ORDER NO. 16 326

ENTERED AUG 26 2016

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1719

In the Matter of PUBLIC UTILITY COMMISSION OF OREGON, Investigation to Explore Issues Related to a Renewable Generator's Contribution to Capacity.	ORDER

DISPOSITION: STIPULATION ADOPTED

I. SUMMARY

We opened this investigation in Order No. 15-077 to address differences in the methodologies used to determine a renewable generator's contribution to capacity. After a Commission workshop, initial testimony, and several settlement conferences, the parties to these proceedings agreed to a stipulation.[1] The stipulation provides that, for the purpose of an Integrated Resource Plan (IRP), Portland General Electric Company, PacifiCorp, dba Pacific Power, and Idaho Power Company will estimate the capacity contributions from wind and solar generators using either an Effective Load Carrying Capability (ELCC) or a Capacity Factor (CF) approximation. In this order, we adopt the stipulation, attached as Appendix A. We also find that, as the utilities' renewable penetration level increases in the future (e.g., 20 to 25 percent of system mix), we will require the utilities to perform a one-time benchmark of the CF approximation method against an ELCC calculation.

II. BACKGROUND

A renewable generator's contribution to capacity is a measure of the most likely amount of capacity—ability to generate electric energy—the resource can deliver at the utility's annual peak load or other periods when the grid is stressed. Contribution to capacity is

[1] The parties to these proceedings include: Portland General Electric Company, PacifiCorp, dba Pacific Power, Idaho Power Company, Staff of the Public Utility Commission of Oregon, the Citizens' Utility Board of Oregon (CUB), the Industrial Customers of Northwest Utilities (ICNU), the Oregon Department of Energy (ODOE); Renewable Northwest (Renewable NW), the Renewable Energy Coalition (REC), and the Community Renewable Energy Association (CREA). CREA is not a signatory to the stipulation, but does not object to its terms.

represented as a percentage of plant capacity.[2] As described in Order No. 15-077, PGE, PacifiCorp, and Idaho Power calculate wind and solar contribution to capacity in their IRPs.[3] We opened this investigation to compare the different methodologies used by the three electric utilities to determine contribution to capacity and to consider whether we should adopt a standardized calculation methodology.

We examined two methodologies: an ELCC method and the CF approximation method.[4]

ELCC is a reliability-based method that estimates the additional load that can be served by adding an incremental generator while maintaining the same level of system reliability. System reliability is measured with metrics such as the loss of load probability (LOLP) and the loss of load expectation (LOLE). The LOLP is the probability of a loss of load event in which the system load is greater than available hourly generating capacity. The LOLE is the sum of LOLPs during a planning period, usually one year, for example, 0.1 days per year. ELCC is generally determined by modeling the system with and without the renewable generation in question, and comparing how much capacity the generator adds while still maintaining the same level of LOLE.

The CF approximation method approximates ELCC by calculating the capacity factor for a generator or class of generators for each hour of the year (mean generator output/maximum generator output). The weight for each hour is the LOLP for that hour divided by the sum of LOLPs for all hours. While there is an initial LOLP calculation for each hour, there are no iterative LOLP calculations.

We began this investigation with a Commission workshop where three independent experts provided background information. Subsequently, we asked the parties to file testimony addressing certain issues related to the calculation of contribution to capacity.

III. INITIAL TESTIMONY

We asked the parties to address four issues. We asked them: (1) to describe their preferred methodology to calculate a renewable generator's contribution to capacity, (2) to address the advantages and disadvantages of an ELCC calculation, (3) to address whether an approximation method should be benchmarked against an ELCC calculation, and (4) whether the utilities should all be required to use the same calculation method.

---

[2] Parties distinguish capacity factor of a generating resource, which just measures how much energy that resource is expected to produce over a given period of time, and capacity contribution, which considers how much the resource produces during peak load periods or other periods when the grid is stressed. *See, e.g.,* PAC/100, Link/4.

[3] *See e.g., In the Matter of Portland General Electric Co., 2013 Integrated Resource Plan,* Docket No. LC 56, Order No. 14-415 at 13-14 (Dec 2, 2014) (taking under advisement the recommendation to open an investigation into a renewable generator's contribution to capacity).

[4] Stipulation at 2-3 defines ELCC and CF approximation.

To provide the proper context for evaluating the parties' stipulation, we briefly summarize the testimony of PGE, PacifiCorp, Idaho Power, Staff, ICNU, CUB, and Renewable NW on these four issues.

A. Parties' Preferred Methodologies

The utilities prefer flexibility in choosing a method. The other parties prefer the ELCC method but are generally open to the CF approximation method.

PGE recommends no changes to existing policy and procedures, in part, because there is no single industry standard method. PGE used an ELCC methodology for its 2016 IRP, resulting in 14.1 percent of nameplate capacity for PGE's portfolio of mostly wind resources in the Columbia Gorge. Previously, in its 2013 IRP, PGE used 5 percent as the assigned contribution to capacity estimate.

PacifiCorp prefers the CF approximation method. PacifiCorp believes it produces results similar to ELCC results—and uses only a fraction of the computational resources. For support, PacifiCorp and several other parties point to a National Renewable Energy Laboratory (NREL) study that found the CF approximation method the most dependable technique for approximating the ELCC method.[5] PacifiCorp used a CF approximation in its 2015 IRP, resulting in 14.5 percent for its East Balancing Authority Area (BAA) wind and 25.4 percent for West BAA wind, and values in the mid-30 percent range for solar PV.[6]

Idaho Power prefers an approximation method, stating that its approximation is reasonably accurate, transparent, can be easily verified by an independent party, and comparable to the ELCC. For planning purposes, Idaho Power uses a 5 percent peak capacity contribution for wind resources, and for PURPA avoided cost pricing, it uses actual wind data with a 3.9 percent contribution to peak capacity.

Staff, ICNU, CUB, and Renewable NW all support the ELCC method as the most accurate measure of capacity—during the system peak load, and for other times during the year that the system may be stressed. Staff, CUB, and Renewable NW (not ICNU) allow that the CF approximation method is also acceptable, considering that it is less computationally intensive and requires less data.

ICNU offers step-by-step technical recommendations for performing ELCC calculations.[7] First, the ELCC of a renewable resource should be compared to the ELCC of a thermal resource. Second, the generation profile of the wind and solar resource should be modeled as a stochastic variable in the reliability studies underlying the ELCC calculations. Third, the reliability metric used in the ELCC calculation should be based

[5] *See* NREL/Milligan presentation at exhibit Staff/103.
[6] PAC/102, Link/3.
[7] ICNU/100, Mullins/14.

on LOLE days/year. Fourth, diversity benefits associated with a portfolio of renewables should be reflected in the ELCC calculations.[8]

B. Advantages and Disadvantages of ELCC Methodology

The parties generally recognize the wide-spread use of the ELCC method and describe both its advantages and disadvantages.

PGE explains that ELCC methods are more detailed and analytically robust than heuristic time-window methods[9] and are more appropriate at a higher penetration level of variable resources. PGE explains that heuristic, time-window methods estimate the resource's likely output over peak hours. Their principal advantage is that they are easy to understand and to calculate, as they generally consist of simple statistics averaged over a large number of hours. The disadvantage, PGE explains, is that heuristic methods may not use the most critical hours. ELCC methodologies, by contrast, capture the correlations among load and variable resource production in order to identify the critical set of hours in which a system has a non-zero loss of load probability. Renewable resources that are expected to produce at a high level during either the summer or the winter peak hours can be expected to have a high marginal ELCC relative to resources producing at lower levels during those hours.

PacifiCorp states the primary advantages of the ELCC method are that it is a robust technique, tied to system reliability, and widely accepted in the literature. The disadvantage, PacifiCorp maintains, is that it is computationally burdensome and involves a five-step process.[10] With these steps, the ELCC is iterative in nature, meaning that it may take many trial runs for the model to converge to an answer.

Idaho Power appreciates that the ELCC method is accepted as the theoretical standard. However, Idaho Power lists several disadvantages, including the extensive data required, the lack of transparency that comes with complex software and specialized consultants, and the fact that current power supply models may not be easily adapted to the iterative ELCC process.

ICNU states that approximation methods have the potential to create a wide range of capacity contribution values. ICNU recommends full ELCC studies and states that the computational intensity is not as problematic as it once was because the utilities commonly develop and perform reliability studies in their IRPs to calculate planning reserve margins.

Staff and Renewable NW agree that the ELCC method is recognized as a common and robust approach to determining capacity credit. They state that the disadvantage of the

---

[8] Because only one round of testimony was filed, the utilities did not respond to ICNU's proposal. In addition, the stipulation does not address these ELCC calculation issues, but ICNU is a signatory to it.
[9] PGE/200, Olson/14.
[10] PAC/100, Link/9.

ELCC method is that it requires synchronized generation and load data, which utilities may not have readily available.

C. Advantages and Disadvantages of Requiring an Alternative or Approximation Method to be Benchmarked Against ELCC Calculation

Only two parties addressed the use of a benchmark for an approximation method.

PacifiCorp cautions that a benchmark requirement would effectively eliminate the efficiencies that make an approximation method desirable. If PacifiCorp uses an ELCC method, it would rely on that calculation and not perform a redundant approximation.

Idaho Power states that an approximation method should be verified by comparison with other calculations, but believes that requiring an ELCC comparison is overly prescriptive.

D. Advantages and Disadvantages of Requiring Utilities to Use Same Method

The utilities agree that they should have flexibility in choosing the methodology that produces reasonable results for their particular systems. PacifiCorp states that the Commission can still achieve consistency among utilities by identifying more than one acceptable methodology, including the CF approximation method or by requiring that the chosen method be based on hourly LOLP metrics. Renewable NW agrees that the utilities should not be required to use the same calculation method.

Staff believes that all electric utilities should use the full ELCC methodology, and that the Commission should waive the requirement upon a showing by the utility that synchronized load and generation data is unavailable.

After initial testimony, the parties participated in settlement conferences and ultimately filed a stipulation and supporting joint testimony.

IV. DISCUSSION

A. The Stipulation

As discussed above, the parties eventually reached a settlement on these issues and submitted a stipulation for our review. [11]

The parties agree that, for the purpose of the IRP, the utilities will estimate the capacity contributions from wind and solar generators using either an ELCC or CF approximation methodology. The stipulation requires that the contribution be estimated based on all

[11] The stipulating parties filed motions to have their pre-filed testimony and exhibits admitted into the record. The motions are granted and the stipulation and the following testimony and exhibits are received as evidence in this proceeding: Albi – Macfarlane (PGE/100), Olson (PGE/200-202), Link (PAC/100-101), Haener (Idaho Power/100), Hanhan (CUB/100-101), Mullins (ICNU/100-102), O'Brien (RNW/100), Crider (Staff/100-107), Joint Party/100.

hours in a year to address concerns raised in testimony over using only peak hours. The parties generally agree that both of these methods should produce reasonable and accurate results.

The stipulation contains a provision for using interpolation or extrapolation from calculated ELCC and CF approximation values as needed. The parties explain that it is impractical to produce full ELCC calculations for every year of an entire IRP or for every resource combination. The stipulation also contains a waiver process so that a utility may apply to the Commission for permission to use an alternate methodology.

Regarding Idaho Power's methodology, the parties agree that Idaho Power's existing methodology can continue to be used as a CF approximation method, with the addition of a LOLP analysis based on all hours in a year.

The stipulation also clarifies that it does not establish the translation from renewable capacity contribution percentages to prices or dollar values for other dockets or filings.

The parties request that we approve and adopt the stipulation and order that the capacity contribution of wind and solar generators be calculated by using the ELCC method or the CF approximation method (as defined in the stipulation) for inclusion in a utility's IRP.

B. Commission Resolution

We adopt the stipulation. The parties all agree that both the ELCC method and the CF approximation method produce reasonably accurate values for wind and solar resources' contribution to capacity for IRP purposes. The stipulation provides that the utilities will use one of these methods, and we find that this agreement is in the public interest.

In reaching this decision, we note that the studies relied on by the parties are limited by historical data with low renewable penetration levels. Specifically, the study that concludes that the CF approximation method is the most dependable approximation method considers solar at less than 0.1 percent of penetration.[12] No evidence was presented as to the reasonableness of the CF approximation method at higher penetration levels. Thus, as the utilities' renewable penetration level increases in the future (e.g., 20 – 25 percent of system mix), we will require the utilities to perform a one-time benchmark of the CF approximation method against an ELCC calculation.

Finally, we note that the stipulation is limited to IRP purposes and, for reference, we explain how the capacity contribution affects IRPs. In the IRP, capacity contribution values are used to calculate load and resource balances from existing resources. Through this analysis, the capacity contribution values affect the timing and amount of additional capacity needed to reliably serve customer load over time, as reflected in the utility's action plan.[13] While the stipulation states that it does not establish the translation from

[12] PAC/101, Link/35 (NREL study examining 100 MW nameplate solar facility against 110 GW of Western interconnection-wide load).
[13] PAC/100, Link/12.

renewable capacity contribution percentages to prices or dollar values for other dockets or filings, we note that the IRP-derived capacity contribution value is currently used in other Commission proceedings.[14] For example, the capacity contribution value from the IRP currently feeds into PURPA avoided costs, and is currently proposed to be used as an input to calculate the resource value of solar.[15]

V. ORDER

IT IS ORDERED that the stipulation by and between Portland General Electric Company; PacifiCorp, dba Pacific Power; Idaho Power Company; Staff of the Public Utility Commission of Oregon; the Citizens' Utility Board of Oregon; the Industrial Customers of Northwest Utilities; Renewable Northwest; Renewable Energy Coalition; and the Oregon Department of Energy attached as Appendix A, is adopted.

Made, entered, and effective AUG 26 2016.

Lisa D. Hardie
Chair

John Savage
Commissioner

Stephen M. Bloom
Commissioner

A party may request rehearing or reconsideration of this order under ORS 756.561. A request for rehearing or reconsideration must be filed with the Commission within 60 days of the date of service of this order. The request must comply with the requirements in OAR 860-001-0720. A copy of the request must also be served on each party to the proceedings as provided in OAR 860-001-0180(2). A party may appeal this order by filing a petition for review with the Court of Appeals in compliance with ORS 183.480 through 183.484.

[14] Stipulation at 3.
[15] *In re Investigation into Qualifying Facility Contracting and Pricing*, Order No. 16-174, Docket UM 1610 (May 13, 2016) (reconsideration pending); *In re Investigation to Determine Resource Value of Solar*, Docket UM 1716, Staff Opening Testimony, Staff/200, Olson 30-31 (Jun 1, 2016).

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1719

In the Matter of: PUBLIC UTILITY COMMISSION OF OREGON, Investigation to Explore Issues Related to a Renewable Generator's Contribution to Capacity.	STIPULATION

This Stipulation is entered into for the purpose of resolving all issues in this Docket.

PARTIES

The Parties to this Stipulation are: the Staff of the Public Utility Commission of Oregon (Staff), the Citizens' Utility Board of Oregon (CUB); the Oregon Department of Energy (ODOE), Renewable Northwest (RWN), Renewable Energy Coalition (REC), Idaho Power Company (Idaho Power), the Industrial Customers of Northwest Utilities (ICNU), Portland General Electric Company (PGE), and PacifiCorp d/b/a Pacific Power (PacifiCorp) (collectively, Parties). The Parties represent all persons and entities that intervened and were active in this proceeding.[1]

BACKGROUND

1. The Commission opened this Docket pursuant to its Order No. 15-077 (issued March 10, 2015). In its Order, the Commission adopted Staff's recommendation to open an investigation into the determination of a renewable generator's contribution to peak-load capacity.

2. Subsequently, on May 11, 2015, the Administrative Law Judge (ALJ) issued her Corrected Memorandum. In her Corrected Memorandum, the ALJ requested Staff to file a report identifying independent experts able to appear at a future Commission workshop.

[1] Community Renewable Energy Association (CREA) is also a party to this Docket. Staff is authorized to state that while CREA does not object to the terms of the Stipulation, it does not intend to be a signatory on it.

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

3. The Commission workshop was held on August 17, 2015. The following experts appeared telephonically at the workshop:

Andrew Mills with the Lawrence Berkeley National Laboratory;

Michael Milligan with the National Renewable Energy Laboratory; and

John Fazio with the Northwest Power & Conservation Council.

4. Pursuant to the Schedule set by the ALJ in her Prehearing Conference Memorandum (issued September 9, 2016), the Parties filed their Opening Testimony and Exhibits on December 14, 2015.

5. Thereafter, the Parties met in person at several settlement conferences and also corresponded via electronic mail. During these discussions, the Parties considered the following issues:

a. The preferred methodology to calculate the capacity contribution to meeting peak load attributed to wind and solar generators;

b. Whether to require the use of an Effective Load Carrying Capability calculation, an alternate approximation, or some other method; and

c. Whether to require that each utility use the same calculation method.

6. As a result of the settlement discussions and email correspondence related to the discussions, the Parties were able to resolve the three issues set forth immediately above. As such, the Parties present the following Stipulation, which resolves all issues, for the Commission's review and requested approval.

SUBSTANTIVE TERMS OF STIPULATION

The Parties agree that:

7. As used in this Stipulation, "Effective Load Carrying Capability" is defined as the estimated additional load that can be added to a system, or the estimated benchmark resources (conventional or perfect) that can be avoided, due to the inclusion of a particular resource or group of resources with no net change in system reliability as measured by Loss-Of-Load

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

Probability (LOLP) or Loss-Of-Load Expectation (LOLE). ELCC is expressed as a percentage of nameplate capacity of the particular resource or group of resources. In the ELCC study, the particular resource or group of resources shall be modeled as a stochastic variable or through an alternative comparable method that captures the variability of such resource or group of resources.

8. As used in this Stipulation, "Capacity Factor approximation" is defined as an approximate estimate of the ELCC of a particular generator or class of generators based on the weighted sum of the following ratio, calculated for each hour for all hours of the year:

(mean generator output/maximum generator output)

The weight for each hour is the loss of load probability for that hour divided by the sum of loss of load probabilities for all hours.

9. Idaho Power, PacifiCorp and PGE (Utilities) will use either an Effective Load Carrying Capability (ELCC) or Capacity Factor (CF) approximation for estimating capacity contributions from wind and solar generators for Integrated Resource Planning (IRP).

10. The Utilities will prepare contribution estimates based on an assessment of all hours in a year.

11. The Utilities may interpolate or extrapolate from calculated ELCC/CF approximation values as needed.

12. The Utilities may apply to the Commission for a waiver to allow the use of other methodologies in the Integrated Resource Plan. Utilities must demonstrate that the proposed methodology produces results reasonably comparable to the ELCC method.

13. Idaho Power's existing methodology for estimating capacity contribution of wind and solar generators for Integrated Resource Planning is an acceptable CF approximation methodology with the addition of an LOLP analysis that is based on all hours in a year.

14. This Stipulation does not establish the translation from renewable capacity contribution percentages to prices or dollar values for other dockets or filings.

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

15. This Stipulation will be offered into the record in this proceeding as evidence pursuant to OAR 860-001-0350(7). The Parties agree to support this Stipulation throughout this proceeding and any appeal. The Parties further agree to provide witnesses to sponsor the Stipulation at any hearing held, or, in a Party's discretion, to provide a representative at the hearing authorized to respond to the Commission's questions on the Party's position as may be appropriate.

16. If this Stipulation is challenged by any other party to this proceeding, the Parties to this Stipulation reserve the right to cross-examine witnesses and put on such case as they deem appropriate to respond fully to the issues presented, including the right to raise issues that are incorporated in the Settlement embodied in this Stipulation. Notwithstanding this reservation of rights, the Parties agree that they will continue to support the Commission's adoption of the terms of this Stipulation.

17. The Parties have negotiated this Stipulation as an integrated document. If the Commission rejects all or any material portion of this Stipulation, or imposes additional material conditions in approving this Stipulation, any Party disadvantaged by such action shall have the rights provided in OAR 860-001-0350(9) and shall be entitled to seek reconsideration or appeal of the Commission's Order.

18. By entering into this Stipulation, no Party shall be deemed to have approved, admitted, or consented to the facts, principles, methods, or theories employed by any other Party in arriving at the terms of this Stipulation. No Party shall be deemed to have agreed that any provision of this Stipulation is appropriate for resolving the issues in any other proceeding.

19. This Stipulation may be executed in counterparts and each signed counterpart shall constitute an original document. The Parties further agree that any facsimile copy of a Party's signature is valid and binding to the same extent as an original signature.

20. This Stipulation may not be modified or amended except by written agreement among all Parties who have executed it.

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By: Mike

Date: 4/27/16

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By: Michael P. Goetz

Date: 4/18/16

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By: Wendy Simons

Date: 4/18/16

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By: _____

Date: _____

CITIZENS' UTILITY BOARD OF OREGON

By: _____

Date: _____

OREGON DEPARTMENT OF ENERGY

By: _____

Date: _____

RENEWABLE NORTHWEST

By: M. H. O'Brien

Date: 4/27/16

RENEWABLE ENERGY COALITION

By: _____

Date: _____

IDAHO POWER COMPANY

By: _____

Date: _____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By: _____

Date: _____

PORTLAND GENERAL ELECTRIC

By: _____

Date: _____

PACIFICORP d/b/a PACIFIC POWER

By: _____

Date: _____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By: Lisa Seago

Date: 4/28/16

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By: Lisa F. Nordstrom

Date: 4-22-16

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date: 4/5/16

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By: V. Denise Saunders

Date: 04/22/2016

PACIFICORP d/b/a PACIFIC POWER

By:_____

Date:_____

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784

This Stipulation is entered into by each Party on the date entered below such Party's signature.

STAFF OF THE PUBLIC UTILITY COMMISSION OF OREGON

By:_____

Date:_____

CITIZENS' UTILITY BOARD OF OREGON

By:_____

Date:_____

OREGON DEPARTMENT OF ENERGY

By:_____

Date:_____

RENEWABLE NORTHWEST

By:_____

Date:_____

RENEWABLE ENERGY COALITION

By:_____

Date:_____

IDAHO POWER COMPANY

By:_____

Date:_____

INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

By:_____

Date:_____

PORTLAND GENERAL ELECTRIC

By:_____

Date:_____

PACIFICORP d/b/a PACIFIC POWER

By: R B Duke

Date: 4/28/16

Department of Justice
1162 Court Street NE
Salem, OR 97301-4096
(503) 947-4520 / Fax: (503) 378-3784