BEFORE THE UTAH PUBLIC SERVICE COMMISSION

IN THE MATTER OF THE APPLICATION OF ROCKY MOUNTAIN POWER FOR AUTHORITY TO INCREASE ITS RETAIL ELECTRIC UTILITY SERVICE RATES IN UTAH AND FOR APPROVAL OF ITS PROPOSED ELECTRIC SERVICE SCHEDULES AND ELECTRIC SERVICE REGULATIONS	DPU EXHIBIT 11.0SR DOCKET NO. 09-035-23

Pre-filed Surrebuttal Testimony

Of

William A. Powell, PhD

On Behalf of

Utah Division of Public Utilities

November 30, 2009

Artie Powell, PhD

Surrebuttal Testimony

Division of Public Utilities

Docket No. 09-035-23

Introduction

Q: Please state your name, business address, and employment position for the record.

A: My name is William "Artie" Powell; my business address is Heber Wells Building, 160 East 300 South, Salt Lake City, Utah; I am employed by the Utah Division of Public Utilities ("Division" or "DPU"); my current position is manager of the energy section.

Q: Are you the same Dr. Powell that filed direct testimony in this proceeding?

A: Yes, I am. I filed direct testimony on behalf of the DPU on October 8, 2009.

Q: What is the purpose of your surrebuttal testimony?

A: I will address several comments to the rebuttal testimony of Company witnesses Mr. Gregory Duvall and Mr. Steven McDougal. Specifically, I will address certain comments to Mr. Duvall's rebuttal testimony on intra-hour wind integration costs ("WIC") and Mr. McDougal's rebuttal testimony on the forecasting methodology for generation overhaul expense.

Q: Would you please summarize your surrebuttal testimony, conclusions, and recommendations?

A: Yes. In his rebuttal testimony, the Company's witness Mr. Gregory Duvall maintains his original position on the costs for intra-hour WIC. Based on the un-rebutted issues raised by Division witnesses in direct testimony, the Company's rebuttal position is unreasonable. However, the Division does recognize that there are costs associated with integrating wind resources. Therefore, to arrive at a final revenue position, the Division recommends adopting a compromise position consisting of the Company's rebuttal position on inter-hour costs and Mr. Kevin Higgins' position on intra-hour costs at $1.79 and $3.02 per megawatt hour respectively. This results in an approximate adjustment on a Utah basis to the Company's rebuttal position of $3.5 million. Additionally, after reconsidering the Company's position on forecasting its generation overhaul position, the Division is adopting the Company's methodology and rebuttal position. In direct testimony, the Division made an adjustment of approximately $1.5 million to the Company's filed application. By adopting the Company's rebuttal position, the adjustment decreases to approximately $430,000. Along with other adjustments, Division witness Dr. Brill summarizes these adjustments in his surrebuttal testimony.

Wind Integration Costs

Q: In rebuttal testimony, Company witness Mr. Gregory Duvall characterizes the Division's position on intra-hour WIC. Do you agree with his characterization?

A: No. In his rebuttal testimony, Mr. Duvall states, "While the Division accepts that there are costs associated with truing up forecasts on a day-ahead and hour-

ahead basis [inter-hour costs], their position is that there are no intra-hour costs."[1] I have two objections to this statement. First, it would be more accurate to say that the Division did not challenge the Company's estimate of the inter-hour (day-ahead and hour-ahead variations) WIC of $2.08 per megawatt hour. Second, the Division's position on intra-hour WIC is that the Company did not provide reasonable or reliable support for its estimate of $4.83 per megawatt hour put forward in its application and, therefore, the Division recommended that the Commission disallow these costs.

Q: In its direct testimony, the Division did not challenge the Company's inter-hour WIC estimate. Is the Division prepared to take a position on this issue at this time?

A: Yes. In his rebuttal testimony, Mr. Duvall adopts the adjustment proposed by Mr. Philip Hayet, a witness for the Office of Consumer Services (OCS). Mr. Hayet's adjustment reduces the Company's total WIC estimate by approximately 29 cents ($0.29). Accordingly, Mr. Duvall reduces the Company's estimate of the inter-hour WIC from $2.08 to $1.79. Therefore, for purposes of this rate case only, the Division will accept the Company's rebuttal position of $1.79 per megawatt hour for the inter-hour WIC.

Q: If the Company is reducing the inter-hour WIC to $1.79 per megawatt hour, what is the implied intra-hour WIC in the Company's rebuttal position?

[1] Mr. Gregory N. Duvall, "Rebuttal Testimony of Gregory N. Duvall – Redacted," November 2009, Docket No. 09-035-23, p. 36, lines 779-781.

A: The implied intra-hour cost is the same as originally filed by the Company, $4.83 per megawatt hour.

Q: In its direct testimony, the Division recommended that the intra-hour WIC be disallowed. Is it the Division's position that there are no intra-hour WIC?

A: No. In my direct testimony, I explained that the Division's recommendation was due to the uncertainty and, thus, the unreliability of the Company's intra-hour WIC estimates.[2]

Q: To what uncertainty are you referring?

A: Mr. George Evans, a witness for the Division, and I raise several concerns with the Company's intra-hour WIC study. Concerns raised by Mr. Evans include the Company's assumption that additional reserves must always be added to integrate wind resources, without considering how offsetting variations may reduce the need for those reserves; the Company's assumption that new wind resources would perform in the exact manner as existing wind resources; and the limited data used in the Company's study.[3] Additionally, in my direct testimony, I demonstrated that the Company's underlying assumption of normality and, thus, use of a Z-score of 1.96 is not supported by statistical theory or the sample data employed in the Company's study.

[2] See my direct testimony in this docket at page 3, lines 49-52 and page 12, lines 197-202.
[3] See Mr. Evans direct testimony in this docket at pages 14-17, lines 210-269.

Q: In light of the concerns raised in direct testimony by the Division, do you believe that the Company's rebuttal position on intra-hour WIC is reasonable?

A: No. The Company did not even attempt to address any of the several substantive issues that the Division raised about the assumptions and methodology employed by the Company in deriving its intra-hour costs. Despite the fact that the Division's concerns are un-rebutted on this docket's record, the Company is maintaining its original position on intra-hour WIC, $4.83 per megawatt hour.

Q: Is it reasonable for the Commission to adjust the Company's intra-hour WIC estimate in this docket?

A: In my opinion, yes. If incorporated in the Company's WIC study, most of the concerns raised by the Division would likely reduce the Company's intra-hour WIC estimate. For example, in my direct testimony I cited independent experts who find that incorporating load variations in a WIC study significantly reduce the need for additional reserves when integrating wind resources.[4]

Q: In addition to the Division's recommendation to disallow the intra-hour costs, are there other estimates on record in this docket that the Commission could use to adjust the Company's estimate?

A: Yes. In his rebuttal testimony, Mr. Duvall indicates that the Company used in its 2007 general rate case an intra-hour WIC value of $1.16 per megawatt hour.[5] My understanding of this number is that it is for hour-ahead integration costs and

[4] See my direct testimony in this docket at pages 13-14, lines 222-229.
[5] Mr. Duvall, Direct Testimony, page 39, lines 852-854.

does not include any costs for either regulate-up or regulate-down integration costs.[6] Additionally, Mr. Kevin Higgins, a witness for the Utah Association of Energy Users ("UAE"), offers an estimate of $3.02 per megawatt hour.[7]

Q: Have you estimated an adjustment for each of these intra-hour values?

A: Yes. Assuming a $1.79 inter-hour cost, if the Commission were to adopt $1.16 as an estimate of the intra-hour costs, the adjustment would be approximately $16.2 million on a system basis or approximately $6.6 million on a Utah basis. If the Commission were to adopt Mr. Higgins' intra-hour estimate of $3.02 per megawatt hour, the adjustment would be approximately $8.6 million on a system basis or $3.5 million on a Utah basis. Each of these adjustments is relative to the Company's rebuttal position using $1.79 for the inter-hour costs and $4.83 for the intra-hour costs. In comparison, the Division's position of disallowing the intra-hour costs would result in an adjustment of approximately $21 million on a system basis or approximately $8.6 million on a Utah basis. For convenience, I summarize these adjustments in Table 1.

Q: Given the wide disparity in the adjustments, is there a possible alternative to the Division's position of disallowing the entire intra-hour costs and the Company's position of the entire cost?

[6] As defined in the Company's direct testimony in this case, the intra-hour wind integration costs are made of three components: the hour-ahead forecast error, regulate-up variation, and regulate down variation.
[7] Mr. Higgins, Direct Testimony, page 20, lines 481-483.

A: Yes. The Division recognizes that there are costs to integrating wind resources and that it may be reasonable to allow some costs for the intra-hour variation. However, given the uncertainty surrounding the Company's estimates, allowing the entire cost requested by the Company would be unreasonable. A reasonable compromise might be the average of the available intra-cost values on record in this case.

Table 1: Wind Integration Cost Adjustments

	Inter-Hour	Intra-Hour	Total WIC	Adjustment (Utah Basis)
RMP (Rebuttal)	1.79	4.83	6.62	NA
Option 1[8]	1.79	0	1.79	$8,595,066
Option 2[9]	1.79	1.16	2.95	$6,649,068
Option 3[10]	1.79	3.02	4.81	$3,528,760

The average of all four intra-hour WIC is approximately equal to $2.25 per megawatt hour. Alternatively, the average of the three non-zero numbers is approximately $3.00, which is close to the $3.02 value proposed by Mr. Higgins in rebuttal testimony. While any value in this range — between $2.25 and $3.02 — could be just as reasonable, in the interest of arriving at a final revenue

[8] This assumes $1.79 for inter-hour costs and disallowance of the intra-hour costs.
[9] Assumes $1.16 for intra-hour costs from Rocky Mountain Power's 2007 rate case, Docket No. 07-035-93.
[10] Assumes $3.02 for intra-hour costs as proposed by Mr. Higgins in rebuttal testimony. Mr. Higgins' rebuttal position on behalf of UAE recommends disallowance of the Company's inter-hour WIC .

requirement position, the Division recommends the latter approach or the average of the three non-zero values.

Adding the inter-hour and the hour values, $1.79 and $3.02 respectively yields a total WIC of $4.81 per megawatt hour. This results in a total company adjustment of approximately $8.6 million or approximately $3.5 million on a Utah basis. (See Table 1)

Forecasting Generation Overhaul Expense

Q: Responding to Ms. Brenda Salter's direct testimony, the Company's witness, Mr. Steven McDougal, provides an illustration in his rebuttal testimony, between lines 532 and 533, of escalating the four-year average versus averaging the four-year escalated amounts. Is this the same illustration provided by Mr. McDougal in his direct testimony?

A: Yes. The illustration purportedly shows the difference between two forecasting methodologies. The first approach (or Example 1) uses the average of four historical years to forecast the amount contained in the fifth year. The second approach (Example 2) first escalates the historical years to arrive at a fifth-year dollar equivalent. The average of these escalated four-years is used as the forecast for the amount in the fifth year. According to Mr. McDougal's illustration, the second methodology provides a better estimate or forecast of the fifth-year value. Indeed, in Mr. McDougal's illustration, the second methodology yields exactly the fifth-year value while the first methodology significantly underestimates the value.

However, there are two changes I would make to the illustration to characterize the differences between the Company's proposed methodology and that used by the Division.

Q: What two changes would you make to Mr. McDougal's illustration?

A: In his rebuttal testimony, Mr. McDougal implies that the first methodology of his illustration represents the Division's methodology while the second is that proposed by the Company. The first change I would make is to method one to escalate the average of the four historical years to use as an estimate of the fifth-year value. The second change I would make is to add some volatility to the historic year values.

If the first change is added to Mr. McDougal's illustration, then the forecast of the fifth-year value is 106.4 (=103.8*(1.025)).[11] This estimate or forecast is still not as accurate as that from the second methodology in Mr. McDougal's illustration, but his illustration shows no volatility in the historic years. If volatility is added to Mr. McDougal's illustration, the first methodology may actually provide the better forecast. Therefore, the second change I would make to Mr. McDougal's illustration is to add volatility to the historical values. I illustrate these points in Table 2.

[11] The average of the four historical years in Mr. McDougal's illustration is 103.8. The inflation used in the illustration is 2.5 percent. See Mr. McDougal's rebuttal testimony, p. 25, lines 528-535. For consistence, I will use the same inflation rate throughout my surrebuttal testimony.

The value to be forecast is the fifth year base value, 110.4, found in the far right column of Table 2. Under Method One, the forecast is 108.6 (row f). This forecast is derived by averaging (row e) the four historical values[12] (row d) and escalating the average (row f) using an inflation rate of 2.5 percent. The forecast error, -1.8, is the difference between the forecast and the fifth year base value (108.6 – 110.4). Using Method Two, the forecast is 112.6 (row i). Method Two's forecast is derived as the average (row h) of the escalated historical four years (row g). The escalated historical values are calculated as the historical values (row d) multiplied by the inflation factors[13] (row b). For Method Two, the forecast error is equal to 2.2 (=112.6 – 110.4). Thus, in this example, Method One's forecast is better than Method Two's.

Q: Are you saying Method One is better than Method Two for forecasting what the value would be in the test year for a rate case?

A: No, this example does not provide sufficient information to draw such a conclusion. All this example illustrates is that under certain conditions, namely the pattern of the random variates shown in Table 2, Method One may be better than Method Two. However, to draw a general conclusion about which method is better, the above experiment would need to be repeated many times.

[12] The historical values are equal to the base year values plus a random deviate. In this example, and in the experiment described herein, random deviates were drawn from a uniform distribution from the range -5 to 5. For year one, the random deviate was set to zero to begin the sequence in year with a value of 100.
[13] The inflation factors are equal to $(1 + 0.025)^{5-y}$, where y represents the year: y = 1, 2, 3, 4.

Table 2: Forecasting Methods Utilizing the Historical Average

			Year 1	Year 2	Year 3	Year 4	Year 5
(a)	(a) Base Values		100.0	102.5	105.1	107.7	110.4
(b)	(b) Inflation Factor	$(1 + 0.025)^{5-y}$	1.104	1.077	1.051	1.025	
(c)	(c) Random Variate		0.00	0.70	3.00	4.80	
	Method One						
(d)	Historical Values	a + c	100.0	103.2	108.1	112.50	
(e)	Four Year Average	Avg(d)	105.9				
(f)	Fifth Year Forecast	e*(1 + 0.025)	108.6				
	Method Two						
(g)	Escalated Historical Values	d*b	110.4	111.1	113.5	115.3	
(h)	Four Year Average	Avg(g)	112.6				
(i)	Fifth Year Forecast	h	112.6				

Q: Have you conducted the analysis you just described?

A: Yes. I repeated the comparison of the two methods described in Table 2 ten thousand (10,000) times, drawing a new set of random variates from the same distribution[14] for each replication. In fact, the example from Table 2 is the seventeenth (17^{th}) replication of the experiment. DPU Exhibit 11.1SR attached to this testimony contains the first 20 replications of this experiment; all 10,000 replications are provided in the electronic version of this exhibit.

[14] For this experiment, I drew the random variates from a uniform distribution over the range from minus five (-5) to five (5).

The results of the experiment clearly indicate that, on average, Method Two, the Company's proposed method of forecasting the generation overhaul expense, will provide a better estimate of the value being forecasted than Method One. To determine this, I calculated the average of the squared forecast errors, or mean squared error (MSE) — for each forecast method. The results show that the MSE for Method One (17.54) is approximately ten times that of Method Two (1.72).

Other statistics from the experiment support this conclusion. For example, the maximum error, in absolute terms, for Methods One and Two are 7.69 and 3.82 respectively, thus the range of errors for Method Two is less than half that of Method One. Additionally, Method One always underestimates the fifth-year value being forecasted. (See DPU Exhibit 11.1SR)

Q: Is your conclusion that Method Two is the best method to use to forecast test year values for issues like generation overhaul expense?

A: Not exactly. Other methods may provide better estimates of the test year values. For example, I didn't explore whether de-trending the historical values first and then averaging and escalating would lead to better estimates than the two methods presented herein. However, of the two methods on record in this case, the analysis described herein clearly supports Method Two over Method One.

Therefore, based on our analysis of the two forecasting methods, the Division is adopting Mr. McDougal's adjustment as presented in his rebuttal testimony.

Q: Does that conclude your surrebuttal testimony?

A: Yes, it does.