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TESTIMONY of

BYRNE LOVELL, DANNY L. CHEN, MARCUS A. HARRIS,

AND MICHAEL R. LINN

Witnesses for Bonneville Power Administration

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Section 1: Introduction and Purpose of Testimony

Q. Please state your names and qualifications.

A. My name is Byrne Lovell, and my qualifications are contained in BP-16-Q-BPA-26.

A. My name is Danny L. Chen, and my qualifications are contained in BP-16-Q-BPA-09.

A. My name is Marcus A. Harris, and my qualifications are contained in BP-16-Q-BPA-15.

A. My name is Michael R. Linn, and my qualifications are contained in BP-16-Q-BPA-24.

Q. What is the purpose of your testimony?

A. The purpose of this testimony is to explain, support, and sponsor the risk analysis portion of the Transmission Revenue Requirement Study and the Documentation for the Transmission Revenue Requirement Study.

Section 2: Risk Analysis

Q. Please describe the purpose of the risk analysis.

A. We conduct the risk analysis to evaluate whether BPA's 95 percent Treasury Payment Probability (TPP) standard will be met, given the proposed rates. Transmission TPP is the probability that BPA will be able to make all of its scheduled payments to the U.S. Treasury associated with Transmission Services (TS) in full and on time during the two-year rate period.

Q. Have you made any major changes to the risk analysis methodology for this rate proceeding?

A. No. The methodology used in this rate proceeding is essentially the one that has been used in the last six rate proceedings. *See* Transmission Revenue Requirement Study, BP-16-E-BPA-08, § 2.2; Transmission Revenue Requirement Study Documentation, BP-16-E-BPA-08A, ch. 10.

Q. How does the methodology evaluate whether the TPP standard will be met?

We calculate TPP using a Monte Carlo simulation. Monte Carlo simulation is a method of repeatedly drawing random samples of input variables (in this instance, several TS revenue and expense items) and combining them to generate a set of possible outcomes (in this case, possible yearly changes in financial reserves available for risk attributed to Transmission (TS Reserves) for FY 2015, 2016, and 2017). A simulation comprises many games (sometimes called iterations). We run 3,200 games, each of which generates an annual TS cash flow (change in TS Reserves) value for each of three fiscal years, thus creating three probability distributions of TS cash flows. We then examine the output of the simulation to see how often all of BPA's financial obligations associated with TS have been met.

Q. Please explain how you run each game.

A. We start each game with the known level of TS Reserves at the end of FY 2014. The model draws randomly from the distributions of possible values for the revenue and expense items that can vary during FY 2015 and calculates a FY 2015 cash flow. It adds this cash flow to the ending FY 2014 TS Reserves balance to obtain the FY 2015 ending TS Reserves balance. This process is repeated for FY 2016 and for FY 2017. Then another game is run, starting again with FY 2014 ending TS Reserves.

When all 3,200 games have been run, we count the number of games in which the Treasury payment was made in both FY 2016 and FY 2017. If the Treasury payment was made in both years in at least 95 percent of the games, the TPP standard has been met.

Q. Have you made any changes to the Transmission Risk Analysis Model (TRAM)?

A. We have made some changes to the way expense and revenue variability are modeled, we have added some variability to cash timing lags from one year to the next, we have removed the calibration adjustment, and we have updated TS's within-year liquidity need.

Q. What changes have you made to the way expense variability is modeled?

A. As in the previous rate case, we have modeled the variability, or uncertainty, of the following expenses: (1) transmission operations; (2) transmission maintenance; (3) agency services general and administrative (G&A) expense; and (4) interest on long-term debt issued to the Treasury and interest on long-term debt issued through a lease arrangement (Lease Financing). In this rate case, we have made changes to how we model uncertainty for these expenses. We have also added modeling of uncertainty for the expense associated with transmission engineering, and removed modeling of uncertainty for the expense of the Transmission Acquisition and Ancillary Services program.

We have changed the way we model uncertainty for transmission operations, transmission maintenance, and agency services G&A. Previously, we created the distribution of possible values for these expenses by consulting with subject matter experts. We used their assessment of the risks around these costs and possible ranges of outcomes as inputs to TRAM. For this rate case, we have generated distributions of possible values for these expenses (and for transmission engineering expenses) from historical data. We compared rate case projections of these expenses to actual results for

the most recent five years of historical data (FY 2009–2013). Five years strikes a reasonable balance between using more years of data for greater statistical power and using only data from years when the costs included in the expense categories were similar to their current makeup. We use the minimum and maximum differences between rate case projections and actual results as the bookends for the distribution of possible values for these expenses. Transmission Revenue Requirement Study Documentation, BP-16-E-BPA-08A, ch. 10.4. This methodology is more objective than the method used in previous rate cases and allows us to incorporate actual historically observed variability for these expenses.

Q. What change have you made to the modeling of uncertainty in interest expense?

A. Previously, we based our characterizations of the uncertainty in interest expense on three factors: (1) the degree to which a future interest rate might vary from the forecast value, (2) the degree to which an interest rate in one year is correlated with the interest rate in the prior year, and (3) the degree to which different interest rate products, such as the rate BPA pays for funds borrowed for Lease Financing and the interest rate BPA can obtain from the US Treasury, tend to move up and down together. We obtained data on these factors by interviewing subject matter experts. We now base our characterizations of interest rate expense uncertainty on historical daily interest rate data from 1994 through 2014. These data include the interest rates for different term lengths (*e.g.*, one-year, ten-year, etc.) for both the U.S. Agency rate, the rate at which BPA borrows from the U.S. Treasury, and a taxable interest rate for utilities with a Double A credit rating (AA Taxable Utilities rate), which we use as a proxy for the interest rate for Lease Financing. *Id.* ch. 10.4.4.

Q. Why did you make this change to the modeling of uncertainty in interest expense?

A. The new method has two advantages over the prior method. First, it uses historical data to determine volatility instead of relying on subject matter expert knowledge. Volatility is the potential for a variable in one time period to differ from its value in the previous period (in this case, the potential for an interest rate in one period to differ from the interest rate in the previous period). We know the interest rates that are available to BPA now; we are highly uncertain about interest rates many years from now. Interest rate volatility is a measure of how quickly the uncertainty about interest rates increases as we look farther into the future. TRAM creates projections of interest rates for each month of the current fiscal year and of the following two-year rate period, and it needs to know how fast to increase the interest rate uncertainty over time as it generates these projections. This methodology provides that information based on historical data.

Second, it uses the actual observed correlation between the U.S. Agency and AA Taxable Utility interest rates over the same timeframes. The new approach is both simpler and more firmly based on observed patterns of month-to-month changes in interest rates.

Q. What change have you made to the modeling of uncertainty in transmission acquisition and ancillary services expense?

A. We have removed uncertainty in transmission acquisition and ancillary services expense from TRAM. We assessed the components of this expense category and determined that either the expenses are fixed; that is, they have no uncertainty over the rate period; or they are offset by like amounts of revenue that are perfectly correlated; that is, any change in expense would be matched by an equal change in revenue. Because all the components of this expense category are either fixed or offset by revenue, there is no uncertainty to model.

Q. What changes have you made to the modeling of revenue variability?

A. We have made three changes. First, we have changed the way we model uncertainty in Mid-C and NP-15 prices in the short-term Point to Point (PTP) and Southern Intertie (IS) sales forecasts. As discussed in the testimony supporting the Transmission Rates Study, we are now using power prices from AURORAxmp® in our model to forecast sales. Fredrickson *et al.*, BP-16-E-BPA-14, at 5–7. The model that forecasts these sales also develops the distribution of possible Mid-C and NP-15 prices (that is, our assumptions of the range of prices that could occur during the rate period and their associated likelihoods) for the sales. In previous rate cases, we used power prices from Intercontinental Exchange (ICE) in the model. *Id.*

In addition, the risk analysis for these revenue items incorporates a measure of natural gas volatility, because natural gas prices significantly impact power prices. In the previous rate case, we modeled natural gas volatility based on risk distributions of prices associated with financial options at the Henry Hub gas trading market, obtained from ICE. In this rate case we use the natural gas risk distributions included in the Power Risk and Market Price Study. Power Risk and Market Price Study, BP-16-E-BPA-04, § 2.3.1.

Finally, we are now modeling revenue uncertainty for generation inputs services for which expenses are fixed but the revenues are variable. Previously, we did not model revenue uncertainty for these generation inputs revenues.

Q. Why are you using AURORAxmp® and the Power Risk and Market Price Study instead of ICE?

A. Our reasons for using AURORAxmp® instead of ICE, and for using the natural gas distributions from the Power Risk and Market Price Study, are the same as those discussed in the testimony supporting the Transmission Rates Study. Fredrickson *et al.*,

BP-16-E-BPA-14, at 5–7. In short, using AURORAxmp® and the natural gas distributions from the Power Risk and Market Price Study ensures that the assumptions about future electricity prices used to set transmission rates are consistent with the assumptions used to set power rates. In addition, if requested, we are able to publish AURORAxmp® prices and the distributions from the Power Risk and Market Price Study. We were unable to publish prices and distributions from ICE because the information was proprietary.

Q. What changes did you make to add revenue variability to certain generation inputs services?

We modeled revenue risk for generation inputs services whose revenue varies but whose expenses are fixed. Power Services (PS) charges TS a fixed amount during the rate period for supplying generation inputs for Regulation and Frequency Response Service (RFR) and Dispatchable Energy Resource Balancing Service (DERBS). The revenue TS will receive for these products, however, is uncertain. RFR charges are based on loads in BPA's balancing area, and the uncertainty stems from the potential variability in loads, which can vary based on weather and economic conditions. We examined the historical RFR loads from FY 2008 to FY 2014 and used the range over that time period as the measure of the potential uncertainty for rate period loads, and correspondingly, RFR revenue.

The other generation inputs service with fixed expense and variable revenue is DERBS, and again the revenue is uncertain because the basis on which DERBS is charged—station control error for non-Federal thermal plants—is uncertain. Station control error represents the deviation of a generator from its basepoint, which is the generation level that the plant is planned to operate to. We examined historical data from FY 2012 to FY 2014 for non-Federal thermal plant station control errors and used

the range over that time period as the measure of the potential uncertainty for rate period station control error, and correspondingly, DERBS revenue. Transmission Revenue Requirement Study Documentation, BP-16-E-BPA-08A, ch. 10.3.7.

Q. Did you model revenue risk for any other generation input services?

A. No. Transmission Services' revenue from two other generation inputs-related services is also variable, but the expense that TS pays to PS is equally variable and perfectly correlated with the revenue. As a result, there is no need to model the revenue risk for these services because it causes no variability in Transmission Services' *net* revenue, TS cash flow, or TS Reserves. The services in this category are Energy & Generation Imbalance (EI/GI) and Operating Reserve – Spinning & Supplemental (OR). A fifth service, Variable Energy Resource Balancing Service (VERBS), has essentially fixed revenue and essentially fixed expenses, and therefore causes no significant net revenue risk.

Q. Please explain cash timing lags.

A. Cash timing lags are differences between when revenue or expenses are accounted for and when the cash is received or paid out. Prior to this rate case, we had not modeled uncertainty in cash timing lags. Most of BPA's financial measurements are made in terms of revenues and expenses; that is, accrual accounting. Cash timing lags arise when the revenue and cash receipts, or expenses and cash disbursements, occur at different times. Uncertainty in cash timing lags exists when the assumed timing difference between an expense and the corresponding cash disbursement, or between a revenue and the corresponding cash receipt, cannot be counted on to match the actual cash timing lag.

Q. Why are you now modeling uncertainty in cash timing lags?

A. Most of the risk analysis is performed by assessing uncertainty in revenues and expenses. Revenues or expenses projected to be recorded by accounting near the end of a fiscal year have the potential for the cash to lag, and to be received or paid in the following year. As noted earlier, the purpose of this risk analysis is to assess whether the proposed rates will satisfy BPA's TPP standard—that is, how probable it is that TS Reserves will be sufficient for BPA's cash obligations associated with TS. If cash timing lags occur at the end of a fiscal year, they can impact levels of year-end TS Reserves available to make the year-end Treasury payment. Assessing the uncertainty in cash timing lags helps us assess the uncertainty in the amount of year-end TS Reserves, thus helping us calculate TPP more accurately.

Q. How are you modeling uncertainty in cash timing lags?

A. We have based our modeling of cash timing lags on six years of historical data (FY 2009 –2014) for the following BPA financial accounts: accounts payable, accounts receivable, materials, and prepaid expenses. Cash timing lags are reflected in the historical year-over-year changes to these accounts. We calculated how much of each year-over-year change in each category could be attributed to TS and used the resulting TS data (the range of TS year-over-year changes) as the basis for a distribution of the possible cash timing lags. Transmission Revenue Requirement Study Documentation, BP-16-E-BPA-08A, ch. 10.5.

Q. Are you continuing to apply a calibration adjustment in the risk analysis?

A. No. Since the BP-14 rate case, we have continued to refine our characterization of the uncertainty of each revenue or expense variable that we use in modeling TS's financial performance. The calibration adjustment, which we used to ensure that the overall

financial risk shown in TRAM's output reflected historically observed financial uncertainty, is no longer necessary.

Q. Please explain within-year liquidity need.

A. The within-year liquidity need is the amount of cash or other liquidity (the temporary availability of cash) BPA needs at the beginning of a fiscal year for dealing with cash flow deficits that result from payments being made before cash receipts. The transmission business unit has over $900 million in annual expenses. Debt service payments and revenue receipts are the primary drivers of monthly surplus or deficit in TS's cash flow. In the 2002 transmission rate case, BPA determined that its within-year liquidity need for TS was $20 million. This means that BPA determined that, after all expenses are paid at the end of a year, including the Treasury payment, it needed to have at least $20 million of liquidity on hand for use during the next fiscal year in the event cash disbursements were made ahead of cash receipts. BPA has made the same assumption in each rate case since. TRAM records a Treasury payment miss (that is, TRAM assumes that BPA is unable to make its Treasury payment) if TS Reserves in a game are below the within-year liquidity need at the end of either year in the rate period.

Q. Has your assessment of within-year liquidity need changed?

A. Yes. As part of the current risk analysis, we reevaluated TS's within-year liquidity need by examining five years of TS within-year liquidity usage (FY 2010–2014). We found that the maximum within-year liquidity used by year for FY 2010 through 2014 was $96 million, $11 million, $17 million, $30 million, and $61 million, respectively. Based on this record, we have determined that TS needs $100 million of within-year liquidity. *See* Transmission Revenue Requirement Study Documentation, BP-16-E-BPA-08A, ch. 10.6.

Q. What are the results of the risk analysis for this rate period?

A. BPA has identified and quantified transmission risks and designed risk mitigation tools that achieve BPA's policy standard of at least a 95 percent TPP. *See* Transmission Revenue Requirement Study, BP-16-E-BPA-08, § 2.2. Simulations of TS Reserves available for risk have expected values of $446 million, $417 million, and $359 million at the end of fiscal years 2015, 2016, and 2017, respectively. *Id.* § 2.2.4. These reserves and the cash flow anticipated from the proposed rates for FY 2016 and FY 2017 yield a two-year TPP of over 99.9 percent, thereby meeting BPA's TPP standard of 95 percent for the two-year period. *Id.*

Q. Does your analysis incorporate any proposed consumption of TS Reserves in the rate period?

A. We are proposing to consume $15 million of TS Reserves in each year in the rate period in lieu of borrowing to fund capital projects. *Id.* § 2.3.3. That is, our planned borrowing is $15 million less than our planned use of cash for capital investments, which will result in drawing down reserves by $15 million per year. The risk analysis and calculation of TS Reserves include this proposed consumption.

Q. Have you made any other changes to the transmission risk analysis?

A. No.

Q. Do you anticipate making any changes to the risk analysis for the Final Proposal?

A. Yes. We plan to update the data in our risk models.

Q. Does this conclude your testimony?

A. Yes.

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