–Before the Public Service Commission of Utah–

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 7.0 DIR Docket No. 20-035-04

FOR THE DIVISION OF PUBLIC UTILITIES
DEPARTMENT OF COMMERCE
STATE OF UTAH

Direct Testimony of
Dr. William "Artie" Powell

September 2, 2020

Q: Please state your name, whom you work for, your title, and business address.

A: My name is Dr. William "Artie" Powell. I am the Director for the Division of Public Utilities (DPU or Division). My business address is 160 East 300 South, Salt Lake City, Utah, 84114.

Q: Are you testifying on behalf of the Division?

A: Yes I am.

Q: Would you please summarize your education and experience?

A: I hold a doctorate degree in economics from Texas A&M University. Prior to joining the Division, I taught courses in economics, regression analysis, and statistics both for undergraduate and graduate students. I joined the Division in 1996 and have since attended several professional courses or conferences dealing with a variety of regulatory issues including, the NARUC Annual Regulatory Studies Program (1995) and IPU Advanced Regulatory Studies Program (2005). Since joining the Division, I have testified or presented information on a variety of topics including, electric industry restructuring, incentive-based regulation, revenue decoupling, energy conservation, evaluation of alternative generation projects, cost of capital, and, among other topics, generation overhaul expense.

Q: What is the purpose of your testimony?

A: I testify on the method to estimate generation overhaul expense (GOE) for the test year. In his direct testimony, Rocky Mountain Power (RMP) witness Mr. Steve McDougal explains that RMP normalizes GOE using a four-year historical average for the years 2016 to 2019. However, prior to averaging, the four historical expense amounts are restated in 2019 dollars. The Division supports RMP's use of this method to estimate or forecast GOE and recommends the Commission approve its use.

Q: Please explain why the Division supports the use of this method for estimating GOE for the test year.

A: In past rate cases, parties have advocated one of two methods to forecast generation overhaul expense (GOE). The first method, Method 1, inflates or restates the average of four historical values. For example, if G_1, G_2, G_3, and G_4 are the historical annual GOE, then the fifth or test period GOE, G_5, is estimated as,

$$\hat{G}_5 = \frac{(1+\pi)}{4}[G_1 + G_2 + G_3 + G_4] = \frac{(1+\pi)}{4}\sum_{i=1}^{4} G_i \qquad \text{Eq. 1}$$

where π is the rate of inflation. The alternative method, Method 2, averages the restated historical values to estimate the test period value. That is,

$$\tilde{G}_5 = \frac{1}{4}[G_1(1+\pi)^4 + G_2(1+\pi)^3 + G_3(1+\pi)^2 + G_4(1+\pi)]$$

$$= \frac{1}{4}\sum_{i=1}^{4} G_i(1+\pi)^{5-i} \qquad \text{Eq. 2}$$

Of these two methods, economic and statistical (or probability) theory suggests that the Method 2, the method proposed by RMP, is on average more accurate.[1]

Q: Please explain why you say Method 2 is more accurate than Method 1.

A: I'll explain the economic and statistical considerations separately, starting with the economic considerations. Economic theory suggests that in order to compare two values separated by time, the values need to have a common monetary base: the values should be expressed in real terms, where the effects of inflation are taken into account, as

[1] A detailed explanation of the two methods and their statistical properties are provided in DPU Exhibit 7.1 DIR attached to this testimony.

opposed to nominal terms, which ignores inflation. Comparing values expressed in nominal terms can lead to erroneous conclusions. For example, suppose we bought a particular item in the year 2000, for $30; and another person bought the same item in 2010 for $50. Who paid more for the item? In a nominal sense, the second person paid more: $50 is greater than $30. However, a nominal comparison such as this ignores the effect of inflation on the purchasing power of the dollar between the two periods and can lead to erroneous conclusions. The proper comparison would take into account the effects of inflation using a price index—such as the Consumer Price Index—to either deflate the 2010 value to 2000 dollars; or, inflate the 2000 value to 2010 dollars. Suppose the price index in 2000 was 1.00 and in 2010 the price index was 1.75. Then, the $30 price paid in 2000 would be equivalent to $52.50 (=1.75*$30) in 2010. Thus, in this example, the person buying the item for $50 in 2010 actually paid less in real terms than the person paying $30 in 2000.

By inflating each of the historical GOE values to a common base year, Method 2 properly takes into account the effects of inflation before making a comparison (or forecast) for the test year.

Q: Please explain why statistical theory supports Method 2 over Method 1.

A: To explain why statistical theory supports the use of Method 2 over Method 1, we have to specify a statistical model. To demonstrate this, consider the following specification of the annual generation overhaul expense. Let the generation overhaul expense, G, be specified as,

$$G_i = H_i + \varepsilon_i \qquad \text{Eq. 3}$$

where G_i = the actual or observed generation overhaul expense for period "i"; H_i = the base or unobserved (unknown) generation overhaul expense for period "i"; ε_i = a random error (or shock) term with a mean zero and standard deviation σ_ε; and

$H_i = H_{i-1}(1 + \pi)$. On average, under this specification, Method 1 will underestimate the GOE in the test period, whereas, Method 2 will on average equal the test period value. Further details of the statistical properties for the two methods are found in DPU Exhibit 7.1 DIR.

Q: Do you have any other evidence that Method 2 is likely to provide a better estimate of the test year level of generation overhaul expense?

A: Yes. I have simulated the two estimation methods for the model previously defined. Since the simulation is relatively large—10,000 replications—I provide the full simulation only in electronic form, DPU Exhibit 7.2 DIR, as part of my pre-filed testimony. The simulation confirms the conclusions drawn from the statistical modeling, namely, Method 2 provides a better estimate of the test year value. A summary of the simulation results are in Table 1.

Table 1: Simulation Results (10,000 Replications)

	Average Estimate	Minimum	Maximum	RMSE[2]	Under Estimated	Percent Under Estimated
Method 1	1,078	987	1,166	56	9,496	94.96%
Method 2	1,126	1,031	1,218	31	5,046	50.46%

To perform the simulation I chose a value for year 1's base or unobserved value, H_1, of 1,000 and an inflation rate of three percent (3%). Given the model specified herein, these assumptions yield a fifth year base value, H_5, of 1,126, which is the value to estimate using the first four values. To generate the observed values, G_i, for the four historic years, I used the RAND() function in EXCEL© to generate random deviates, which were

[2] The root mean squared error, RMSE, is a common statistical measure of the accuracy or precision of an estimator and is defined as the square root of the average squared deviations of the estimates around the true value being estimated. The smaller the RMSE the more accurate the estimate, that is, the smaller is the variation of the estimate around the true value. Any basic statistics book can be consulted for information. One online source is found at https://towardsdatascience.com/what-does-rmse-really-mean-806b65f2e48e.

added to the four historic values. Under these conditions, Method 1 underestimates the fifth year value approximately 95% of the time; whereas, Method 2, underestimates the fifth year value as expected approximately 50% of the time (see Table 1). The root mean squared error, RMSE, of the estimates from the two methods also indicate that Method 2 provides a better estimate on average—the RMSE for Method 1 is approximately two times as large (1.8 = 56/31) as the RMSE for Method 2.

Q: Do you have any final comments?

A: Yes. I agree with Mr. McDougal that "the purpose of averaging is to adjust for uneven costs, and that without the restatement to constant dollars in the average calculation, overhaul expenses reflected in rates will be systematically understated." (Lines 503-506) As demonstrated in my testimony, this conclusion is supported by both economic and statistical theory. Ignoring inflation can lead to erroneous economic or financial decisions and statistical theory shows that averaging before escalating GOE will systematical underestimate the test year value. Therefore, the Division recommends the Commission approve RMP's proposed method for estimating GOE for the test year.

Q: Does that conclude your direct testimony?

A: Yes it does.