirements and variable O&M costs, which in turn lowers the average fuel cost that all customers help pay for. To calculate avoided energy costs for net metering, I recommend using the same technique used to develop Schedule 37 and 38 QF avoided cost estimates, which is based on a differential production cost approach. This requires two production cost runs, one performed with and the other without the impact of net metering energy, which essentially modifies the load requirements that PacifiCorp has to meet. The difference in production cost results represents the avoided energy costs that should be used in evaluating net metering.

ii) Avoided capacity costs – In deriving an avoided capacity cost, three questions must be addressed. First, what type of resource should be used to base the capacity cost ($/kW-year) calculation on? For this, it would be reasonable to use the calculation of capacity payments made to QFs that are smaller than 3 MWs based on PacifiCorp's Schedule 37 tariff. Currently, in deriving capacity payments in that tariff, PacifiCorp bases its capacity cost calculation on the cost of a simple cycle combustion turbine ("SCCT"). I believe it would be reasonable to do the same in this net metering docket.

Second, should avoided capacity benefits be included in the costs and benefits analysis during periods of resource sufficiency when PacifiCorp has no need to acquire new resources? I do not believe that the evaluation should include an avoided capacity cost benefit during a resource sufficiency period. During resource sufficiency periods, PacifiCorp would not be incurring capacity costs to acquire new resources, and therefore, during those periods the net metering evaluation should not assume that there would be any capacity costs that could be avoided by the net metering resources. Therefore, I recommend that in the net metering evaluation, avoided capacity cost benefits should only be included during resource deficiency periods.

Third, during resource deficiency periods when avoided capacity costs are included in the costs and benefits calculation, what capacity contribution value should be used in deriving avoided capacity costs? Intermittent resources such as solar do not provide the same capacity value as conventional resources, and therefore should not be credited with the same capacity contribution value. For purposes of an initial costs and benefits analysis, I recommend PacifiCorp use the same solar capacity contribution value that the Commission recently approved for Schedule 38 avoided cost payments to solar QFs, which is currently set to 34.1% for fixed solar resources.[7]

iii) Avoided transmission costs – Net metering energy can reduce power flows on transmission lines and can possibly reduce the need for installing additional transmission capacity. I recommend that PacifiCorp conduct power flow studies to determine the impact of reduced transmission flows on its need to upgrade its transmission system. Based on this analysis PacifiCorp should derive an avoided transmission cost to use in the costs and benefits analysis.

iv) Avoided distribution costs – As mentioned previously, depending on the power flows on the utility's distribution system, it is possible that net metering could cause distribution costs to increase or decrease. Net metering could result in a distribution system benefit if the distribution system peak requirements are reduced. However, distribution system impacts are difficult to analyze, and may not be significant, therefore, for purposes of an initial cost/benefit analysis, I recommend that these costs should be ignored, unless they can be easily and cost effectively determined.

v) Avoided T&D line losses – Since net metered energy results in less generated energy having to be produced by the utility's central station plants, T&D line losses are also reduced. I recommend that this benefit be accounted for in the costs and benefits

[7] Commission Order in Docket 14-035-140, June 26, 2015, at 18.

analysis by assuming a fixed loss percentage value that PacifiCorp derives for the amount of T&D line losses that would be avoided.[8]

Q. WHAT STUDY PERIOD LENGTH WOULD YOU RECOMMEND USING?

A. The study period length will depend on the objective of the analysis. For purposes of evaluating the costs and benefits of net metering impacts on the utility, I recommend 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. For purposes of examining the impact of costs and benefits on other customers, a shorter term analysis should be relied upon to measure the specific impacts on current customers and to avoid inter-generational inequities that would result if the analysis were to use costs and benefits that occur across a longer time horizon. Further, if the results of the costs and benefits analysis are specifically used in developing rates, then the analysis should be consistent with the ratemaking planning horizon. It would simply be inappropriate to use the results of a long-term cost and benefit analysis in a ratemaking analysis, since rates are normally set based on current estimates of costs, not costs determined ten or twenty years out in time.

Q. WOULD THE INPUT ASSUMPTIONS BE DEVELOPED THE SAME WAY FOR SHORTER TERM STUDIES AS FOR LONGER TERM STUDIES?

A. No, they would not. For the longer term study, costs that relate to capital investments such as capacity costs and T&D costs should be based on long-term life cycle costs, and could be expressed as levelized values, for example over a period of 20 or 25 years. Also, in a

[8] It is also possible that T&D line losses could increase, depending on power flows caused by the net metering energy, though this impact is not expected to be significant.

longer term study, fuel costs could reflect a changing mix of resource types that will occur as new units are added or as units retire.

For the shorter term study, costs should be reflective of what the utility will incur at the present time, and should only include costs and benefits that are typically found in the utility's cost of service study. I provide an example in the next section to demonstrate the kind of short term analysis that should be performed to investigate the impacts of PacifiCorp's net metering program. I believe this is the type of study that should be performed to satisfy the Commission's requirements to determine impacts on other customers, which will be particularly important when the Commission considers developing just and reasonable rates in the next phase.

III. EXAMPLE DEMONSTRATING THE IMPACTS OF NET METERING

Q. HAVE YOU PERFORMED AN ANALYSIS SHOWING THE IMPACTS THAT RESIDENTIAL NET METERING ENERGY HAS ON THE UTILITY AND ITS OTHER CUSTOMERS (NON-NET METERING RESIDENTIAL CUSTOMERS)?

A. Yes, for this study, I performed a hypothetical short-term study of the costs and benefits of net metering energy, and I present results to illustrate the kind of impacts that will affect non-net metering customers. The results show the impacts on the net metering customers as well. The purpose of the analysis is simply to demonstrate the use of the framework, and to illustrate the impacts; however, this is not intended to provide a precise analysis of the costs and benefits of net metering. PacifiCorp should perform a more precise analysis in conjunction with its next rate case proceeding.

I developed a one year analysis that includes some of the costs and benefits discussed above, in order to demonstrate the impacts based on PacifiCorp's current rate tariff structure. For this analysis, I selected simple inputs without performing detailed studies to develop precise assumptions and results. The study compares the results of two cases, one without and one with distributed solar generation (net metering) added. To be conservative, and for the sake of simplicity, I ignored some of the costs mentioned above that could possibly increase in the case with the added distributed generation, such as additional administrative expenses.[9] However, in a proper study, I believe that these costs should be addressed.

Q. PLEASE DESCRIBE THE ANALYSIS.

A. In this analysis, I created two groups of residential customers, one that was a proxy for PacifiCorp's Utah residential net-metering customers, and the other that included the remaining residential (non-net metering) customers. In the case without net metering, i.e. without distributed generation systems, the group containing net metering customers is assumed to buy its entire load from PacifiCorp. In the case with net metering, customers in the net metering group are assumed to generate using their distributed generation systems. Any excess generation the group produces in one month is assumed to offset the group's load in another month when it under-produces. To the extent that the group under-produces over the period compared to its load, the shortfall is assumed to be made up by purchasing from PacifiCorp. For purposes of the study, I assumed that there were approximately 3,300 residential net metering customers, and approximately 749,000 non-

[9] To be clear, I did not exclude the benefits of reduced line losses, or avoided T&D costs as a result of the distributed generation installations. I simply excluded any increase in costs that the utility could occur as a result of the distributed generation resources.

net metering customers, and I developed sales impacts with and without the net metering distributed generation systems.[10] Table 1 provides the assumptions I used concerning PacifiCorp's sales to the customer groups:

Table 1

	Sales Without Net Metering (MWH)	Sales With Net Metering (MWH)	Net Metering Energy (MWH)
Net Metering Customers	31,500	6,608	24,892
Non-Net Metering Customers	6,268,500	6,268,500	0
Total Residential	6,300,000	6,275,108	24,892

For this analysis, I relied on a simple dispatch I developed using a basic spreadsheet model that determined the marginal resources avoided by the net metering energy, and then determined the resulting average fuel cost that residential customers would pay. As part of this dispatch analysis, I also accounted for the impact of reduced T&D losses. The results show that with net metering, there would be a slight reduction in the average fuel cost that all residential customers would have to pay. The average fuel cost dropped from $31.291/MWh to $31.289/MWh when net metering was added.

For fixed costs, which include production, distribution and transmission costs that are allocated to the residential customers, I assumed that a cost of service study had been performed, and determined that $550 million in costs were assigned to all residential customers.[11] This fixed cost revenue requirement has to be recovered from all residential customers that purchase energy from the Company. However, when residential customers

[10] Note the assumptions used were intended to be a reasonable reflection of the PacifiCorp System, though in many cases values were rounded, and were not necessarily reflective of current data.

[11] This is an example of an assumption that was intended to be a reasonable revenue requirement for Utah residential customers, however, the value is rounded, and should not be viewed as being a precise estimate, nor reflective of current data. A more precise estimate will be derived in PacifiCorp's next rate case proceeding.

install distributed generation equipment, they purchase less energy and avoid having to pay part of the embedded fixed costs based on the PacifiCorp's residential customer tariff. The costs not paid by the residential net metering customers are then shifted to other customers, which is demonstrated in the example below.

In addition, I also accounted for benefits net metering may provide in allowing the utility to avoid expenditures for generation capacity, assuming a deficiency exists, and for avoiding T&D capacity. I would stress that these avoided costs should only be included if it can be demonstrated that actual capacity related costs can be eliminated or deferred in the study period, which will have to be determined in an actual study. I assumed for purposes of this analysis that the benefit would be based on a credit of $10/MWh for each MWh produced by the net metering customers.[12]

The following table contains the results of the analysis. The first block contains the revenue requirements assigned to the groups of residential customers without net metering being added, and the second block contains the revenue requirement impacts on the groups with the addition of net metering. The difference in these results represents the overall impacts on the utility caused by net metering.

Table 2

[12] This value has simply been selected for purposes of this analysis. A precise estimate should be derived as part of the proper study that will be performed to evaluate the costs and benefits of net metering energy.

Illustrative Example - Net Metering Impacts				
	Fuel Costs ($)	Fixed Costs ($)	Capacity Credit ($)	Total ($)
Without Net Metering				
Net Metering Group	985,667	2,750,000	0	3,735,667
Non-Net Metering Group	196,147,643	547,250,000	0	743,397,643
Total	197,133,309	550,000,000	0	747,133,309
With Net Metering				
Net Metering Group	206,751	579,161	-262	785,650
Non-Net Metering Group	196,134,710	549,420,839	-248,660	745,306,890
Total	196,341,462	550,000,000	-248,922	746,092,540

The results demonstrate that due to savings in fuel and avoided generation and T&D capacity costs, overall, total revenue requirements to residential customers decrease by approximately $1 million ($747.1 - $746.1 million) with the addition of net metering energy. However, this comes at a detriment to non-participating residential customers as additional embedded fixed costs are shifted to them from the net metering customers, amounting to approximately $2.2 million ($549.4 – $547.3). Again, this shift occurs because the same amount of embedded fixed costs $550 million has to be collected from all residential customers, regardless of how much energy a group of the residential customers purchase from PacifiCorp.

Q. PLEASE SUMMARIZE THE NET METERING IMPACTS.

A. Net metering customers benefit by paying lower average fuel costs, and by purchasing less energy from PacifiCorp as a result of installing distributed generation equipment. They also benefit from PacifiCorp possibly being able to spend less on fixed costs as a result of the net metering energy. However, the most significant benefit to net metering customers is the fact that they are able to shift some of the fixed costs they otherwise would have paid for, to the non-net metering customers ($2.2 million).

The non-net metering customer group does not receive net benefits caused by net metering energy. While they do receive benefits of paying lower average fuel costs and paying somewhat less on fixed costs because PacifiCorp is possibly able to reduce spending on fixed costs due to the net metering energy, the non-net metering customer group is ultimately harmed due to the large amount of fixed costs that are shifted to them from the net metering customers. After accounting for all of the costs and benefits, non-net metering customers suffer a harm of $1.9 million ($745.3 – $743.4).

Q. HAVE YOU PERFORMED ANY SENSITIVITY ANALYSIS TO DETERMINE THE IMPACT IF THE PENETRATION OF NET METERING CUSTOMERS INCREASES AS EXPECTED?

A. Yes, I performed two sensitivity analyses based on different growth rates assumptions for net metering penetration. I developed these assumptions after reviewing the Company's response to UCE 2.3, which provided information about the number of residential net metering customers added in Utah over time. The data indicates that net metering installations first began in 2002 and have steadily increased each year. The compound annual average growth rate in the number of installations added over the period from 2002 to June 2015 is approximately 100% growth every year. While it is certainly possible that this large growth rate could continue into the future, I performed two analyses, one in which I assumed the growth rate would be 20% per year over the next ten years, and another in which I assumed the growth rate would be 40% per year over the next ten years, which was intended to be a high growth case for illustrative purposes.

The results are still based on a one year analysis, at the 10th year of the study period. In the 20% growth rate case, I assumed the number of net metering customers would increase to 20,433 (3,300 * 1.2^10), and in the 40% growth rate case, I assumed the number of net metering customers would be 95,454 (3,300 * 1.4^10). In both cases I assumed all costs would escalate at 2.5% per year over the ten year period. Finally, I assumed that the residential class sales would remain constant over the ten year period largely due to energy efficiency.

Q. WHAT DO THE RESULTS SHOW?

A. Hayet Direct - Exhibit OCS-2.2 contains a detailed summary of the impacts on net metering and non-net metering customers, while Table 3 below contains a selection of those results for each of the growth cases.

Table 3

Illustrative Example - Net Metering Impacts
Comparison of Growth Cases

Annual Total ($/Year)	**Base 3,300 NM Customers**	**20% Growth 20,433 NM Customers**	**40% Growth 95,454 NM Customers**
Total Reduction in Costs to NM Group			
Avoided Generation Cost	-778,915	-6,173,995	-28,847,573
Avoided Capacity Cost	-262	-13,134	-315,675
Fixed Cost Shifted to Other Cust	-2,170,839	-17,109,057	-77,704,523
NM Cust Cost Savings	-2,950,017	-23,296,186	-106,867,771
Total Increase in Costs to Non-NM Group			
Avoided Generation Cost	-12,932	-89,430	-242,833
Avoided Capacity Cost	-248,660	-1,959,765	-8,900,700
Fixed Cost Shift from NM	2,170,839	17,109,057	77,704,523
Total Non-NM Customer Cost Increase	***1,909,247***	***15,059,862***	***68,560,990***

The results show that the harm to the other non-net metering customers increases significantly over time with increasing levels of penetration. Also, the results follow the same pattern as discussed above, that is the net metering customers benefit by significant reductions in generation costs (including reduced T&D line losses), and reductions due to PacifiCorp being able to avoid some fixed costs. But a significant portion of the benefit they receive comes about at the expense of non-net metering customers, since a large amount of fixed costs are shifted to the non-net metering customers. In total, in the 40% growth rate case, the net metering customers incur savings of approximately $107 million.

Correspondingly, the non-net metering customer group suffers even greater harm as the penetration increases. In the 40% growth rate case, after accounting for the small benefit of reduced fuel expense and avoided capacity costs, the non-net metering group of customers incurs an increased total cost of approximately $69 million. Again, while this is purely a hypothetical analysis based on simple assumptions that were made for the convenience of the analysis, it nevertheless demonstrates how other residential customers will be affected over time. While a more precise and more accurate study should be performed, Hayet Direct - Exhibit OCS-2.2 demonstrates that under these assumptions, due to the shift in fixed costs, growth in net metering will result in residential customers hypothetically having to pay $9 per month more than they otherwise would have paid had net metering not occurred.

Q. UP TO NOW YOU HAVE FOCUSED ON RESIDENTIAL CUSTOMERS, WOULD YOU EXPECT TO SEE SIGNIFICANT COST SHIFT ISSUES WITH REGARD TO NON-RESIDENTIAL NET METERING CUSTOMERS?

A. Potentially, some cost shifting could occur related to non-residential net metering customers, however, I do not think it would be as significant as with residential net metering customers. In the case of residential customers, nearly all of the residential class fixed costs are collected from those customers through variable energy rates. Residential net metering customers avoid paying some of the fixed costs when energy utilization decreases because of the way that the residential energy tariff is structured, which is primarily based on a variable energy rate.

In the case of non-residential customer classes, nearly all of the classes recover some (or most) of their fixed costs through demand charges. Because of that, it is possible that the non-residential net metering customer would not shift fixed costs to other customers in the same class. This could be confirmed based on an analysis performed at the time the impacts of the residential net metering program are evaluated. If confirmed, then it would be unnecessary to perform any further analysis of the costs and benefits of non-residential net metering customers. Furthermore, there are currently only about 460 non-residential net metering customers, which is about ten times smaller than the number of residential customers that net meter. Even if cost shifting was found to be a problem with non-residential customers, it is unlikely that cost shifting would be as significant of a problem as with residential customers. Over time, the Commission could monitor this to determine whether the magnitude of the issue changes significantly.

IV. LOAD SHAPE EVALUATION

Q. HAVE YOU PERFORMED AN EVALUATION OF RESIDENTIAL CUSTOMER LOAD SHAPES?

A. Yes, aside from the question of whether intra-class cost subsidization occurs, another evaluation that I performed was an analysis of residential non-net metering load shapes. However, I would ultimately like to compare both residential net-metering and non-net metering load shapes when PacifiCorp completes its net metering load research study, which it expects to finish by September of this year. This will be important because it will help address the question of whether residential net-metering and non-net metering customers place similar demands on the PacifiCorp System, and whether it is reasonable to recover costs from those customers in the same way.

Q. SPECIFICALLY, WHAT DID YOU EVALUATE WITH REGARD TO THE RESIDENTIAL NON-NET METERING LOAD SHAPES?

A. I conducted an evaluation to determine whether there are any significant differences in the load characteristics of different size residential non-net metering customers. I based the evaluation on data the Company provided in response to OCS 2.1, which contained load research data consisting of average hourly demand data for a selection of unidentified residential customers for the years 2013 and 2014. The data included load shapes for 195 non-net metering customers, and one net metering customer that I excluded from the analysis I performed. The data contained a wide variation of residential customers. For example, the largest peak demand in an hour for one of the customers was 41 kW, while the smallest peak demand for a customer was .9 kW.[13] Given this variation in size, I separated customers into four different strata and developed seasonal average shapes for the four groups covering a 24 hour period for the season. I used the same strata as the Company is using for its Load Research Study[14], which is based on average monthly kWh energy usage. The strata are:

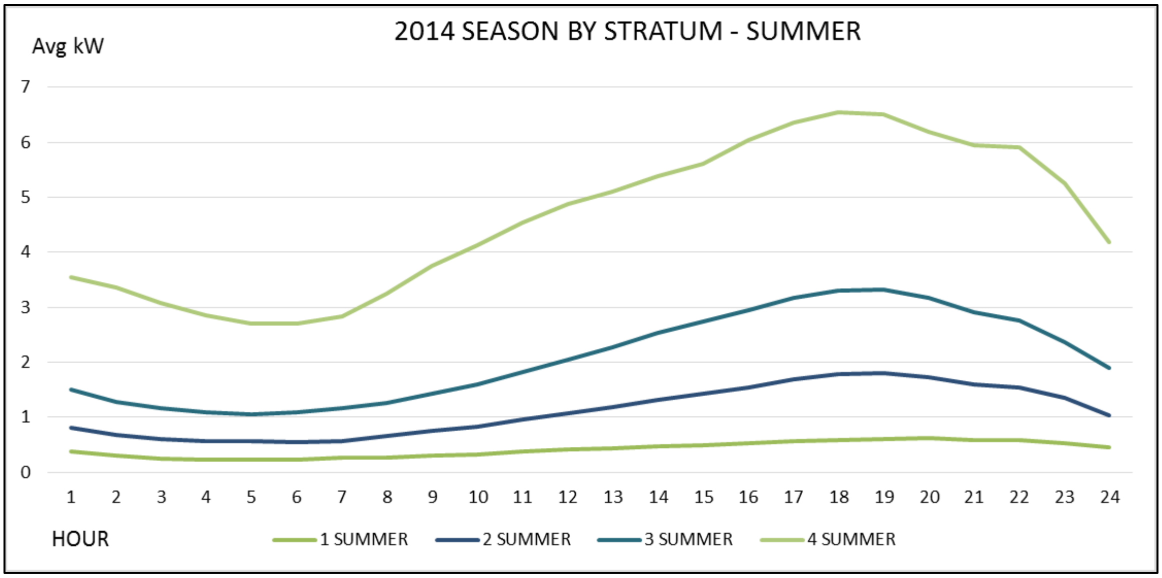
- Stratum 1 - 0 - 400 kWh
- Stratum 2 - 401 - 900 kWh
- Stratum 3 - 901 - 2000 kWh
- Stratum 4 - 2001 kWh or more

Q. DID YOU FIND THAT NON-NET METERING RESIDENTIAL CUSTOMERS GENERALLY HAVE A SIMILAR LOAD SHAPE?

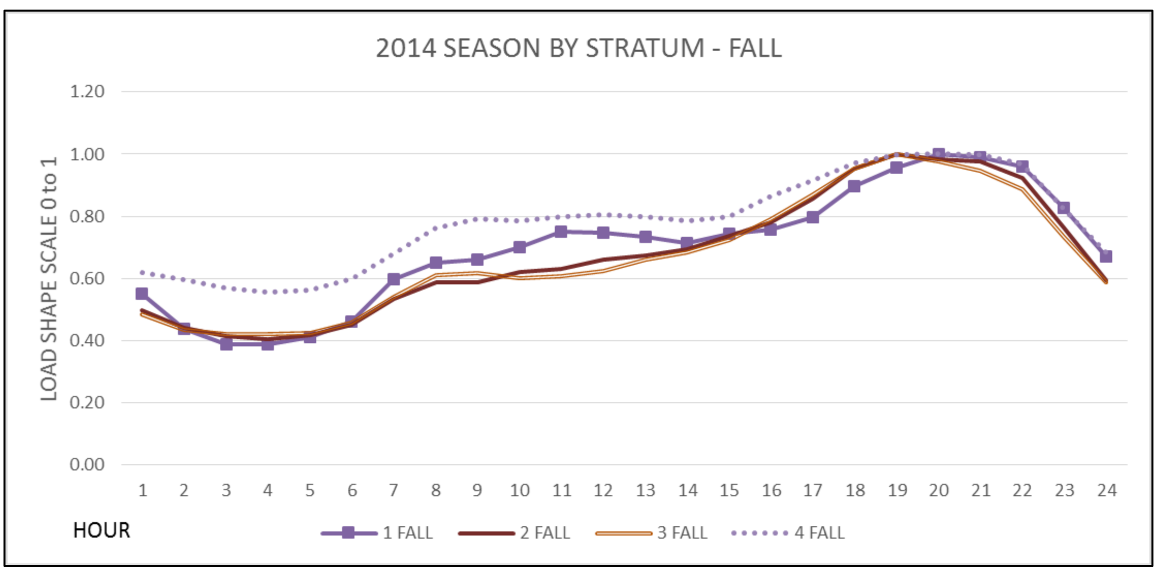
A. Yes, in general, the shapes are similar, but the magnitudes vary. The following graph contains average daily shapes for the four strata for the summer season, with Stratum 1 being the lowest shape and Stratum 4 being the highest shape on the graph. Though I am only providing this graph for the summer season, each of the seasonal shapes were consistent across the four strata.

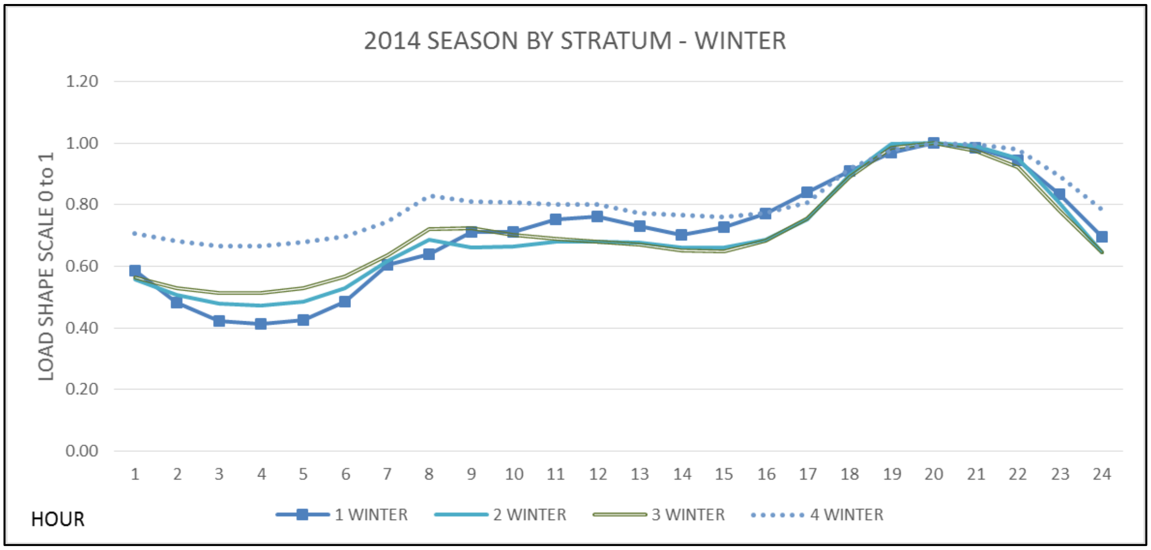
[13] Note that there were some problems that had to be accounted for in working with the Company's data, such as large negative values in some hours. Though I believe the adjustments we made were reasonable, the Office submitted discovery to the Company (OCS Set 3) regarding the data. Responses were received via email on July 28, 2015; however, I did not have time to review them prior to completing this testimony.

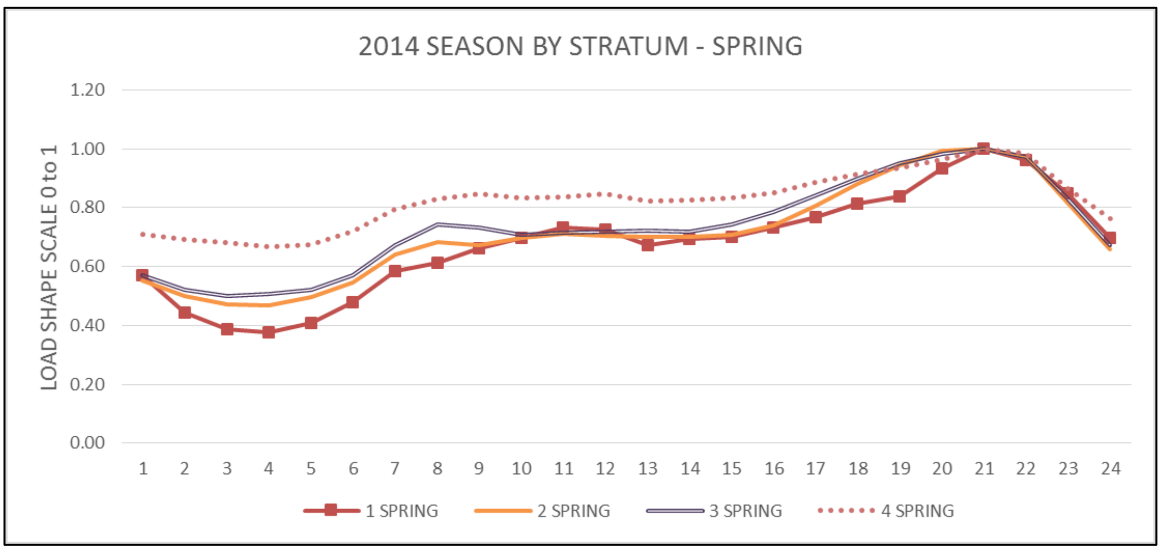
[14] PacifiCorp Technical Conference on Net Metering Load Research Study, November 5, 2014, at 17.

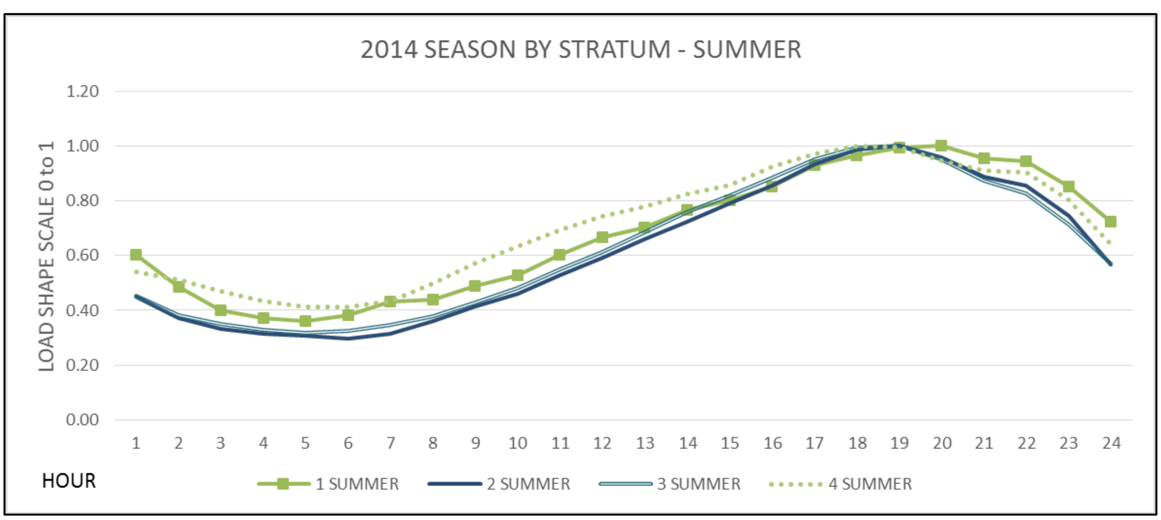


I also normalized the data by scaling each stratum by the peak period value to place the results on a scale of 0.0 to 1.0. The following graphs are presented by season and demonstrate that the overall shapes are very similar regardless of stratum and regardless of season.




2014 SEASON BY STRATUM - WINTER
LOAD SHAPE SCALE 0 to 1
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
1 WINTER
2 WINTER
3 WINTER
4 WINTER


2014 SEASON BY STRATUM - SPRING
LOAD SHAPE SCALE 0 to 1
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1 SPRING
2 SPRING
3 SPRING
4 SPRING


2014 SEASON BY STRATUM - SUMMER
LOAD SHAPE SCALE 0 to 1
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
1 SUMMER
2 SUMMER
3 SUMMER
4 SUMMER

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING THE RESIDENTIAL CUSTOMER LOAD SHAPE EVALUATION YOU PERFORMED.

A. Based on this evaluation, I am able to conclude that there are no significant differences in the load characteristics of the different residential customer stratum, other than the size differences. The different stratum have similar shapes, and each stratum peak each season at about the same time. Because the different residential class stratum appear to be homogenous, I believe it is appropriate that these stratum are all included in the same residential class. As I mentioned, I will perform a similar evaluation of residential net-metering and non-net metering load data when PacifiCorp completes its net metering load research study, in order to determine whether residential net-metering and non-net metering customers are also homogenous.

V. CONCLUSIONS AND RECOMMENDATIONS

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS.

A. In this docket, the Commission has requested parties to provide recommendations for a framework that the Commission should adopt for evaluating net metering impacts on PacifiCorp as a whole and on other non-net metering customers. The procedure I recommend includes identifying the appropriate costs and benefits to use in the analysis, determining the appropriate time period for the analysis, which could vary depending on the study objectives, computing the net benefits by subtracting the costs from the benefits, and calculating a net present value of the net benefit results. If the analysis were to evaluate the overall costs and benefits impacts of net metering on the utility as a whole, then the study should be performed over a long-term horizon similar to the planning period used in the IRP to evaluate other resource alternatives, and should use cost inputs consistent with long-term resource planning studies. This study period length would allow consideration of long term penetrations of distributed generation resources and should include life cycle resource cost inputs. I also believe that importance needs to be attached to consideration of costs and benefits impacts on "other customers", which are the non-net metering customers. The study period for this analysis should be short-term and should include current costs and benefits similar to what are used in rate case proceedings, which rely on cost of service studies.

My testimony also outlines the types of costs and benefits that should be included in these analyses. The types of costs and benefits for each of these analyses would basically be the same, though the values used in the analyses may be derived differently to be consistent with the short versus long-term studies. However, the Office does not believe that external costs and benefits such as health impacts, and social and environmental benefits should be considered in the analyses.

In the evaluation of costs and benefit impacts on other customers, it is important to understand how fixed costs are shifted to non-net metering customers given the operation of the current residential customer rate tariff. I have performed an illustrative hypothetical analysis demonstrating three levels of net metering penetration, which shows the increasing amount of harm that could potentially impact non-net metering customers as the penetration of net metering increases. I recommend that the Commission address this rate structure issue further in the next phase of this proceeding.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

Hayet_Direct - Exhibit OCS-2.2

Hayet Direct - Exhibit OCS-2.2

Illustrative Example - Net Metering Impacts
Detailed Comparison of Growth Cases

	Base		20% Growth		40% Growth	
	3,300 NM Customers		20,433 NM Customers		95,454 NM Customers	
	Annual Total ($/Year)	Customer $/Month	Annual Total ($/Year)	Customer $/Month	Annual Total ($/Year)	Customer $/Month
Tot Reduction in Costs to NM						
Avoided Generation Cost	-778,915	-19.67	-6,173,995	-25.18	-28,847,573	-25.18
Avoided Capacity Cost	-262	-0.01	-13,134	-0.05	-315,675	-0.28
Fixed Cost Shifted to Other Cust	-2,170,839	-54.82	-17,109,057	-69.78	-77,704,523	-67.84
NM Cust Cost Savings	-2,950,017	-74.49	-23,296,186	-95.01	-106,867,771	-93.30
Tot Increase in Costs to Non-NM						
Avoided Generation Cost	-12,932	0.00	-89,430	-0.01	-242,833	-0.03
Avoided Capacity Cost	-248,660	-0.03	-1,959,765	-0.22	-8,900,700	-1.13
Fixed Cost Shift from NM	2,170,839	0.24	17,109,057	1.95	77,704,523	9.86
Non-NM Customer Cost Increase	1,909,247	0.21	15,059,862	1.72	68,560,990	8.70
Total Impact to Utility						
Avoided Generation Cost	-791,848	-0.09	-6,263,426	-0.69	-29,090,406	-3.22
Avoided Capacity Cost	-248,922	-0.03	-1,972,898	-0.22	-9,216,375	-1.02
Fixed Cost	0	0.00	0	0.00	0	0.00
Total Utility Savings	-1,040,770	-0.12	-8,236,324	-0.91	-38,306,781	-4.24