Docket No. UM 1910
Exhibit PAC/400
Witness: Kevin C. Putnam

**BEFORE THE PUBLIC UTILITY COMMISSION**

**OF OREGON**

**PACIFICORP**

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**Reply Testimony of Kevin C. Putnam**

**April 2018**

**REPLY TESTIMONY OF KEVIN PUTNAM**
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**Q. Are you the same Kevin Putnam who previously submitted testimony in this proceeding on behalf of PacifiCorp d/b/a Pacific Power?**

A. Yes.

**PURPOSE AND SUMMARY OF TESTIMONY**

**Q. What is the purpose of your testimony in this proceeding?**

A. My testimony replies to opening testimony filed on March 16, 2018, by Public Utility Commission of Oregon Staff (Staff) witness Ms. Brittany Andrus (Staff/100 and Staff/200), and Oregon Solar Energy Industries Association (OSEIA) witness R. Thomas Beach (OSEIA/100-102). Specifically, I address inputs for two elements in the resource value of solar (RVOS) calculation: avoided transmission and distribution (T&D) capacity, and avoided line losses. First, I will clarify and explain how PacifiCorp's proposed T&D capacity should be used in the RVOS calculation, because it is a reasonable system-wide average that represents the value of deferring distribution infrastructure attributable to the incremental solar penetration in the Oregon service territory. Second, I will explain the details of the company's revised line loss calculation.

**AVOIDED T&D CAPACITY**

**Q. Staff notes that PacifiCorp's approach "is not a resource value of solar but a resource value of energy efficiency."[1] Do you agree that it would not be appropriate to use a T&D deferral value calculated for energy efficiency?**

A. Yes. Using a T&D deferral value calculated based on the characteristics of energy efficiency would not be an appropriate representation of the T&D deferral value of a

[1] Staff/100, Andrus/30.

solar resource.

**Q. Did the company use a T&D deferral value specific to energy efficiency for the resource value of solar transmission and distribution deferral value?**

**A.** No. The company clarifies that a T&D deferral value specific to energy efficiency was not used for the T&D deferral value in the RVOS. For the 2017 Integrated Resource Plan (IRP), the company calculated a value that was representative of deferring T&D projects. This value was then modified to create a system-wide average for the 2017 IRP for a specific resource of demand side management. The company did not use this modified system-wide average or "resource value of energy efficiency" within the resource value of solar. The company started with the base value of deferring T&D projects and modified it specific to the solar resource to create a system-wide average that represents the value of deferring distribution infrastructure attributable to the incremental solar penetration in the company's Oregon service territory.

**Q. Staff recommends that for the T&D capacity element the company use the marginal cost of service study method used by Portland General Electric Company (PGE) "until a more reliable and transparent location-specific methodology is approved by the Commission."[2] Do you agree with this approach?**

A. No. I have two concerns with Staff's recommendation. First, Order No. 17-357 allows PacifiCorp to calculate a system-wide average for the T&D capacity. Second, PacifiCorp has not prepared a marginal cost of service study for its Oregon

[2] Staff/100, Andrus/30.

jurisdiction since March 2013.[3] Since that time, PacifiCorp has revised its approach for developing the marginal cost of transmission and distribution.

**Q. What changes has PacifiCorp made in its approach to calculating transmission deferral values since its last Oregon marginal cost of service study?**

A. The difference in PacifiCorp's calculation is that the cost of projected transmission additions are divided by the capacity that would be added from the construction instead of the peak load growth projected for the investment horizon as was done in PacifiCorp's previous studies. Using the actual capacity added from the equipment as the denominator is a more accurate reflection of the cost of adding transmission capacity.

**Q. Why did PacifiCorp make the change from load growth to capacity added in the transmission calculation?**

A. PacifiCorp made this change because using the actual capacity added from transmission equipment as the denominator is a more accurate reflection of the marginal cost of adding transmission than load growth. Transmission investment is also often made to meet reliability standards for existing load. For example, Snow Goose 500-230 kV Substation and Sams Valley 500-230kV Substation were necessary to achieve compliance with North American Electric Reliability Corporation (NERC) Transmission Planning Standards (TPL Standards). Another transmission project, Wallula-McNary 230 kV transmission line, is necessary to enable PacifiCorp to comply with PacifiCorp's Open Access Transmission Tariff (OATT), transmission service agreements, and the Federal Energy Regulatory

[3] *See* Docket No. UE 263.

Commission's (FERC) requirements to provide the requested transmission service. Using load growth would misrepresent the value of these projects in a deferral calculation.

**Q. How do the March 2013 marginal cost of service values compare to the calculated transmission and distribution deferral base values?**

A. The table below provides these values:

| | 2013 MCOSS | 2017 T&D deferral value |
|---|---|---|
| **Transmission** | **$165.04** | **$5.94** |
| **Distribution Substation** | **$22.27** | **$13.44** |

**Q. OSEIA recommends using a regression analysis of load growth and distribution investment.[4] Do you think that this analysis is useful in the context of a resource value of solar?**

A. No. OSEIA's analysis shows that both loads and distribution investment have grown over time.[5] This approach to estimating future distribution deferral from rooftop solar overstates the value for several reasons. First, a correlation between capital additions and increases in load does not necessarily mean there is causality. Second, there are a variety of reasons that investments in distribution must be made. For example, the company is required to relocate distribution lines to accommodate a road that is widened, which results in distribution investment, but is not tied to a capacity or load increase. In the equation, this would increase the numerator (distribution investment) while the denominator (load) remains static creating a false representation of the deferral value. Another example of this would be replacing failed or deteriorated distribution infrastructure. This is a necessary expenditure to maintain service and is

[4] OSEIA/100, Beach/23.
[5] OSEIA/100, Beach/24.

not a deferrable distribution investment expense. By including this type of investment, it has the same effect of increasing the numerator without a corresponding increase to the denominator leading to an inaccurately higher distribution deferral value.

In addition, OSEIA proposes to add a 7.9 percent “general plant loader” and an adder of $22.13 per kW-year for O&M costs to the distribution deferral value. OSEIA provides no clear evidence for why these additional values should be applied to distribution costs deferrable by solar beyond a statement that they were derived from historic costs from the FERC Form 1 report. The vast majority of O&M and general plant are not avoidable by solar. For example, maintenance costs include costs associated with the company complying with OAR 860 division 24 rules. General plant includes items like company trucks and desktop computers. These are not avoidable costs. An example of non-avoidable operations cost would be responding to a downed distribution wire and performing the associated repairs. Using these adders would overstate the distribution deferral value leading to an inflated value for distribution capacity.

**Q. What is your recommendation for the T&D deferral value?**

A. The company proposes to continue using the T&D deferral value as calculated because it is a reasonable system-wide average that represents the value of deferring distribution infrastructure attributable to the incremental solar penetration in the Oregon service territory. Additional work is necessary because the distribution capacity contribution the company used was based on the analysis of 13 substations that demonstrated a capacity need but does not factor in the remaining 258 substation transformers that do not have a capacity need, which, if factored in, would reduce the value.

**Q. Is OSIEA's approach of using a system peak or transmission peak to calculate transmission capacity contribution and the associated deferral benefit attributable to the incremental solar penetration in the Oregon service territory accurate?**

A. Yes. I agree in principle that using a system peak or transmission peak could be a representation of when there is potential for transmission deferral benefit. This is dependent on how the system is defined. OSEIA's analysis used available data for the entire PacifiCorp system, but this information is not representative of the peak load in PacifiCorp's Oregon service territory. The peak load times for PacifiCorp's western balancing authority (PACW) or Oregon peak load times would be a more accurate definition of the system and take into account the locational nature of transmission deferral and consequently the resource value of solar in Oregon.

**Q. What are the peak load times and associated solar capacity contributions for PacifiCorp's western balancing authority and Oregon jurisdiction?**

A. Peak date, time and solar capacity contribution are included in the table below. In this table, the PACW data is based on a 15-minute interval, and the Oregon data is based on a 60-minute interval.

**Table 1 – PACW and Oregon Solar Capacity Contribution**

| PACW | Solar Capacity Contribution | Oregon | Solar Capacity Contribution |
|---|---|---|---|
| 12/9/2013 7:30 AM | 0.65% | 12/9/2013 8:00 AM | 0.65% |
| 2/6/2014 7:30 AM | 3.46% | 2/5/2014 8:00 AM | 3.46% |
| 6/30/2015 5:45 PM | 18.02% | 7/2/2015 5:00 PM | 19.37% |
| 12/14/2016 2:00 PM | 28.28% | 12/14/2016 6:00 PM | 0.00% |
| 1/6/2017 7:30 AM | 0.65% | 1/6/2017 8:00 AM | 0.65% |

**Q. Please explain how the solar capacity contributions at the peak demonstrate the challenges associated with using solar to defer transmission projects.**

A. As shown in Table 1, during three of the last five years in Oregon, the solar capacity contribution was zero or near zero at peak load time. Moreover, this analysis does not include the additional risks associated with utilizing solar as a transmission deferral mechanism such as the potential for clouds or snow covering the solar generation.

**Q. Have you reviewed OSIEA's proposed peak capacity allocation factor (PCAF) methodology and the calculation?**

A. Yes. I reviewed the file supplied by OSIEA titled "Distribution PCAFs – PAC and PGE."

**Q. Did the company find flaws with this calculation that required corrections?**

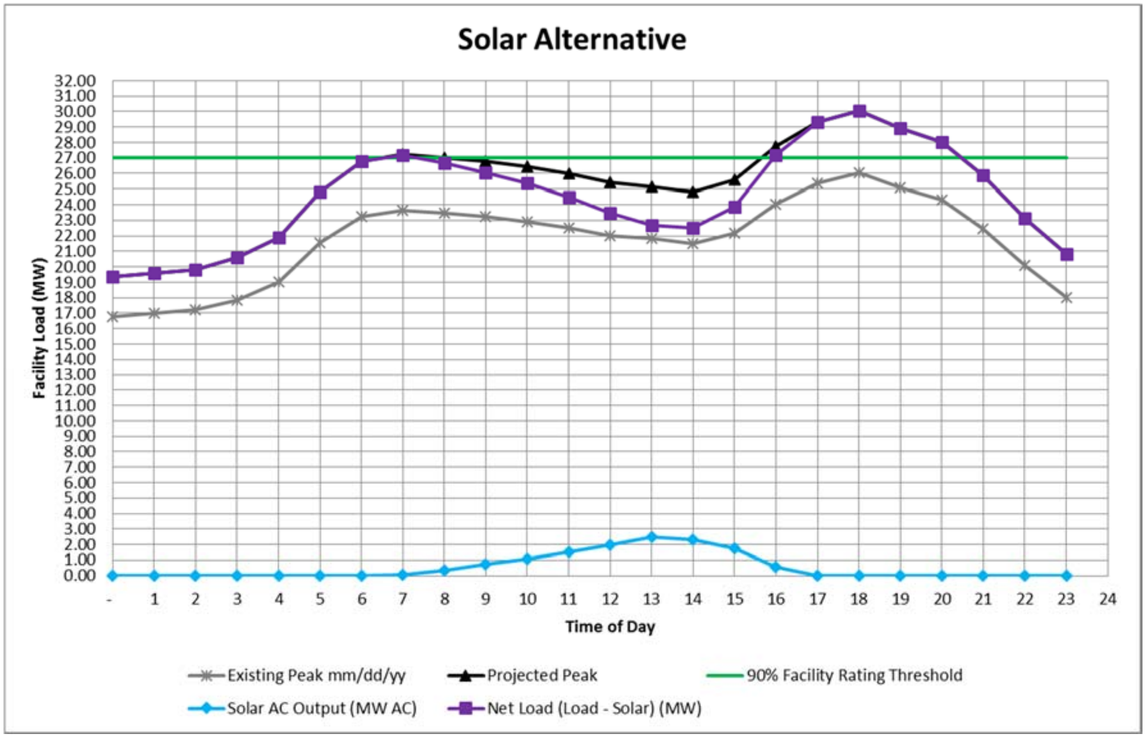
Yes. The company provided the available hourly 8,760 data for the requested items in the response to Renewable Northwest data request 5. In reviewing the calculation performed by OSEIA, the data included an interval that appears to be the power flow under a fault condition or an erroneous value, not a value due to normal loading. The company adjusted this single value to a reasonable loading number. The company also removed the Dorris Substation loading data due to its location in California.

These modifications resulted in a distribution capacity contribution of 22.4 percent rather than 35.5 percent using OSIEA's proposed methodology.

**Q. Do you have any additional comments regarding OSEIA's methodology?**

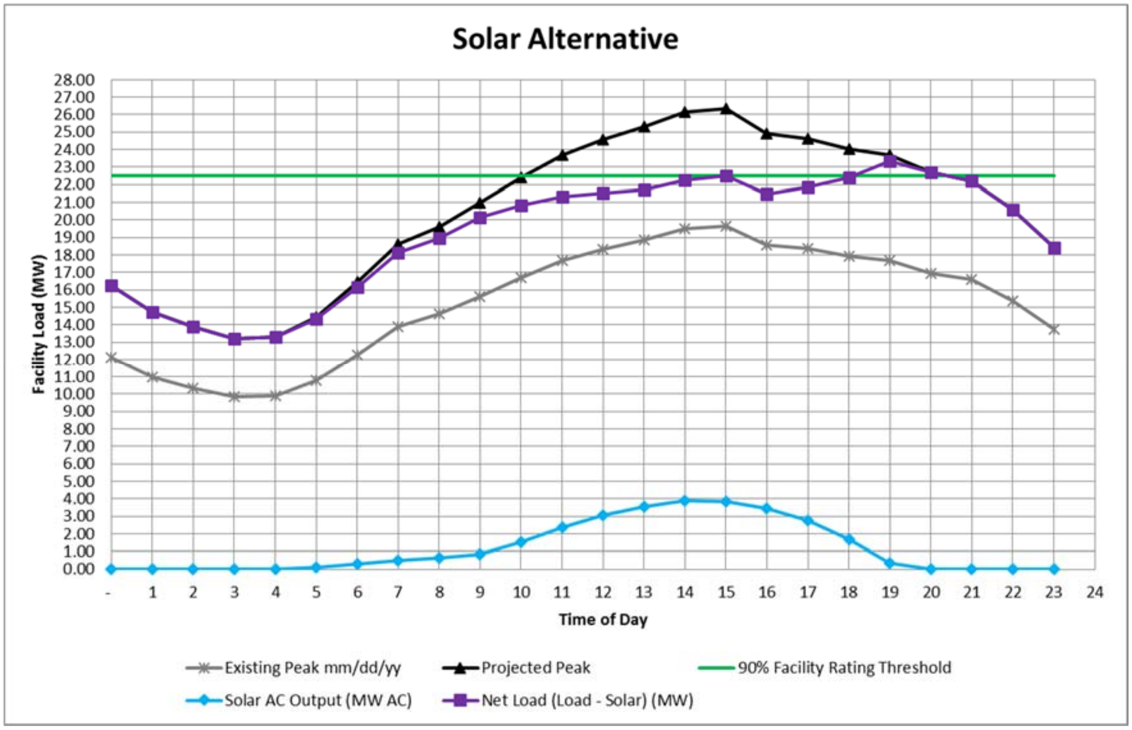
A. Yes. The methodology does not consider the coincidence of the solar generation to the actual peak times to insure that the resource could actually defer the distribution infrastructure improvement cost. Figure 1 below illustrates the alternative evaluation of a winter-peaking substation that was included in OSIEA's PCAF calculation. The company also calculated an individual distribution capacity contribution for this substation based on the methodology, which is five percent. This five percent can be seen in Figure 1 below in that the solar does contribute for a minimal amount of time of the loading above 90 percent but would not contribute to the distribution deferral due to the non-coincidence with the load peak later in the day. This would lead to the company's customers paying a distribution deferral credit and also paying for the distribution infrastructure improvement.

**Figure 1 –Evaluation of Winter-Peaking Substation**




The company completed the same analysis for a summer peaking substation using the same methodology.  The individual PCAF would be 38.5 percent; however, in the alternative analysis the solar resource does not provide full coverage for the deferral in hour 19 and 20.

**Figure 2 –Evaluation of Summer-Peaking Substation**




The non-coincidence of solar generation with peak load can also be inferred in figures 2 and 3 provided in OSIEA's testimony, which demonstrate the majority of the PCAF allocation occurring past hour 1800 in both figures.

This method also has a similar deficiency to the company method which only evaluates locations that were constrained while ignoring the remaining locations that have no loading constraints which presents zero deferral opportunity but would apply the same distribution capacity contributions to those substation transformers which overstates the value of solar.

**Q. Does the PacifiCorp have any additional analysis regarding the PCAF methodology?**

A. Yes. The company evaluated what portion of the distribution capacity contribution was from the Oregon peak day on 1/6/2017. Table 2 below demonstrates that the distribution capacity contribution is being credited with 4.51 percent of the total 22.4 percent. It also shows there are considerable hours during the day that exceeded the 90 percent that solar did not contribute. In addition, comparing this to the actual peak time of the Oregon peak shows that solar does not contribute to actual distribution deferral. This demonstrates that the distribution capacity contribution of solar is being over-stated by this methodology for Oregon customers, which would result in "double-paying" for distribution capacity.

**Table 2 – Distribution Capacity Contribution From Peak**

| Date and Time | Wtd. Average | Redmond PV Watts | PCAF |
|---|---|---|---|
| 1/6/2017 0:00 | 0.000261134 | 0 | 0 |
| 1/6/2017 1:00 | 0.0002529 | 0 | 0 |
| 1/6/2017 2:00 | 0.000215045 | 0 | 0 |
| 1/6/2017 3:00 | 0.000251543 | 0 | 0 |
| 1/6/2017 4:00 | 0.000186225 | 0 | 0 |
| 1/6/2017 5:00 | 0.000271745 | 0 | 0 |
| 1/6/2017 6:00 | 0.030030468 | 0 | 0 |
| 1/6/2017 7:00 | 0.089413181 | 0.0162558 | 0.001453483 |
| 1/6/2017 8:00 | 0.03661197 | 0.2137749 | 0.00782672 |
| 1/6/2017 9:00 | 0.068580081 | 0.4363581 | 0.029925474 |
| 1/6/2017 10:00 | 0.008603212 | 0.5782608 | 0.0049749 |
| 1/6/2017 11:00 | 0.000954179 | 0.6472044 | 0.000617549 |
| 1/6/2017 12:00 | 0.00037897 | 0.6378399 | 0.000241722 |
| 1/6/2017 13:00 | 7.17763E-05 | 0.6008136 | 4.31242E-05 |
| 1/6/2017 14:00 | 0 | 0.4792338 | 0 |
| 1/6/2017 15:00 | 0 | 0.2841759 | 0 |
| 1/6/2017 16:00 | 0.000152715 | 0.0604599 | 9.23312E-06 |
| 1/6/2017 17:00 | 0.000907883 | 0 | 0 |
| 1/6/2017 18:00 | 0.002124241 | 0 | 0 |
| 1/6/2017 19:00 | 0.000979707 | 0 | 0 |
| 1/6/2017 20:00 | 0.000184126 | 0 | 0 |
| 1/6/2017 21:00 | 0 | 0 | 0 |
| 1/6/2017 22:00 | 0.000163687 | 0 | 0 |
| 1/6/2017 23:00 | 1.30716E-05 | 0 | 0 |
| 1/7/2017 0:00 | 0 | 0 | 0 |
| | | **Sum of PCAF:** | 4.51% |

**Q. Does PacifiCorp have a recommendation regarding the PACF methodology?**

A. Yes, parties agree that solar only avoids transmission and distribution capacity cost to the extent that solar production occurs at times of peak load demand on the T&D system.[6] The PCAF methodology does not adequately assess the coincidence of the solar generation and peak load demand on the constrained elements of the T&D system. The company recommends continuing to use its current calculation that considers both loading constraints and coincidence of solar production to peak load.

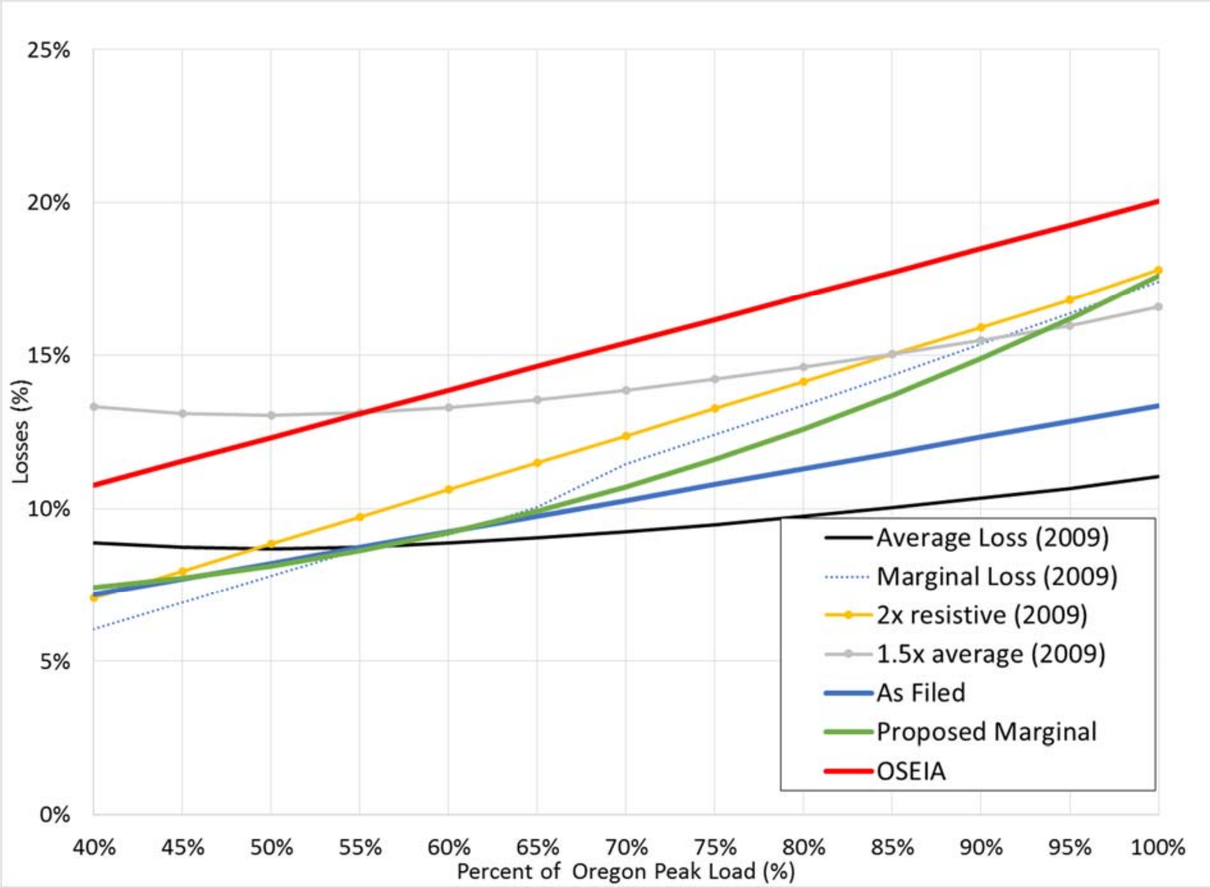
## AVOIDED LINE LOSSES

**Q. Has PacifiCorp changed the line loss calculation from its direct filing?**

A. Yes. PacifiCorp used the results from its power flow studies to calculate a marginal loss by load level and then fitted to a 12 month and 24 hour profile for resources connected at either the primary or secondary voltage level. This resulted in an increase of 9.5 percent to the line loss element from the original. In addition, PacifiCorp calculated a marginal line loss, two times resistive and 1.5 times average line losses based on the 2009 line loss study to create a comparison for results. The results are presented in Figure 3 below. The proposed marginal losses closely align to the marginal loss calculated off the 2009 line loss study and is similar to twice resistive losses calculated from the 2009 study that is expected.

[6] OSIEA/100, Beach/12.

**Figure 3 - Comparison of Line Loss Calculations**




**Q. Does PacifiCorp support using a 1.5 multiplier of average line losses as proposed by OSEIA?[7]**

A. No. The Regulatory Assistance Project study referenced by OSEIA points out that marginal losses are actually lower at low loads than the 1.5 multiplier and higher at high loads.[8] As demonstrated in the chart above, applying the factor would reduce the value of the avoided line losses at peak load and overstate the value at lower load factors.

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[7] OSEIA/100, Beach/25-26.

[8] Regulatory Assistance Project, Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements (August 2011), at 5. See http://www.raponline.org/wpcontent/uploads/2016/05/rap-lazar-eeandlinelosses-2011-08-17.pdf.

**Q. Does this conclude your reply testimony?**

A. Yes.