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November 4, 2014

Via Electronic Filing

OREGON PUBLIC UTILITY COMMISSION
ATTENTION: FILING CENTER
PO BOX 1088
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RE: Docket No. UM 1610 – In the Matter of
PUBLIC UTILITY COMMISSION OF OREGON
Staff Investigation Into Qualifying Facility Contracting and Pricing.

Enclosed for electronic filing in the above-captioned docket is the Public Utility Commission Staff's Opening Testimony.

/s/ Kay Barnes

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c: UM 1610 Service List (parties)

PUBLIC UTILITY COMMISSION OF OREGON

UM 1610

STAFF OPENING TESTIMONY OF

BRITTANY ANDRUS

In the Matter of
PUBLIC UTILITY COMMISSION OF OREGON
Staff Investigation Into Qualifying Facility Contracting and Pricing.

November 4, 2014

CASE: UM 1610
WITNESS: BRITTANY ANDRUS

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 300

Opening Testimony

November 4, 2014

Q. Please state your name, occupation, and business address.

A. My name is Brittany Andrus. My business address is 3930 Fairview Industrial Dr. SE., Salem, Oregon 97302-1166.

Q. Please describe your educational background and work experience.

A. My Witness Qualification Statement is found in Exhibit Staff/301.

Q. What is the purpose of your testimony?

A. I provide testimony on the capacity payment to solar qualifying facilities (QFs) receiving renewable avoided cost payments.

Q. Did you prepare an exhibit for this docket?

A. Yes. I prepared Exhibit Staff/302, which is an Excel spreadsheet showing the Staff-proposed calculations for capacity payments to QFs.

Q. What led to the implementation of standard renewable avoided cost prices?

A. In 2011, the Commission ordered Portland General Electric Company ("PGE") and PacifiCorp to offer standard avoided cost prices and contract terms to renewable QFs that are based on the costs of avoiding a renewable resource. (Order No. 11-505.) PGE and PacifiCorp subsequently filed standard renewable avoided cost prices[1] and forms of contracts to comply with the Commission's order, but the proposed prices and contract terms did not become effective. The Commission held the implementation of the renewable standard avoided cost prices in abeyance pending its investigation in this

[1] The term "standard renewable avoided cost prices" is used to differentiate the published avoided cost prices and contract terms for renewable QFs 10 MW and below from the negotiated rates used for larger facilities.

docket. In February 2014, the Commission issued Order No. 14-058, again requiring PGE and PacifiCorp to file standard avoided cost prices and forms of contracts for renewable resources, but with some changes in the methodology ordered in Order No. 11-505.

With respect to the capacity contribution adjustment, the Commission stated, "[w]e agree on the need to adjust for capacity contribution of each resource type and adopt Staff's proposed method for calculating capacity adjustments, as set forth in Staff/102-103, using input estimates derived from the utility's acknowledged IRP. We direct the parties to address issues regarding calculation methodology in future utility IRPs." Staff/102-103 contains example calculations for adjusting the capacity payment to QF resources based on their contributions to meeting peak load, as compared to the avoided resource. For standard avoided cost prices, the avoided resource is a combined-cycle combustion turbine (CCCT). For renewable avoided cost prices, the avoided resource is the utility's next renewable resource acquisition in its IRP, currently wind for PacifiCorp and PGE.

Each of the three electric utilities made filings to comply with Order No. 14-058. PacifiCorp's and PGE's filings included both standard avoided cost prices and standard renewable avoided cost prices for wind, solar and baseload QFs. Idaho Power's filing included only standard avoided cost prices, because they are not required as of yet to comply with RPS annual requirements.

Q. Why are avoided cost prices for wind, solar, and baseload QFs different?

A. Standard avoided cost prices and standard renewable avoided cost prices reflect an estimate of the costs of either a CCCT or a renewable resource that will be avoided by the utility due to its purchases from the QF. These include the avoided cost to produce energy, as well as the avoided cost to provide capacity during the period of resource deficiency as determined in the utility's IRP. QFs of different resource types provide different levels of capacity; therefore, the extent to which the different resources allow utilities to avoid the purchase or acquisition of capacity is different for each resource. In Order No. 14-058, the Commission ordered that avoided cost prices reflect these differences.[2]

Q. How is the avoided cost of capacity calculated in avoided cost pricing?

A. The total fixed costs of a single-cycle combustion turbine (SCCT) provide the basis for valuing capacity. SCCT costs are used for valuing capacity in marginal cost studies and for establishing the capacity-related portion of CCCT costs.

Q. How is the payment for capacity calculated for avoided cost prices?

A. The initial, or "basis," step is to spread the capacity-related portion of CCCT costs (based on the fixed costs of an SCCT) on an on-peak dollars-per-MWh basis, because it is assumed that all capacity costs are incurred to meet on-peak load requirements.[3] The capacity-related per-MWh price is added to the

[2] Order No. 14-058 at 15.
[3] The hours used in establishing that price are the year's total of sixteen-hour daily, Monday-through-Saturday-less-holidays, time intervals.

on-peak per-MWh energy price to obtain the full, or composite, on-peak per-MWh price.

Q. Please describe the capacity payment adjustment methodology adopted in Order No. 14-058 to account for the different levels of capacity provided by different resource types.

A. For QFs receiving *standard* avoided costs, resource types whose expected contribution to meeting peak load is below that of an SCCT receive an on-peak capacity payment that is reduced accordingly. The capacity payment is adjusted by multiplying the capital cost allocated to capacity for the avoided resource (the capacity-related portion of CCCT costs, which is the costs of an SCCT), expressed in a dollars-per-MWh, by a "contribution to peak" factor (CTP) for the QF. This CTP factor is sourced from the utility's acknowledged IRP for the specific type of QF generation (wind, solar solar, or baseload, e.g., geothermal), and represents the portion of the QF's capacity that is assumed to be available to meet peak loads. For a baseload QF, the CTP factor is assumed to be equivalent to that of the avoided resource. For wind and solar resources, the CTP factor is significantly lower. The result of this multiplication is the QF capacity adjustment amount, which is added to the on-peak hour energy prices.

For the standard *renewable* avoided cost prices, the capacity contribution adjustment begins with the assumed CTP factor of the avoided renewable resource, which is currently wind. The avoided renewable resource CTP is embedded in the energy payment, which is based on the total fixed costs of wind on a dollar-per-MWh basis. The QF incremental capacity CTP factor is calculated by subtracting the CTP of the avoided resource (wind) from the CTP of the QF type (wind, solar, or baseload, e.g., geothermal) sourced from the utility's acknowledged IRP. The incremental capacity CTP factor is multiplied by the price for capacity, which is that same "basis" on-peak dollars-per-MWh defined in the answer on page 4. The result of this multiplication is the QF capacity contribution *adjustment* amount, which is added to the on-peak-hour energy price.

Q. Why is Staff proposing a change to how the capacity payment is calculated?

A. In April 2014, Obsidian Renewables filed a Motion for Clarification, requesting that the Commission clarify how the Capacity Adder described in Staff/l03, Bless/2 will be applied to solar QF resources electing standard renewable avoided cost prices. In a ruling dated June 10, 2014, the Administrative Law Judge (ALJ) granted the request for clarification and directed parties to address the methodology applicable to renewable solar QF resources, raised by Obsidian's Motion for Reconsideration, in the investigations currently taking place for PacifiCorp's and Idaho Power's UM 14-058 compliance filings.

In the interest of implementing standard renewable avoided cost prices in a timely manner, parties to UM 1610 agreed to ask the ALJ to address the capacity contribution calculation in Phase II of UM 1610, rather in the compliance phase of Phase I.

Q. What is the issue regarding the calculation of the capacity contribution payments for solar QFs that Obsidian identified in its April 2014 motion?

A. Under the current method, solar QFs would be undercompensated for the value of capacity due to the way the total payment related to the capacity contribution payment is calculated. Currently, the capacity contribution payment is based on the hours that the avoided resource is expected to operate, not on the hours that the solar QF is expected to operate. Because the solar QF is expected to be available for fewer hours than the avoided resource, the result is an underpayment to the QF. Ideally, the amount of compensation to a QF should be directly proportional to its contribution (or availability) during on-peak hours. However, under the current methodology when one applies the solar capacity payment to the hours in which a solar QF resource is likely to generate, and compares that dollar amount to the dollars that would be received by the avoided resource, the difference is disproportionate compared to the relative CTP of a solar resource as compared to the avoided resource.

Q. What factor or factors drive this under-compensation?

A. Staff /103, Bless 2 adjusts the CTP by comparing the avoided renewable resource to a solar resource. However, the adjustment is applied to a dollars-per-MWh rate for capacity. Because of this, an assumed availability is embedded in the calculation. The following is the representative calculation contained in Staff /103, Bless/ 2, “Renewable Avoided Cost Prices: Solar QF Resource,” for the year 2018:

C	D	E	F	G
Capacity		Solar QF Resource		
Capital Cost Allocated to Capacity (On-Peak Hours)	Renewable Proxy Resource Contribution to Peak	QF Resource Contribution to Peak	QF Incremental Capacity Contribution to Peak	QF Capacity Adder
$/MWh	%	%	%	$/MWh
			= E - D	= C x F
$24.48	5%	30%	25%	$6.12

The "QF Capacity Adder" of $6.12 is applied to all on-peak hours in which the QF resource type generates. The adder is developed by starting with "Capital Cost Allocated to Capacity (On-Peak Hours)," a volumetric rate of $24.48. This dollar-per-MWh rate is calculated for a capacity resource for which a 91.8 percent capacity factor in on-peak hours is assumed. In this example, based on the capacity payments above, one MW of solar would receive less than nine percent of the annual dollars than that of a MW of avoided capacity, rather than receiving 25 percent:

	$/MWh	Annual Hours	On-Peak Hours %	On-Peak Capacity Factor	Total of Annual Capacity Payments
1 MW Avoided Capacity	$ 24.48	8,760	56.1%	91.8%	$ 110,439
1 MW Solar Capacity	$ 6.12	8,760	56.1%	32.7%	$ 9,835
Solar Capacity Payments as a % of the Avoided Resource:					8.9%

A substantial number of on-peak hours (defined by the North American Electric Reliability Corporation (NERC) as 6:00 a.m. to 10:00 p.m. Monday through Saturday, except certain holidays) are in the morning or evening, when the sun is not shining. Because of this, it is simply impossible for a solar QF to generate during these hours. Therefore, payment for capacity based on a volumetric rate which assumes availability during most or all peak hours is inappropriate when applied to a resource that is incapable of generating in the number of hours on which the volumetric rate is based.

Q. What does Staff propose to correct the capacity contribution adjustment payment to solar QFs receiving the standard renewable avoided cost prices?

A. Staff's proposal has two steps: First, determine the value of capacity on a dollars-per-MW basis. This step is analogous to determining an annual revenue requirement for a capacity resource. Second, determine how to pay those dollars over the course of a year on a dollars-per-MWh basis. This is the rate, or price, design step.

Q. Please describe the components of the first step.

A. In order to remove the hours component in the capacity valuation, it is necessary to go back a step and determine the value of avoided capacity to the utility on a dollars-per-MW basis. This value represents the annual fixed costs per MW per year of a single-cycle combustion turbine over the life of the facility. This cost per MW represents the full value of a resource that can be considered as "pure capacity." Due to the intermittent nature of their generation, wind and solar resources cannot provide pure capacity, but instead will provide a portion of this capacity. The portion of capacity provided by the renewable resource, its CTP, is represented as a percentage of the full value. The value of capacity that is actually avoided by a renewable generator is then equal to the CTP percentage multiplied by the full capacity value. The relative capacity value of one renewable generator compared to another can be calculated by taking the difference of their respective CTP percentages and multiplying the difference by the full capacity value.

Q. Can you give an example of how this calculation would work?

A. Yes. The following is an example in which wind is the avoided resource, and the total annual value per MW of capacity is $140,320.[4] By applying the difference in CTP to that dollar amount, an annual capacity value for a solar QF is $13,190. This amount is equal to the difference in CTP between the solar generation and the avoided resource (i.e., wind) times the value per MW of the single cycle combined cycle combustion turbine capacity resource (or 9.4 percent x $140,320).

Contributions to Peak (CTP)			**Capacity Value**	
Wind %	Solar %	Difference %	Simple Cycle CT Fixed Costs $/MW-yr	Annual Capacity Value per MW
a	b	c = b - a	d	e = c * d
4.2%	13.6%	9.4%	$140,320	$13,190

Q. Please describe the components of the second step.

A. The second step spreads the quantity of dollars determined in the first step over a set number of on-peak hours in which the capacity payment is made to the QF. There are multiple options for designing the capacity portion of the

[4] The representative inputs for this example are based on the 2024 Total Resource Fixed Costs from PacifiCorp's Replacement Compliance Filing for Avoided Cost Prices (Schedule 37), and Standard Contracts, filed on August 11, 2014, in compliance with Order No. 14-058, approved August 19, 2014.

avoided cost rate.

Currently, the volumetric payment for capacity is added to the energy payment in each NERC on-peak hour of the year for MWhs generated in those hours. Another approach is to make those payments in the hours in which the capacity is most needed.

Q. How would the most needed hours be determined?

A. These hours could be defined as those with the highest loss of load probability (LOLP). They could also be defined as the on-peak hours in the month or the months of the utility's system peak. LOLP hours and system peak months are defined in IRPs, and they are unique to each utility.

Q. Please give an example of how this second step would work in practice.

A. The following shows the NERC-designated on-peak hours for the listed months for the annual option, and for two versions of the monthly option:

	Option 1	Option 2	
	Annual	2-Month Coincidental Peak (Jul/Aug)	4-Month Coincidental Peak (Jul/Aug/ Dec/Jan)
On-Peak Hours	4,912	832	1,659

Q. How are the on-peak capacity factors calculated?

A. For these illustrations of Staff's proposed methodology, the on-peak capacity factors are calculated using monthly generation profile data for a solar facility from PV Watts®, a program produced by the National Renewable Energy Laboratory's Renewable Resource Data Center. The expected output for the month, months, or year must be adjusted to account for the proportion of

NERC on-peak hours within the hours that solar is expected to generate during the respective timeframes. This adjustment is necessary in order to achieve the correct total of capacity payments as the adder to the energy payments in NERC-defined on-peak hours. Staff's expectation is that in practice, the inputs to this method would be from the utility's most recent acknowledged IRP. The following table shows the calculation of the on-peak factor for the two-months' peak option.

	Energy Generated MWh	3-year Average Total Hours	3-year Average On-Peak Hours	16-Hour Block Hours	Monthly Capacity Factor	On-peak Hours % of 16-Hour Block Hours	Energy Generated On-peak MWh	Monthly On-Peak Capacity Factor
	f	g	h	i	j = f*g	k = h/i	l = f*k	m = l/h
July	188	744	411	496	25.3%	82.8%	156	37.9%
August	182	744	421	496	24.5%	84.9%	155	36.7%
					2 Month (Jul/Aug) weighted avg CF:			37.3%

Using these inputs, the following calculations would result in the capacity contribution adjustment that would be expected to pay the target capacity dollars over the course of a year.

Option 1				Option 2			
				Example Based on Two-month CP: July and August			
Annual On-Peak Hours	On-Peak Capacity Factor	On-Peak Capacity Payment All Months $/MWh	Total of Capacity Payments	On-Peak Hours in Utility's CP Months	On-Peak Capacity Factor	On-Peak Capacity Payment July and August $/MWh	Total of Capacity Payments
f	g	h = e / (f * g)	i = f * g * h	j	k	= l / (j * k)	= m * (k * l)
4,912	27.5%	$ 9.76	$ 13,190	832	37.3%	$ 42.49	$ 13,190

Q. What are the advantages and disadvantages of each option?

A. Option 1 is consistent with the current payment structure of paying on each on-peak hour of the year, so administratively it is the simplest. A disadvantage is that it pays QFs for capacity in all on-peak hours, including in months in which it is not needed. Conversely, Option 2 provides an incentive for the QF to perform in those most-valued months, which better matches the hours in which the capacity will likely be needed. A minor disadvantage of Option 2 is that implementing this pricing structure could entail changes to current language in standard QF power purchase agreements, in the schedules of avoided cost prices, and to utility billing and payment systems and procedures.

Q. Does Staff see a similar issue with the other avoided cost calculations?

A. Any methodology in which a number of hours of operation is assumed as part of the capacity factor calculation will have the potential for a mismatch between that assumption and the number of hours in which the QF will be able to generate. In Order No. 14-058, the Commission ordered a capacity contribution adjustment for the standard avoided cost price calculation. Staff intends to testify regarding the need to modify the methodology for calculating the capacity contribution adjustment for other avoided cost prices later in this docket.

Q. If the Commission adopted either of Staff's proposed options, how would it be implemented?

A. Inputs for CTP and for the number of on-peak hours in which the renewable resource type generates would come from the utilities' acknowledged IRPs. Both assumptions would be based on the characteristics of the same resource, e.g., a single-axis tracking utility-scale PV solar facility. The payment would be the same regardless of where the QF is located or the individual characteristics of the QF.

Q. Does this conclude your opening testimony?

A. Yes.

CASE: UM 1610
WITNESS: BRITTANY ANDRUS

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 301

Witness Qualification Statement

November 4, 2014

WITNESS QUALIFICATION STATEMENT

NAME:	Brittany Andrus
EMPLOYER:	Public Utility Commission of Oregon
TITLE:	Senior Utility Analyst Energy, Resources and Planning
ADDRESS:	3930 Fairview Industrial Dr. SE Salem, Oregon, 97302-1166
EDUCATION:	M.B.A. Portland State University, Portland, Oregon B.A. English Michigan State University, East Lansing, Michigan
EXPERIENCE:	I have been employed at the Oregon Public Utility Commission since 2011. My current responsibilities include research, analysis and technical support for electric company proceedings, with an emphasis on resource planning, power costs, and qualifying facilities under PURPA. I was previously employed for 17 years by the Bonneville Power Administration, a wholesale power marketing agency within the federal Department of Energy. My duties included energy efficiency planning and program management, long term load and revenue forecasting, long term power sales contracts, rate impact analysis, short term load forecasting, power and transmission scheduling, and management of load forecasting data and processes.

CASE: UM 1610
WITNESS: BRITTANY ANDRUS

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 302

Exhibit in Support
Of Opening Testimony

November 4, 2014

Exhibit 302
Calculation of Capacity Payment for Renewable Avoided Cost Prices

Step 1. Determine Value of QF Capacity

Contributions to Peak (CTP)			Capacity Value	
Wind %	Solar %	Difference %	Simple Cycle CT Fixed Costs $/MW-yr	Annual Capacity Value per MW
a	b	c = b - a	d	e = c * d
4.2%	13.6%	9.4%	$140,320	$13,190

Step 2. Determine hours over which to spread capacity payments and calculate capacity price (rate)

Option 1: Pay on on-peak hours for all months
Option 2: Pay on on-peak hours only in the months of the utility's coincidental peaks (CP)

Option 1	**Option 2**	
Annual On-Peak Hours	2-Month CP On-Peak Hours	4-Month CP (Jul/Aug/ Dec/Jan)
4,912	832	1,659

Option 1				**Option 2**			
				Example Based on Two-month CP: July and August			
Annual On-Peak Hours	On-Peak Capacity Factor	On-Peak Capacity Payment All Months $/MWh	Total of Capacity Payments	On-Peak Hours in Utility's CP Months	On-Peak Capacity Factor	On-Peak Capacity Payment July and August $/MWh	Total of Capacity Payments
f	g	h = e / (f * g)	i = f * g * h	j	k	= l / (j * k)	= m * (k * l)
4,912	27.5%	$ 9.76	$ 13,190	**832**	**37.3%**	$ 42.49	$ 13,190

Calculation of On-Peak Capacity Factor for Option 2

	Energy Generated MWh	3-year Average No. of Hours	3-year Average No. of On-Peak Hours	No. of 16-Hr Block Hours	Monthly Capacity Factor	On-peak Hours % of 16-Hr Block Hours	Energy Generated On-Peak MWh	Monthly On-Peak Capacity Factor
	n	o	p	q	r = n / o	s = p / q	t = n * s	u = t / p
July	188	744	411	496	25.3%	82.8%	156	37.9%
August	182	744	421	496	24.5%	84.9%	155	36.7%
			832				2 Month (Jul/Aug) weighted avg CF:	**37.3%**

CERTIFICATE OF SERVICE

UM 1610

I certify that I have, this day, served the foregoing document upon all parties of record in this proceeding by delivering a copy in person or by mailing a copy properly addressed with first class postage prepaid, or by electronic mail pursuant to OAR 860-001-0180, to the following parties or attorneys of parties.

Dated this 4th day of November, 2014 at Salem, Oregon

Kay Barnes

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UM 1610
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