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REBUTTAL TESTIMONY OF

ANGELA R. DECLERCK, THOMAS R. MURPHY, AND LYNN M. HART

Witnesses for Bonneville Power Administration

SUBJECT: Rebuttal Testimony for Generation Inputs for Ancillary Services

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Section 1. Introduction and Purpose of Testimony

Q. Please state your names and qualifications.

A. My name is Angela R. DeClerck. My qualifications are contained in WP-02-Q-BPA-15.

A. My name is Thomas R. Murphy. My qualifications are contained in WP-02-Q-BPA-53.

A. My name is Lynn M. Hart. My qualifications are contained in WP-02-Q-BPA-27.

Q. Please state the purpose of your testimony.

A. The purpose of our testimony is to rebut arguments regarding the Bonneville Power Administration's (BPA) costing methodologies used to allocate generation costs to the provision of ancillary and other services made by the Northwest Investor-Owned Utilities (NW IOUs), Enron Power Marketing, Inc. (Enron), the High Load Factor Group, and the Western Public Agencies Group (WPAG).

Q. How is your testimony organized?

A. This testimony is presented in three sections, including this introductory section. The second section rebuts arguments made by NW IOUs and Enron regarding the reactive power and voltage control embedded cost methodology. The third section rebuts arguments made by the High Load Factor Group regarding the application of Cost Recovery Adjustment Clause (CRAC) to the methodology used to allocate costs to generation inputs for Operating Reserves.

Section 2. Methodology Used to Allocate Costs to Generation Inputs for Generation Supplied Reactive Power and Voltage Control

Q. Have you reviewed the testimony of the NW IOUs and Enron pertaining to the allocation of costs for generation inputs to Generation Supplied Reactive Power and Voltage Control? Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08.

A. Yes. The NW IOUs and Enron argue that BPA used an inconsistent method to allocate costs of hydro generation electrical facilities to generation inputs for generation supplied reactive power and voltage control.

Q. The NW IOUs and Enron argue that BPA has mixed capability and actual-use methods in allocating the costs of hydro generation electrical facilities to generation inputs for generation supplied reactive power and voltage control. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 4. Do you agree?

A. No. BPA's approach to calculate the weighted average system power factor, which is used to allocate a percentage of electrical generation equipment costs to the cost of producing reactive power and voltage control, is based on a capability method rather than the actual-use method. While BPA is not using an actual-use method, elements of BPA's proposed methodology do account for the normal operation of the hydro generation units. Hydro generation units are constrained to operate below nameplate ratings. Therefore, BPA is defining the capability of the hydro generation units to provide reactive power using points on the generator capability curves corresponding to normal operations, rather than nameplate ratings. *See* Wholesale Power Rate Development Study, WP-02-E-BPA-05, at 82-83.

BPA's hydro generating units are normally operated at much lower real power generation levels than the machine nameplate ratings imply. Therefore, machine nameplate ratings are not indicative of how BPA's hydro generation facilities are operated. The capability of a hydro unit to provide reactive power is more accurately described at a point corresponding to normal operation. Hydro units are operated below nameplate rating due to energy constraints, plant operating restrictions (such as elevation limits and discharge limitations), and fish passage constraints. Because of these restrictions, there is more total hydro generation real power production capacity, as defined by the nameplate rating, than can be used at any one time. Even the one hour capability is less than the nameplate rating for most plants. Due to these plant constraints, defining the capability of a hydro generating unit at the nameplate rating overstates the real power capability and understates reactive power capability.

Q. The NW IOUs and Enron argue that BPA's use of a power factor based on normal operations rather than the rated power factor results in an arbitrary allocation of costs for electrical generation components used to produce generation supplied reactive power and voltage control. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 5. Do you agree?

A. No. Using a power factor that correlates with normal operation of the hydro generation system is necessary to properly reflect the hydrosystem's ability to provide reactive power and voltage control to support transmission system reliability. Based upon a generator capability curve, lower real power production results in more reactive capability available to support transmission system reliability. *See* Attachment 1, example capability curve. By selecting a power factor that corresponds to an operating point at the midpoint of the peak efficiency band, the hydrosystem's capability to provide reactive power to the transmission system is more accurately accounted for.

BPA derived a weighted average system power factor based on operation of the hydro generation units near the midrange of the peak efficiency band, which was used to allocate a percentage of the costs of electrical generation equipment to the generation input costs for reactive power and voltage control. BPA considered the reactive power capabilities of the hydro generating plants as an element of aggregate systemwide total power production capability. Notably, the testimony of the NW IOUs and Enron embraces viewing the power system's reactive capability on an aggregate basis. *See* Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 6.

Q. The NW IOUs and Enron argue that BPA's use of a power factor based on normal operations rather than the rated power factor "provides for the 'cherry picking' of assumptions to produce an arbitrarily higher or lower allocation factor." In developing the costing methodology for generation inputs for reactive power and voltage control, was it BPA's intention to "cherry-pick" assumptions in order to obtain an arbitrarily higher or lower allocation factor?

A. No. BPA developed this methodology in an effort to fairly allocate the costs of relevant electrical system components between the cost of producing reactive power and the cost of producing real power, as those costs are incurred in operating the Federal Columbia River Power System (FCRPS). We believe that we have succeeded in developing a fair allocation. Furthermore, as the testimony below demonstrates, the methodology proposed by the NW IOUs and Enron produces an allocation that is arbitrary in terms of reflecting actual FCRPS costs and unfairly reduces the allocation of costs to generation inputs for reactive power and voltage control.

As real power production is decreased, more reactive capability is available. BPA's choice of a power factor that corresponds to an operating point at the midpoint of the peak efficiency band of the hydro generating units corresponds to 14,767 megawatt (MW) of real power production. One possible alternative to BPA's proposed methodology would be a power factor corresponding to BPA's average real power production. BPA's average real power production is 9,280 MW. A power factor corresponding to BPA's average real power production would result in much higher reactive power capabilities and would raise the allocation of costs for electrical generation components used in the production of generation supplied reactive power and voltage control. BPA's choice of a power factor that corresponds to an operating point at the midpoint of the peak efficiency band of the hydro generating units understates the reactive power capability of the hydro generation system, on average; therefore, the allocation of costs to reactive power production is reduced in comparison to the allocation of costs corresponding to BPA's average real power production.

The NW IOUs and Enron propose the use of a weighted average power factor, based on the machine's nameplate ratings, to be used as a factor to determine the allocation percentage of electrical generation equipment used in the production of reactive power and voltage control. This choice of power factor corresponds to real power generation levels of over 18,188 MW. *See* Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, Attachment C, page 1 of 2. BPA does not generate at levels that approach 18,188 MW and consequently does not operate near the aggregated nameplate ratings of the hydro generating facilities. This extreme figure results largely from the fact that many BPA machines have a rated power factor of, or approaching, unity.

Machine nameplate ratings of unity correspond to allocations of costs to reactive power production equaling zero. Such allocations are arbitrary in that they bear no relationship to real-world operating conditions. In our judgment, allocations based upon nameplate ratings would be unfair. Instead, BPA has proposed an allocation that results in reactive power generation input costs that are less than the costs corresponding to average real power production, but more than the costs corresponding to an arbitrary machine nameplate rating approach. Of these three possible allocations, BPA's proposal is superior because it has technical merit and reaches a fair result. As the following testimony will demonstrate, this was possible without the intricate, costly, marginally informative, and foreseeably unachievable, technical analysis that the NW IOUs and Enron propose.

Q. *The NW IOUs and Enron argue that it is appropriate to consider the operation of the hydro generator units at the midrange of the peak efficiency band in making a determination of reactive power capability in the Q^2/S^2 allocation when additional assumptions are included in the analysis. Such assumptions would: (1) include the fact that hydro generator units are at times not operated at peak efficiency; (2) but are sometimes operated at or near rated real power output; (3) take into account the amount of reactive power actually needed to support transmission system reliability; and (4) consider that the available reactive power capability of the hydro generating units is often greater than the required reactive power needed to support transmission system reliability. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 7 and 8. Do you agree?*

A. Yes. Although BPA is not using an actual-use method, elements of BPA's proposed methodology account for the normal operation of the hydro generation units. As the answers below will demonstrate, BPA considered the factors that the NW IOUs and Enron assert must be accounted for when using a methodology that accounts for the operation of the hydro generator units at the midrange of the peak efficiency band.

Q. *The NW IOUs and Enron argue that BPA did not account for hydro generator units that are operated at or near rated real power output or are otherwise not operated near peak efficiency in making a determination of reactive power capability in the Q^2/S^2 allocation. Schlect and Banaghan WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, page 7 and 8. Do you agree?*

A. No. BPA accounted for the variations in hydro generator operations based on changes in load by assuming the power factors for hydro generator units are derived from an operating point that corresponds to the midpoint of the peak efficiency band. The hydro units are controlled to operate within 1 percent of the peak efficiency band even when following fluctuations in load. The variations in hydro generation caused by load fluctuations are equally distributed in the positive and negative directions around the midpoint of the peak efficiency band. When more power output is required, more hydro units are put online to allow the operating hydro units to be controlled within 1 percent of peak efficiency. Conversely, when less power output is required, more hydro units are taken offline to continue to allow the operating hydro units to be controlled within 1 percent of peak efficiency. BPA has used a weighted average power factor: on average, the effect of these fluctuations in load on the availability of reactive capability is accounted for by choosing the midpoint of the peak efficiency band because more reactive capability is available when the units are operating in the peak efficiency band below the midpoint and less reactive capability is available when the units are operating above the midpoint. *See* Attachment 1.

Q. The NW IOUs and Enron argue that BPA did not make reasonable assumptions for the amount of reactive power actually needed to support transmission system reliability. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 7 and 8. Do you agree?

A. No. BPA has determined that while it operates the hydro generating units at lower generation levels than those corresponding to the nameplate ratings of the hydro generator units, the transmission system is still usually curtailed due to reactive power demands on the transmission system. Hydroplant operators are routinely instructed by BPA dispatchers to put more hydro generating units online to provide additional reactive power to support transmission reliability, or to adhere to voltage schedules that are provided by Transmission Business Line (TBL) dispatchers. TBL has a reactive power monitoring system to maintain reactive power margins (determined by TBL's Reactive Margin Criteria) and has stated in their rate case workshops that there are times when 100 percent of the reactive power available from BPA hydro generating units at a particular location is needed.

Given these facts, BPA did not find it necessary or worthwhile to perform the rigorous analysis required to determine the exact reactive power requirements imposed by transmission system reliability. Moreover, these requirements change frequently depending on the level of powerflows on the system, generation patterns, and intertie levels, among other things. Reactive power requirements can be determined through powerflow analysis, but the results are only valid for one particular set of operating conditions. Thus, the analysis proposed by the parties would be extensive, but of limited utility.

Q. The NW IOUs and Enron argue that BPA did not consider the fact that the available reactive capability of the hydro generating units is often greater than the required reactive power needed to support transmission system reliability. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 7 and 8. Do you agree?

A. No. Even though the reactive capability of the hydro generating units as a system is often greater than the required reactive power needed to support transmission system reliability at a given point in time, a transmission system operator must plan for and meet the maximum reactive needs of the transmission system during a disturbance. It is essential for sufficient reactive power capability to be available, even if it is needed for only short periods of time.

Q. The NW IOUs and Enron argue that for the purposes of allocating costs to reactive power and voltage control, it is not appropriate to compare reactive (MVAR) capability held in reserve for unforeseen events on a power system to real power (MW) capability, held in reserve to respond to unforeseen events. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 9. Do you agree?

A. No. BPA, as a transmission system operator, must adhere to reactive power margins; these are set forth in TBL’s Reactive Power Margin Criteria. Reactive power margins must be maintained to respond to transmission system disturbances, just as excess real power capacity is maintained to meet operating reserve requirements. Providing transmission system reliability support is the hydro operator's highest priority and real power production will be curtailed or redispatched if the reactive power margins necessary to maintain reliable operation of the transmission system are threatened.

Q. The NW IOUs and Enron argue that the nameplate rating of WNP-2 should be used to define the power factor used in making a determination of reactive power capability in the Q^2/S^2 allocation. Schlect and Banaghan, WP-02-E-AC/GE/IP/MP/PL/PS/EN-08, at 8. Do you agree?

A. Yes. WNP-2 is primarily a base-loaded plant. Upon review of the NW IOUs' and Enron's testimony, BPA agrees that the power factor associated with operation of WNP-2 should be the rated power factor of the nuclear units. Because nuclear plants are normally base-loaded near their nameplate ratings, the rated power factor most accurately describes the capability of the nuclear units to provide reactive power during normal operation. Thus, the power factor associated with operation of WNP-2 should be 0.975, instead of the previously proposed power factor of 0.95.

Section 3. Responds to the arguments regarding the application of CRAC to the methodology used to allocate costs to Operating Reserves.

Q. Have you reviewed the High Load Factor Group's (HLFG) testimony pertaining to Operating Reserves? See WP-02-E-HL-01, at 36-39.

A. Yes. The testimony of the HLFG proposes a modification to BPA's costing methodology establishing the maximum per unit interbusiness line charge for operating reserves generation inputs, both spinning and supplemental. The HLFG argues that BPA's methodology is incomplete and must be modified to take into account the application of CRAC.

Q. The HLFG argues that, because the allocated costs and revenue credits for operating reserves generation inputs are based on the same forecasted costs and revenue credits *that go into BPA's power rates, the per unit charges for operating reserves generation inputs should be subject to CRAC. Do you agree?*

A. No. We believe that applying CRAC to an interbusiness line charge such as operating reserves generation inputs is inappropriate. While applying the CRAC to operating reserves generation inputs has some appeal in terms of parity with BPA's posted power rates, HLFG's proposal raises significant issues with respect to interbusiness line cost recovery and with respect to implementation.

Q. What interbusiness line cost recovery issues does the HLFG's proposal raise?

A. In designing the proposed power rates, PBL has accounted for risk associated with variability in the costs assigned to the PBL; the CRAC is one tool for addressing such risk. TBL will account for parallel, but distinct, risk when developing the transmission and ancillary service rates in the transmission rate case. Inserting a CRAC charge into TBL's risk portfolio via the interbusiness line charge for generation inputs to operating reserves seems to add unnecessary complexity to the overall BPA risk management program.

Q. How does the HLFG propose to modify the costing methodology?

A. The HLFG's proposal states that BPA should apply CRAC to the per unit cost of operating reserves generation inputs based on the actual net costs associated with the generation components assigned to operating reserves generation inputs, increasing the per unit cost proportionately whenever CRAC triggers.

Q. Do you agree with the HLFG's proposal?

A. No. We are not convinced that HLFG's proposal would be cost effective. BPA's current systems are not capable of tracking the actual net costs associated with the generation assigned to operating reserves generation inputs. Contrary to the HLFG's understanding of the new accounting system BPA is putting in place, such tracking will probably not be practical in the future. The administrative costs associated with HLFG's proposal would likely outweigh the small amount of revenue projected to result from an application of CRAC to the interbusiness line operating reserves generation input charge.

Q. *Does BPA intend to modify the initial proposal by including a CRAC recovery component in the interbusiness line charge for operating reserves generation inputs?*

A. Not at the present time. BPA staff members have discussed an alternative to the HLFG proposal. The alternative would include a small adder to the per unit cost for operating reserves to compensate for the forecasted probability that CRAC will trigger during the next five-year rate period (*See* WP-02-BPA-02A, at 285). This alternative would use a probabilistic determination of how likely the CRAC would be to trigger, and its amount, in the most likely scenario. Then, the average CRAC-related rate increase would apply as a percentage increase to the proportionate share of the revenue requirement for operating reserves generation inputs. Under this alternative, should CRAC actually trigger during the next five-year rate period, there would be no need to adjust the maximum per unit interbusiness line charge for operating reserves. This alternative mitigates the implementation problem associated with the HLFG proposal, but may not alleviate the interbusiness line cost recovery issues mentioned above.

Q. *Does this conclude your testimony?*

A. Yes.