

Docket No. UM 1910
Exhibit PAC/200
Witness: Kevin C. Putnam

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

PACIFICORP

Direct Testimony of Kevin C. Putnam

November 2017

**DIRECT TESTIMONY OF KEVIN C. PUTNAM
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ATTACHED EXHIBIT

Exhibit PAC/201 – Transmission and Distribution Deferral Value

1 **Q. Please state your name, business address, and present position with PacifiCorp**
2 **d/b/a Pacific Power.**

3 A. My name is Kevin C. Putnam. My business address is 63820 Clausen Drive Suite
4 100, Bend, Oregon 97702. My title is Director, Field Engineering-West.

5 **QUALIFICATIONS**

6 **Q. Briefly describe your education and professional experience.**

7 A. I received a Bachelor of Science in Electrical Engineering from the University of
8 Idaho in 2002. I have worked for PacifiCorp for 15 years. I started working in
9 substation engineering, and then worked in field operations management. I have been
10 in my present position as the director of field engineering for four years. In my
11 current role, I work with field engineers who perform distribution system planning
12 and provide operational support.

13 **PURPOSE AND SUMMARY OF TESTIMONY**

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

15 A. My testimony explains the inputs in the resource value of solar (RVOS) methodology
16 as directed by the Public Utility Commission of Oregon (Commission) in Order
17 No. 17-357. Specifically, I address inputs for two elements in the RVOS calculation:
18 avoided transmission and distribution (T&D) capacity, and avoided line losses. First,
19 I will explain what PacifiCorp has included in the RVOS for avoided transmission
20 and distribution capacity and how it was calculated. Second, I discuss how the
21 granularity of the avoided transmission and distribution capacity can be advanced.
22 Finally, I describe what PacifiCorp has included in the RVOS for avoided line losses
23 and how it was calculated.

1 **AVOIDED TRANSMISSION AND DISTRIBUTION CAPACITY**

2 **Q. Please describe the Commission’s direction regarding calculating avoided**
3 **transmission and distribution capacity.**

4 A. The Commission directed utilities to “use a system-wide average of the avoided or
5 deferred costs of expanding, replacing or updating T&D infrastructure attributable to
6 incremental solar penetration in Oregon service areas” in its initial compliance filing.¹
7 The Commission noted that “avoided costs need not be specifically limited to growth
8 related-investments” and clarified that utilities may continue to use its Marginal Cost
9 of Service Study for the “first version of RVOS.”²

10 **Q. Please explain what PacifiCorp included as avoided transmission and**
11 **distribution capacity in the RVOS and how this was calculated.**

12 A. In 2016, PacifiCorp updated its transmission and distribution deferral calculation for
13 the analysis of demand-side management resources in the 2017 Integrated Resource
14 Plan (IRP). PacifiCorp used the values from this calculation for this element in the
15 RVOS. These values were calculated to represent the average deferral value of
16 transmission and distribution investments based on forecasted capacity additions and
17 projected costs of the projects. The values used in the initial calculation of the RVOS
18 are provided in Exhibit PAC/201 and reflect a transmission deferral value of
19 \$5.94/kilowatt (kW)-year, based on system-wide transmission capacity projects, and a
20 distribution deferral value of \$13.44/kW-year based on distribution capacity increase
21 projects in Oregon.

¹ *In the Matter of Public Utility Commission of Oregon Investigation to Determine the Resource Value of Solar*,
Docket No. UM 1716, Order No. 17-357 (Order No. 17-357) at 8-9 (Sep. 15, 2017).

² Order No. 17-357 at 9.

1 **Q. How do the transmission and distribution deferral values apply to RVOS**
2 **resources?**

3 A. One megawatt (MW) of solar resource is unlikely to enable deferral of an entire
4 megawatt of transmission or distribution. Instead, a capacity contribution value is
5 used to adjust the transmission and distribution deferral for a specific RVOS
6 resource's generation profile. This is analogous to the capacity contribution
7 applicable to generation capacity deferral; however, different capacity contribution
8 values are appropriate to better reflect the location-specific nature of transmission and
9 distribution deferrals, rather than the system-wide load and resource balance
10 applicable to generation capacity deferral. In particular, transmission and distribution
11 elements must be operated in accordance with reliability standards at all times.
12 System changes that reduce transmission or distribution loading during only a portion
13 of the day would not be able to defer required upgrades. Because of the diurnal
14 nature of solar generation and the uncertainty in its output, there are limited
15 circumstances in which solar resources can defer transmission and distribution
16 upgrades. Of 33 transmission upgrade projects currently in the planning stages in
17 Oregon with in-service dates after 2018, only two have transmission loading profiles
18 for which solar resources would likely provide at least one year of deferral to the
19 project in-service date. Because PacifiCorp's planned transmission upgrades in
20 Oregon are primarily intended for reliability compliance, in many cases solar resource
21 additions will not be viable solutions due to their uncertain output. In light of this,
22 while the company will continue to evaluate solar resources as alternatives to

1 transmission upgrades on a case-by-case basis, it has included a transmission capacity
2 contribution of zero in the RVOS model.

3 Since North American Electric Reliability Corporation reliability standards do
4 not apply to distribution system assets, solar is more likely to be a potentially viable
5 alternative at the distribution system level. However, of 13 Oregon substation
6 capacity upgrade projects evaluated by the company, solar generation profiles only
7 produced a viable alternative in one instance. In this analysis, solar was able to defer
8 three MW of expected substation capacity upgrade needs starting in 2023 out of
9 50 MW of total need over the next 10 years. The amount of solar necessary to defer
10 substation capacity is dependent on solar output during the period of highest loading.
11 In the one instance where solar was a viable alternative, peak loading was expected to
12 occur in hour 17 in July and August, so the expected capacity factor of a solar
13 resource during those intervals determines the distribution capacity contribution. In
14 addition, because solar generation is uncertain, the company's distribution planning
15 analysis assumes solar resources are constructed to provide 10 percent more
16 distribution capacity deferral than is needed.

17 **GRANULARITY OF AVOIDED TRANSMISSION AND DISTRIBUTION**

18 **CAPACITY**

19 **Q. Please describe how the avoided transmission and distribution capacity element**
20 **could be adapted to advance the granularity of this element in the future.**

21 A. In Order No. 17-357, the Commission directed utilities to address how to advance the
22 granularity and location-specific value for this element.³ PacifiCorp's distinct service

³ Order No. 17-357 at 9 and 21.

1 territory, planning procedures, and data availability inform its T&D deferral
2 calculation, and PacifiCorp agrees with the Commission that “the value of solar and
3 other distributed energy resources differ between geographic locations based on the
4 specific transmission and distribution system characteristics in that area.”⁴
5 PacifiCorp also agrees with Staff’s statement that “a single solar PV array may not
6 defer a T&D investment, but several systems on the same feeder could contribute to
7 the deferral.”⁵ PacifiCorp considered the distribution feeder level for its proposal to
8 increase the granularity of the transmission and distribution deferral element in these
9 comments. PacifiCorp continues to examine the potential for transmission and
10 distribution deferral at the feeder level. I provide an overview of PacifiCorp’s
11 proposed approach to calculating the impact of solar resources on transmission and
12 distribution deferrals below.

13 **Q. Does PacifiCorp evaluate solar resources as a potential solution to transmission**
14 **and distribution infrastructure needs?**

15 A. Yes. PacifiCorp has developed a distributed energy resource screening tool to
16 evaluate solar, energy storage, and demand-side management as a potential solution
17 for system reinforcement projects. Capacity-increase projects that are identified and
18 submitted into the 10-year capital planning process are evaluated utilizing the tool.

19 **Q. Does the distributed energy resource screen analyze the coincidence of the**
20 **resource to the daily load profile?**

21 A. Yes. The distributed energy resource screen is based on the loading of the specific
22 transmission or distribution element under consideration and evaluates the

⁴ Order No. 17-357 at 9.

⁵ Order No. 17-357 at 8.

1 coincidence of the solar generation profile to determine if the resource is a suitable
2 solution.

3 **Locational Transmission Deferral Value**

4 **Q. Please describe how PacifiCorp proposes to create a locational transmission**
5 **deferral value.**

6 A. PacifiCorp's proposed approach is to create a distinct transmission capacity deferral
7 value for each load forecast pocket. A load forecast pocket is based on the
8 transmission topography, load center and geographic relationship.⁶

9 **Q. How does PacifiCorp propose to address load forecast pockets that have an**
10 **identified transmission capacity increase project?**

11 A. PacifiCorp would apply a transmission deferral credit, starting in the year of the
12 expected start of the transmission capacity increase project. The credit would be
13 applied to a resource's generation profile based on the capacity contribution to the
14 transmission deferral. For transmission capacity-increase projects that the company
15 has performed a distributed energy resource screen that indicates solar is ineffective
16 in meeting the identified capacity need, the company would not apply a transmission
17 deferral credit.

18 **Q. How does PacifiCorp propose to address when it becomes necessary to start**
19 **work on a transmission capacity-increase project to meet the projected capacity**
20 **need?**

21 A. Once the company has committed to a transmission capacity-increase project to meet

⁶ Additional information on load pockets can be found in PacifiCorp's biennial transmission plan, publicly available on OASIS at the link:
http://www.oasis.oati.com/PPW/PPWdocs/PacifiCorp_Local_Transmission_System_Plan_Report_120815.pdf.

1 the projected capacity need, the company would no longer include a transmission
2 deferral credit. If the company continued to include the transmission deferral credit
3 this would be equivalent to “double-paying” for the transmission capacity.

4 **Q. How does PacifiCorp propose to address the transmission deferral value in other**
5 **load forecast pockets?**

6 A. The remaining load forecast pockets would not have an associated transmission
7 capacity project for potential deferral so the company would set the transmission
8 deferral value to zero.

9 **Locational Distribution Deferral Value**

10 **Q. Does PacifiCorp have a proposal to create a locational distribution deferral**
11 **credit?**

12 A. Yes. PacifiCorp’s proposal contains two views of distribution feeders. PacifiCorp
13 proposes to look at the individual distribution feeders and the combination of
14 distribution feeders at the distribution substation transformer level. This is necessary
15 due to the potential for deferral of distribution **line** capacity-increase projects and
16 distribution **substation** capacity-increase projects. Distributed energy resources, in
17 this case solar, installed on an individual distribution feeder could potentially defer a
18 capacity-increase project on that specific feeder. In the case of the distribution
19 substation capacity-increase projects, the collection of feeders normally served by the
20 distribution substation transformer could contribute to the deferral of this type of
21 capacity-increase project.

1 **Q. How does the company propose to address distribution feeders at the individual**
2 **feeder level?**

3 A. For distribution feeders that have an identified capacity-increase project and the
4 distributed energy resource screen indicates a solar resource is a valid alternative, the
5 company would include the distribution deferral value for that location and allocate
6 on the calculated distribution capacity contribution.

7 The intended application of the RVOS model will likely determine whether
8 the difference between project-specific deferral values and system-average deferral
9 values is significant enough to justify the administrative burden of calculating and
10 applying individual project-specific deferral values. Where the intent is to procure
11 resources to avoid a particular upgrade, project-specific values are certainly
12 appropriate. Where the intent is to set system-wide rates, a less granular look will
13 likely be sufficient, though it will not provide the same incentive to locate resources
14 in the most valuable locations.

15 **Q. How does PacifiCorp propose to address the remaining distribution feeders?**

16 A. For distribution feeders with no forecasted capacity issues there would not be a
17 distribution capacity increase to defer, thus the distribution deferral value is zero.

18 **Q. How does PacifiCorp propose to address distribution feeders at the distribution**
19 **substation transformers level?**

20 A. For distribution substation transformers with an identified capacity-increase project
21 and where the distributed energy resource screen indicates solar is a valid solution,
22 PacifiCorp will apply a distribution deferral starting in the year of the identified
23 project. For other locations, the distribution deferral value is zero.

AVOIDED LINE LOSSES

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Q. Please describe the Commission’s direction regarding calculating avoided line losses.

A. The Commission asked “utilities to develop hourly averages of line losses by month for the daytime hours when load on the system is higher, losses are greater, and solar is generating.”⁷ The Commission noted that it “expect[s] the utilities’ values to recognize and reflect that there are seasonal and daily variations in line loss impacts with higher temperatures and higher loads having higher losses.”⁸ The Commission clarified that it does not “expect a true hourly value to this element, but ask[s] the utilities to provide the most granular value they reasonably can inclusive of daytime and seasonal variation.”⁹

Q. Please explain how PacifiCorp addressed this element.

A. PacifiCorp began with the transmission, primary, and secondary losses currently reflected in retail rates, which reflect the company’s most recent line loss study. For the RVOS line loss element, PacifiCorp conducted power flow studies that identified the primary and secondary line losses at 100 percent, 90 percent, and 75 percent of both winter and summer peak loads to supplement the previous study. These losses were then fitted to a 12 month and 24-hour profile to create the marginal losses for resources connected at either the primary or secondary voltage level.

⁷ Order No. 17-357 at 10.
⁸ Order No. 17-357 at 10.
⁹ Order No. 17-357 at 10.

1 **Q. Please explain why PacifiCorp's approach is the most granular value that can be**
2 **used inclusive of daytime and seasonal variation at this time.**

3 A. PacifiCorp's methodology reasonably recognizes the variation of line losses with
4 respect to seasonality, time of day and peak load, and is in accordance with the
5 guidance provided by the Commission. Calculating and administering location-
6 specific line losses would require significant time and effort for what is expected to
7 be a minor improvement in the results since this is a small component of the resource
8 value of solar.

9 **Q. Please explain how the line loss values will be applied in the RVOS calculation.**

10 A. Line loss benefits are highest when generation is offsetting local load and those
11 benefits decrease when generation is exported across various segments of the electric
12 grid. PacifiCorp's line loss element proposal therefore reflects whether output is fully
13 utilized behind the meter, exported to the secondary distribution system, exported to
14 the primary distribution system, or exported to the transmission system. Output that
15 is fully utilized behind a customer's meter would receive credit for avoided line
16 losses based on the customer's interconnection voltage level (transmission, primary,
17 or secondary). Output to the distribution or transmission system would receive lower
18 credit for avoided line losses based on the next higher voltage level, based on
19 expected distribution feeder and substation loading. A resource connected at the
20 secondary level would thus receive credit for avoided secondary line losses for output
21 used behind the meter, credit for avoided primary losses for output exported to the
22 secondary distribution system, credit for avoided transmission losses for output

1 exported to the primary distribution system, and no credit for avoided output exported
2 to the transmission system.

3 **Q. What is the status of PacifiCorp's implementation of the proposals for**
4 **transmission and distribution deferral and line losses mentioned above?**

5 A. PacifiCorp has developed the concept and created a simplified tracking spreadsheet
6 that could be used to capture the data needed for these proposals. Next, the company
7 would need to perform the screening and would allocate the associated cost in the
8 administrative cost element to compile the necessary distribution feeder information.

9 **Q. Do you have any additional comments?**

10 A. Yes. It is possible that the company could incur incremental costs depending on the
11 application of the RVOS and the type of interconnection installed in accordance with
12 applicable rules. An example of these incremental costs PacifiCorp can incur are in
13 net metering interconnections that pass level two interconnection reviews, and do not
14 move to a level three interconnection review. For this level of interconnection, cost
15 responsibility is limited to minor modifications. PacifiCorp proposes that allocation
16 of these incremental transmission and distribution costs follow the principles of the
17 company's existing line extension rule.

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

19 A. Yes.