EXH. RAM-12T
DOCKETS UE-190529/UG-190530
UE-190274/UG-190275
2019 PSE GENERAL RATE CASE
WITNESS: DR. ROGER A. MORIN

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-190529** **Docket UG-190530 (*Consolidated*)**
In the Matter of the Petition of **PUGET SOUND ENERGY** **For an Order Authorizing Deferral Accounting and Ratemaking Treatment for Short-life IT/Technology Investment**	**Docket UE-190274** **Docket UG-190275 (*Consolidated*)**

PREFILED REBUTTAL TESTIMONY (NONCONFIDENTIAL) OF

ROGER A. MORIN

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 15, 2019

PUGET SOUND ENERGY

PREFILED REBUTTAL TESTIMONY (NONCONFIDENTIAL) OF DR. ROGER A. MORIN

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LIST OF EXHIBITS

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Exh. RAM-14	Updated Combination Electric & Gas Utilities – DCF Analysis Value Line
Exh. RAM-15	Updated Combination Electric & Gas Utilities – DCF Analysis Analysts' Growth Forecasts
Exh. RAM-16	Updated Combination Electric & Gas Utilities – Beta Estimates
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I. INTRODUCTION

Q. Are you the same Dr. Roger A. Morin who submitted pre-filed direct testimony on behalf of Puget Sound Energy in this proceeding?

A. Yes. On June 20, 2019, I filed the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T, and supporting exhibits thereto, Exh. RAM-2 through Exh. RAM-10, on behalf of Puget Sound Energy ("PSE"). On August 22, 2019, I submitted a revised Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1Tr, and a revised Fifth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-6r.

Q. What is the purpose of your rebuttal testimony?

A. This rebuttal testimony responds to each of the following cost of capital testimonies:

(i) the Prefiled Direct Testimony of Dr. J. Randall Wooldridge, Exh. JRW-1T, on behalf of the Washington State Office of Attorney General Public Counsel ("Public Counsel"), and

(ii) the Prefiled Testimony of David C. Parcell, Exh. DCP-1T, on behalf of the Staff of Washington Utilities and Transportation Commission ("Commission Staff").

Finally, this prefiled rebuttal testimony provides an updated recommendation of 9.5 percent in view of appreciable changes that have occurred in capital market

conditions since the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T, was filed on June 20, 2019.

Q. What return on common equity are these witnesses recommending for PSE?

A. The return on common equity recommendations for PSE from the two witnesses are as follows:

Mr. Parcell	9.20 percent
Dr. Woolridge	8.75 percent

The upper end (9.5 percent) of Mr. Parcell's range of results is identical to my own return on equity recommendation (9.5 percent) adopted by PSE in this rebuttal testimony. This rebuttal testimony addresses infirmities in Mr. Parcell's results that, when corrected, would increase his range of reasonableness to between 9.0 and 10.0 percent, which encompasses my own return on equity recommendation of 9.5 percent.

Dr. Woolridge's return on equity recommendation of 8.75 percent (upper end of a range of 6.90 - 8.95 percent), however, is more extreme, is outside reasonable limits of probability, and contains numerous flaws and contradictions. Therefore, the majority of this rebuttal testimony addresses Dr. Woolridge's testimony and methodologies.

II. REBUTTAL OF DR. WOOLRIDGE

Q. Please summarize Dr. Woolridge's return on equity recommendation.

A. Dr. Woolridge recommends a return on equity for PSE of only 8.75 percent, the upper end of a range of 6.90 – 8.95 percent.[1]

In determining a proposed return on equity, Dr. Woolridge applies a Discounted Cash Flow ("DCF") analysis to three proxy groups of utilities:

(i) a proxy group of thirty electric utilities,[2] from which Dr. Woolridge produces a return on equity of 8.45 percent;[3]

(ii) my proxy group of utilities from the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1Tr,[4] from which Dr. Woolridge produces a return on equity of 8.35 percent;[5] and

(iii) a small proxy group of nine natural gas utilities,[6] from which Dr. Woolridge produces a return on equity of 8.95 percent.[7]

Dr. Woolridge also performs a Capital Asset Pricing Model ("CAPM") analysis, although he does not rely on the results of this analysis despite devoting several pages of his testimony to the CAPM and its proper inputs. Dr. Wooldridge's CAPM analysis produces (i) 6.90 percent for his proxy group of thirty electric

1 *See* Woolridge, Exh. JRW-1T, at 52 :2-5.
2 *See id*. at 12:1-18.
3 *See id*. at 38:17 – 39:1.
4 *See id*. at 12:19 – 13:6.
5 *See id*. at 39:1-3.
6 *See id*. at 13:7-17.
7 *See id*. at 39:3-6.

utilities,[8] (ii) 6.90 percent for my proxy group of utilities,[9] and (iii) 7.50 percent for the small proxy group of nine natural gas utilities.[10]

From these analyses, Dr. Woolridge proposes that an appropriate equity cost rate for companies in the electric proxy group and my proxy group is in a range of between 6.90 percent and 8.95 percent.[11] (Dr. Woolridge does not appear to rely on the results of the analyses for the small proxy group of nine natural gas utilities.)

Dr. Woolridge concludes that PSE's return on equity is only 8.75 percent, the upper end of a range of 6.90 – 8.95 percent.[12]

Q. What is your general reaction to Dr. Woolridge's return on equity recommendation?

A. Before engaging in a more technical critique of Dr. Woolridge's testimony, my general reaction is that Dr. Woolridge's testimony contains three major infirmities.

[8] *See* Woolridge, Exh. JRW-1T, at 51:4-6.
[9] *See id*.
[10] *See id*. at 51:6-8.
[11] *See id*. at 52:2-3.
[12] *See id*. at 52:3-5.

First, Dr. Woolridge's recommended return on equity for PSE of only 8.75 percent lies well outside the zone of reasonableness and outside the zone of currently allowed returns on equity authorized by state utility commissions in 2018 and 2019, which averages 9.6 percent.[13] If adopted by the Commission, Dr. Woolridge's recommended return on equity would result in PSE having one of the lowest, if not the lowest, allowed return on equity for any investor-owned utility in the country. Moreover, Dr. Woolridge's recommended return on equity lies well below the zone of the allowed and expected returns on equity of his own proxy groups of utilities. None of the utilities in Dr. Woolridge's proxy groups of comparable electric utilities has an allowed return on equity near or below his recommended 8.75 percent for PSE. There would likely be adverse consequences to PSE's credit ratings, financial integrity, and ability to raise capital if the Commission were to adopt Dr. Woolridge's recommendation, and these adverse consequences would eventually harm PSE's customers over time. These facts provide clear proof that Dr. Woolridge's return on equity recommendation for PSE is far too low.

Second, Dr. Woolridge's recommended return on equity of 8.75 percent for PSE rests exclusively on results derived from questionable inputs and methodologies selected for his DCF analyses. Additionally, Dr. Woolridge's CAPM analysis, on which he places little, if any, weight, is flawed, as discussed below.

[13] *See* Regulatory Research Associates, *RRA Regulatory Focus Major Rate Case Decisions – January-September 2019* (S&P Global Market Intelligence Oct. 17, 2019).

Third, Dr. Woolridge's final choice of DCF growth rates—the crux of his recommendation—is arbitrary, contradictory, and inconsistent with several statements in his testimony.

Q. Is Dr. Woolridge's low recommended return on equity for PSE appropriate at this time?

A. No. If adopted, Dr. Woolridge's recommended return on equity for PSE of only 8.75 percent would be among the lowest, if not the lowest, allowed return on equity for an investor-owned utility in the country. This recommendation is untimely and contrary to customers' best interests. PSE's management is committed to maintaining an investment grade creditworthiness so that it will be able to provide reliable and reasonably-priced energy service. Approval of a return on equity for PSE of 9.5 percent would buttress these goals and provide benefits to PSE customers.

Q. Why is maintenance of an investment grade credit rating important to PSE and its customers?

A. Maintaining an investment-grade bond rating will have beneficial long-term cost implications for PSE and its customers as PSE refinances existing debt, issues new capital, and enters into new contractual arrangements. PSE's customers have a vested interest in a strong financial position for the utility, and the interests of customers and shareholders are aligned and are not mutually exclusive. Both benefit from a financially sound utility, and Dr. Woolridge's low recommended

return on equity for PSE, if granted, would be detrimental to the maintenance of an investment-grade goal and contrary to customers' interests.

Q. What are the basic conclusions of your rebuttal to Dr. Woolridge's return on equity testimony?

A. Dr. Woolridge's return on equity recommendation of 8.75 percent rests entirely on arbitrary DCF growth rates that have been plucked out of thin air and should be given little, if any, weight in the Commission's considerations.

Q. Do you have any other general comment on Dr. Woolridge's testimony?

A. Yes, I do. Dr. Woolridge is quite inconsistent on the use of the median value rather than the mean value when computing averages of the various data sets. Throughout his testimony, Dr. Woolridge sometimes chooses the mean, sometimes the median, sometimes both. For example, Dr. Woolridge reports both mean and median results on page 1 of Exh. JRW-4, but he only reports mean results on page 2 of the same exhibit. On page 4 of Exh. JRW-7, Dr. Woolridge reports mean results, but on pages 5 and 6 of Exh. JRW-10, he reports medians. On page 2 of Exh. JRW-11, the column heading is the mean, but Dr. Woolridge reports both the mean and the median, whereas on page 3 of the same exhibit, he reports only the mean.

Dr. Woolridge inappropriately uses median results as measures of central tendency when estimating the cost of capital. The median is defined as the *single* number in a series of numbers that divides the highest half of the numbers from

the lowest half of the numbers in the series. For example, if you had a series of numbers 8, 9, 10, 11, 12, the median of that series would be 10 because there are two values greater than 10 and two that are less than 10. The mean (simple average) of that same series is also 10. However, consider the following series of numbers: 8, 9, 10, 13, 15. The median of this series remains 10, but the mean is now 11. The median discards all information contained in the data series except one number.

Q. How do you respond to suggestions that use of the median attenuates the impact of outliers?

A. Proponents of using the median argue that use of the median attenuates the impact of outliers. In return on equity calculations, however, it is impossible to know *a priori* what values, if any, are outliers. Therefore, it is preferable to use all the values in a data series (which the mean does) instead of relying on a single number (which the median does). In short, Dr. Woolridge should have consistently relied on means rather than medians. It may be that Dr. Woolridge's arbitrary use of median and mean values is somewhat result-oriented because median values may result in lower estimates of central tendency.

Q. Do you have any other general comment on Dr. Woolridge's testimony?

A. Yes, I do. While PSE is a combination gas and electric utility, Dr. Woolridge's primary group of thirty electric utilities contains twelve utilities that have electric operations only, and is therefore inadequate.

Q. Please summarize your specific criticisms of Dr. Woolridge's return on equity testimony.

A. On technical and methodological grounds, I have eight specific criticisms regarding Dr. Woolridge's return on equity testimony:

1. **Return Recommendation Well Out of The Mainstream.** Dr. Woolridge's recommended return is outside the zone of currently allowed rates of return for electric utilities in the United States and for his own primary sample of electric utilities. The average allowed return on equity authorized by state utility commissions for vertically-integrated electric utilities in 2018 is 9.7 percent[14] and 9.6 percent as of September 30, 2019.[15] As shown on the Third Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-13, the currently allowed return on equity for Dr. Woolridge's own proxy group of electric utilities averages 9.9 percent, and Value Line estimates expected average returns on equity of 10.5 percent. These allowed and expected returns on equity exceed Dr. Woolridge's low recommended return on equity for PSE of 8.75 percent by a significant margin.

2. **Understated Dividend Yield.** Dr. Woolridge's dividend yield component is understated because it is not consistent with the annual form of the DCF model. It is inappropriate to increase the dividend yield by adding one-half the future growth rate to the spot dividend yield. The appropriate manner of computing the expected dividend yield when using the plain vanilla annual DCF model is to add the full growth rate rather than one-half the growth rate. This adjustment also allows for the failure of the annual DCF model to allow for the quarterly timing of dividend payments. In short, Dr. Woolridge's DCF results are understated by approximately 10 basis points (i.e., 0.1 percent) alone related to this single flaw.

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[14] *See RRA Regulatory Focus Major Rate Case Decisions – January-September 2019*, footnote 13, *infra*.

[15] *See id*. As of January 15, 2020, Regulatory Research Associates has not yet published an update that includes results of returns on equity authorized by state utility commissions for vertically-integrated electric utilities in the fourth quarter of 2020.

3. **DCF Historical Growth Rates.** Dr. Woolridge examines thirteen growth proxies for the growth component of the DCF model, six of which are historical growth rates in earnings, dividends, and book value, despite substantial changes occurring in the energy utility industry that have made historical data questionable. Moreover, historical growth rates are somewhat redundant since historical growth patterns are already reflected in analysts' growth forecasts, which he also uses and ends up relying upon exclusively in his DCF estimates. Finally, the stock price Dr. Woolridge uses in his DCF analysis is predicated on analysts' growth forecasts and not on historical growth rates.

4. **Sustainable Growth Methodology.** The sustainable growth methodology employed by Dr. Woolridge for estimating the growth component in the DCF formula is logically inconsistent because one is forced to assume the answer to implement the method. Moreover, Dr. Woolridge's sustainable growth methodology fails to account for external stock financing.

5. **Analysts' Growth Forecasts**. Dr. Woolridge decries the use of analysts' growth forecasts and criticizes my use of such forecasts. Yet, inexplicably, Dr. Woolridge ends up relying exclusively on such forecasts in deriving his DCF growth rates and final recommendation.

6. **CAPM Market Risk Premium.** Dr. Woolridge's estimate of the market risk premium for his CAPM analyses is too low because: (i) he has erroneously included the results of studies that employ geometric means instead of the correct arithmetic means; (ii) he arbitrary selects the literature on which he relies; and (iii) he has misrepresented the literature on the subject.

7. **CAPM and the Empirical CAPM.** The plain vanilla version of the CAPM used by Dr. Woolridge understates returns of equity for low-beta securities, such as PSE.

8. **Unfounded criticisms**. Dr. Woolridge's criticisms of my direct testimony are unfounded.

The remainder of this Section II discusses each criticism of Dr. Woolridge's testimony in turn.

A. Dr. Woolridge's Recommended Return on Equity for PSE is Outside the Mainstream for Electric and Combination Electric and Gas Utilities

Q. Are allowed returns on equity of electric and combination electric and gas utilities important determinants of investor growth perceptions and investor expected returns?

A. Yes. Allowed returns, while certainly not a precise indication of a company's cost of equity capital, are nevertheless important determinants of investor growth perceptions and investor expected returns. They also serve to provide some perspective on the validity and reasonableness of Dr. Woolridge's recommendation.

Data collected by Regulatory Research Associates suggest that the average allowed return on equity allowed by state regulatory agencies for vertically-integrated utilities was (i) 9.7 percent for calendar year 2018[16] and (ii) 9.6 percent for the first three calendar quarters of 2019.[17]

Moreover, as shown in the First Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-13, the average allowed return on equity for the electric utilities in Dr. Woolridge's proxy group of thirty electric utilities is

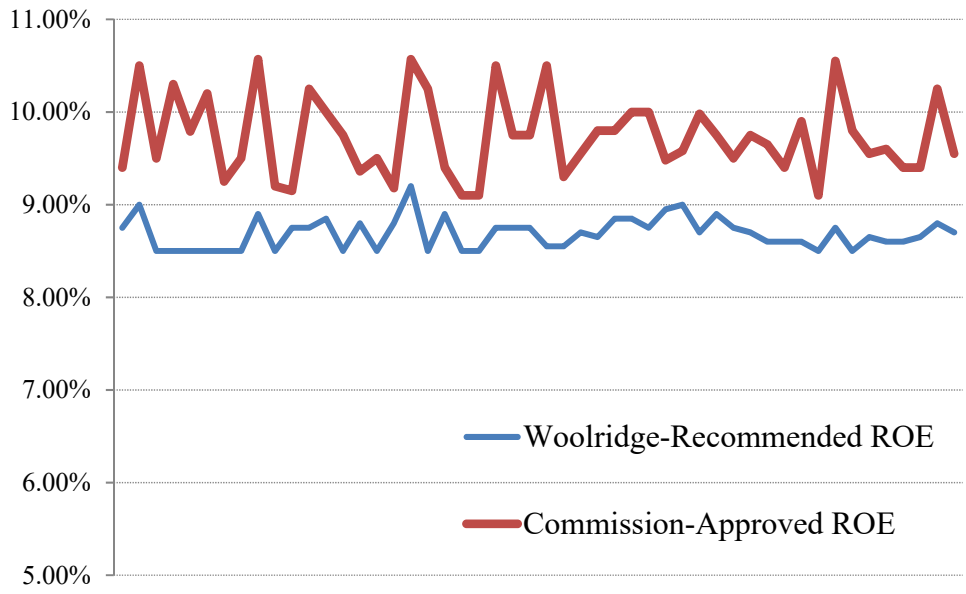
[16] *See RRA Regulatory Focus Major Rate Case Decisions – January-September 2019*, footnote 13, *infra*.

[17] *See id*.

9.9 percent, and the average expected return on equity for these same electric utilities is 10.5 percent.

These allowed and expected returns on equity substantially exceed Dr. Woolridge's recommended return on equity for PSE of only 8.75 percent. Indeed, Dr. Woolridge's recommended returns on equity consistently understate the returns on equity by state utility commissions by at least 100 basis points (i.e., 1 percent), as shown on Figure 1 below.

Figure 1. Dr. Woolridge's Consistent Understatement of Utility Returns on Equity



Adjustment of Dr. Woolridge's consistent understatement would (i) raise the top end of this range from 8.95 percent to 9.95 percent and (ii) increase his recommended return on equity for PSE from 8.75 percent to 9.75 percent. This adjusted return on equity of 9.75 percent is between the return on equity of 9.5 percent proposed in this rebuttal testimony (and adopted by PSE in this

proceeding) and the return on equity of 9.8 percent proposed in the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T.

In short, Dr. Woolridge's recommendation is well outside the mainstream of the allowed rates of return that were current during the period in which Dr. Woolridge performed his analysis and lies outside the zone of recently authorized returns for electric and natural gas utilities and for Dr. Woolridge's own sample of companies.

B. Dr. Woolridge's DCF Results Should be Given Very Little, If Any, Weight Because Dr. Woolridge Has Relied on Erroneous Data Inputs

1. Dr. Woolridge Understates Dividend Yield by Using a Spot Dividend Yield Inflated By One-Half of the Expected Dividend Growth

Q. Does Dr. Woolridge's use an appropriate dividend yield component in his DCF analyses?

A. No. Dr. Woolridge uses an inappropriate dividend yield calculation in his DCF analyses because he multiplied the spot dividend yield by one plus one half the expected growth rate $(1 + 0.5g)$[18] rather than the conventional one plus the expected growth rate $(1 + g)$. This procedure understates the return expected by the investor.

[18] *See* Woolridge, Exh. JRW-1T, at 30:10-14.

Q. Why is Dr. Woolridge's adjustment to the dividend yield component in his DCF analyses inappropriate?

A. The fundamental assumption of the plain vanilla annual DCF model used by Dr. Woolridge is that dividends are received annually at the end of each year and that the first dividend is to be received one year from now. Thus, the appropriate dividend to use in a DCF model is the full prospective dividend (i.e., 1 + g) to be received at the end of the year.

Dr. Woolridge calculates the first dividend by multiplying the current dividend by only one plus one-half the growth rate (i.e., 1 + 0.5g) instead of multiplying by one plus the growth rate.[19] Since the appropriate dividend to use in a DCF model is the prospective dividend one year from now rather than the dividend one-half year from now, Dr. Woolridge's approach understates the proper dividend yield.

Use of this adjustment factor creates a downward bias in Dr. Woolridge's dividend yield component, and underestimates the cost of equity. For example, for a spot dividend yield of 4 percent and a growth rate of 5 percent, Dr. Woolridge's estimated dividend yield is 4.1 percent,[20] whereas the correct dividend yield to employ is 4.2 percent,[21] which is 10 basis points higher.

[19] *See* Woolridge, Exh. JRW-1T, at 30:10-14.

[20] 4% × (1 + (0.05 × 0.5) = 4.1%.

[21] 4% × (1 + .05) = 4.2%.

Q. Is Dr. Woolridge's claim that his dividend yield input reflects the quarterly nature of dividend payments correctly?

A. No, it is not. Dr. Woolridge claims that multiplying the dividend yield by (1 + 0.5g) accounts for the quarterly nature of dividend payments.[22] This is incorrect. The basic annual DCF model ignores the time value of quarterly dividend payments and assumes dividends are paid once a year at the end of the year. Multiplying the spot dividend yield by (1 + 0.5g) does not account for the reality of quarterly dividend payments and understates the expected return on equity.

If Dr. Woolridge wanted to allow for the quarterly nature of dividend payments, he should have relied on the correct quarterly version of the DCF model. The quarterly version of the DCF model actually looks like this:[23]

$$K = \frac{[d_1(1+K)^{3/4} + d_2(1+K)^{1/2} + d_3(1+K)^{1/4} + d_4]}{P_0} + g$$

Where: d_1, d_2, d_3, d_4 = quarterly dividends expected over the coming year
g = expected growth in dividends
P_0 = current stock price
K = required return on equity

[22] *See* Woolridge, Exh. JRW-1T, at 30:1-2.

[23] *See* Dr. Roger A. Morin, *New Regulatory Finance* appx. 11A (Public Utilities Reports, Inc. 2006).

2. Dr. Woolridge Erroneously Relies on Historical Growth Rates in His DCF Analysis

Q. What growth rates did Dr. Woolridge employ in his DCF analyses?

A. Dr. Woolridge employs a veritable smorgasbord of twelve growth rates as proxies for the DCF growth component for each of his three peer groups.[24]

For example, Table 1 below provides the twelve growth rates used by Dr. Woolridge for his DCF analyses for his proxy group of thirty electric utilities.

Table 1. Dr. Woolridge's DCF Growth Rates for His Proxy Group of Thirty Electric Utilities[25]

1	10-yr historical Earnings	3.4%
2	10-yr historical Dividend	5.4%
3	10-yr historical Book Value	3.9%
4	5-yr historical Earnings	3.0%
5	5-yr historical Dividend	5.2%
6	5-yr historical Book Value	3.3%
7	Value Line Projected earnings	5.5%
8	Value Line Projected dividend	5.2%
9	Value Line projected Book Value	4.6%
10	Value Line Internal Growth	3.7%
11	Yahoo analysts' forecasts	4.0%
12	Zacks analysts' forecasts	5.4%
	MEDIAN	**4.4%**

[24] *See generally* Woolridge, Exh. JRW-1T, at 30:15 – 36:20.

[25] *See* Woolridge, Exh. JRW-9, at 3-5.

Q. Does Dr. Woolridge rely on historical growth rates in his DCF analyses?

A. It is unclear whether Dr. Woolridge relies on historical growth rates in his DCF analyses. The first six of the twelve growth rates calculated by Dr. Woolridge and provided in Table 1 above are historical growth rates.

Although Dr. Woolridge reports historical growth rates for his proxy group of thirty electric utilities that range from 3.0 percent to 5.4 percent, Dr. Woolridge uses a growth rate of 5.25 percent for his electric proxy group as shown on his Table 3[26] and replicated below

DCF-Derived Equity Cost Rate/ROE

	Dividend Yield	1 + ½ Growth Adjustment	DCF Growth Rate	Equity Cost Rate
Electric Proxy Group	3.10%	1.02625	5.25%	8.45%
Morin Proxy Group	2.90%	1.02687	5.38%	8.35%
Gas Proxy Group	2.60%	1.03125	6.25%	8.95%

Therefore, it is difficult to discern to what extent he places reliance, if any, on historical growth rates. To the extent that Dr. Woolridge did rely on historical growth rates, he did so in error. Moreover, I was unable to replicate how Dr. Woolridge arrived at his growth rate of 5.25 percent from his range of growth rates of 3.0 percent to 5.4 percent for his proxy group of thirty electric utilities.

[26] *See* Woolridge, Exh. JRW-1T, at 38:Table 3.

Under circumstances of stability, it is reasonable to assume that historical growth rates in dividends and earnings influence investors' assessment of the long-run growth rate of future dividends and earnings

Q. Is it reasonable to assume that historical growth rates in dividends and earnings influence investors' assessment of the long-run growth rate of future dividends and earnings?

A. Under circumstances of stability, it is reasonable to assume that historical growth rates in dividends and earnings influence investors' assessment of the long-run growth rate of future dividends and earnings. However, because of substantial changes in the energy industry, historical growth rates have little relevance as proxies for future long-term growth.

Historical growth rates are downward-biased by the sluggish earnings performance in the last few decades, due to the structural transformation of the energy utility business from a regulated monopoly to a more competitive environment. Moreover, historical growth rates are largely redundant because such historical growth patterns are already incorporated in analysts' growth forecasts that should be used in the DCF model.

One would expect that averages of analysts' earnings growth forecasts, such as those contained in IBES, First Call, Reuters, or Zacks, are more reliable estimates of the investors' consensus expectations than either historical growth rates or one particular firm's dividend growth forecast. As discussed in the Prefiled Direct

Testimony of Dr. Roger A. Morin, Exh. RAM-1Tr, and in this rebuttal testimony, the empirical finance literature has demonstrated that consensus analysts' growth forecasts (i) are reflected in stock prices, (ii) possess a high explanatory power of equity values, and (iii) are used by investors.

Moreover, it is necessary to use earnings forecasts rather than dividend forecasts because of the extreme scarcity of dividend forecasts compared to the availability of earnings forecasts. Given the paucity of dividend forecasts, use of dividend forecasts produces unreliable DCF results.

Finally, it is curious that Dr. Woolridge devotes considerable testimony in denouncing the use of historical data when estimating the market risk premium component of the CAPM and argues why historical market risk premia are irrelevant for estimating future market risk premia,[27] yet is willing to incorporate no less than six historical growth proxies into his DCF analyses. Nowhere does Dr. Woolridge explain this inconsistency.

Q. What do you conclude from Dr. Woolridge's use of historical growth rates?

A. The Commission should reject historical growth rates as proxies for expected growth in the DCF calculation. In fairness to Dr. Woolridge, however, Dr. Woolridge states that he gave primary weight to the projected earnings per share growth rates of Wall Street analysts in using a growth rate of 5.25 percent

[27] *See*, *e.g.*, Woolridge, Exh. JRW-1T, at 43:11 – 45:3.

for his proxy group of thirty electric utilities,[28] despite his condemnation of such forecasts throughout his testimony. Therefore, it is not clear from his testimony to what extent, if any, Dr. Woolridge relied on historical growth rates in deriving his DCF estimates

3. Dr. Woolridge Inappropriately Relies on the Sustainable Growth Methodology in the DCF Analysis Whereby He is Forced to Assume the Answer to Implement the Methodology

Q. Please comment on Dr. Woolridge's sustainable growth estimate in the DCF model.

A. In order to estimate the growth component of the DCF model, Dr. Woolridge relies partially on the so-called "sustainable growth" method, sometimes referred to as the "internal growth" approach,[29] where the growth rate is based on the following equation:

$$g = b \times r$$

Where: b = the percentage of earnings retained
r = the expected rate of return on book equity.

Dr. Woolridge's use of the sustainable growth technique is erroneous for the following five reasons:

(i) the sustainable growth methodology fails to account for the impact of external stock financing on growth, thus understating growth rates;

(ii) the sustainable growth methodology is logically circular because it requires an estimate of the expected rate of

[28] *See* Woolridge, Exh. JRW-1T, at 37:11-14.

[29] *See*, *e.g.*, *id.* at 32:6-12.

return on equity to estimate the cost of equity using the DCF model;

(iii) the sustainable growth methodology is inconsistent with the academic empirical evidence;

(iv) the potential lack of representativeness of Value Line's forecasts as proxies for the market consensus; and

(v) the analysis contains a technical error.

Q. Does Dr. Woolridge's sustainable growth methodology account for external stock financing?

A. No. Dr. Woolridge's sustainable growth methodology fails to account for external stock financing. Utilities engage in two kinds of operations: (i) internal investment decisions on which utilities earn the rate of return 'r', and (ii) external financing activities on which utilities earn the rate of return 's'. Therefore, if a utility is expected to finance stock at the rate 's', the growth component should reflect book value per share results from both types of operations, a reflected in the following formula:

$$g = (b \times r) + (s \times v)$$

Where: b = the percentage of earnings retained
r = the expected rate of return on book equity
s = funds raised from the sale of stock as a fraction of existing common equity
v = fraction of the funds raised from sale of stock that accrues to shareholders at the start of the period

Dr. Woolridge's sustainable growth methodology (i.e., b × r) fails to recognize growth stemming from external stock financing (i.e., s × v). The expectation of continuous stock financing at the rate 's' changes the expected rate of growth

from (b × r) to (b × r) + (s × v). By omitting the latter component of growth, Dr. Woolridge understates the growth of his three proxy groups from this particular method.

Q. Is the sustainable growth methodology used by Dr. Woolridge logically consistent?

A. No. Dr. Woolridge's sustainable growth methodology is not logically consistent and contains a logical contradiction. The contradiction arises because the method requires an explicit assumption on the return on equity expected from the retained earnings that produce future growth.

Dr. Woolridge bases his return on equity estimate on Value Line's forecast returns on equity for the 2022-2024 period.[30] However, the returns on equity used by Dr. Woolridge in calculating the sustainable growth rate do not match Dr. Woolridge's own return on equity recommendation.

For his first group of electric utilities, the average and median expected return on equity of 10.2 percent and 10.0 percent used in Dr. Woolridge's sustainable growth computation[31] substantially exceeds Dr. Woolridge's recommended 8.75 percent. Dr. Woolridge's analysis thus assumes that the earned returns on equity of the electric utilities in his proxy group would exceed, in perpetuity, what Dr. Wooldridge has determined to be their returns on equity. In other words,

[30] *See* Woolridge, Exh. JRW-12, at 4 (column titled "*Value Line* Sustainable Growth Return on Equity").

[31] *See id*. (column titled "*Value Line* Sustainable Growth Return on Equity").

Dr. Woolridge is assuming that these electric utilities will earn actual returns on equity that are higher than the allowed returns on equity authorized by state utility regulators and reflected in rates.

Although the scenario implicit in Dr. Woolridge's sustainable growth method may be imaginable for an unregulated company, it is implausible to assume for a regulated company whose rates are continually re-set by state utility regulators at a level designed to permit the utility to earn a return equal to its cost of capital. The only way that the electric utilities in Dr. Woolridge's proxy group could plausibly earn returns on equity in a range between 10.0 and 10.2 percent is if state regulators set rates based on allowed returns of equity of between 10.0 and 10.2 percent. The only logical conclusion to be drawn from the data in Dr. Woolridge's sustainable growth analysis is that the allowed returns on equity for the electric utilities in Dr. Woolridge's proxy group are within the range of between 10.0 and 10.2 percent.

The logical flaw discussed above compromises the integrity of Dr. Woolridge's sustainable growth methodology, and this flaw should be a sufficient basis for rejecting the results produced by this methodology. In essence, by using an assumed return on equity as an input for a formula to calculate a different return on equity, Dr. Woolridge would require the Commission to make two inconsistent findings regarding the appropriate return on equity for PSE. It is perplexing how Dr. Woolridge would assume that his proxy group of comparable electric utilities

would be expected to earn between 10.0 and 10.2 percent forever, but Dr. Woolridge recommends a return of equity of only 8.75 percent for PSE.

Q. Is the sustainable growth methodology used by Dr. Woolridge consistent with empirical evidence?

A. No. The third difficulty with the sustainable growth methodology is that the empirical finance literature demonstrates this particular method of determining growth (i) is a very poor explanatory variable of market value and (ii) is not as significantly correlated to measures of value, such as stock price and price/earnings ratios.

Q. Are the return on equity and retention ratio forecasts reported by Value Line representative of the market consensus?

A. No. The fourth difficulty with Dr. Woolridge's internal growth rates is that exclusive reliance on Value Line forecasts of returns on equity and retention ratios runs the risk that such forecasts are not representative of investors' consensus forecast.

Q. Please discuss the fifth problem with Dr. Woolridge's sustainable growth methodology estimates.

A. The fifth difficulty with Dr. Woolridge's sustainable growth methodology is that the forecasts of the expected return on equity published by Value Line are based on end-of-period book equity rather than on average book equity. The following

formula adjusts the reported end-of-year values so that they are based on average common equity, which is the common regulatory practice:[32]

$$r_a = r_t \frac{2B_t}{B_t + B_{t-1}}$$

Where: r_a = return on average equity
r_t = return on year-end equity as reported
B_t = reported year-end book equity of the current year
B_{t-1} = reported year-end book equity of the previous year

The result of this error is that Dr. Woolridge's DCF estimates are understated by some 10-20 basis points (i.e., 0.1 to 0.2 percent), depending on the magnitude of the book value growth rate.

Q. What do you conclude from Dr. Woolridge's use of sustainable growth rates?

A. The Commission should reject sustainable growth rates as proxies for expected growth in the DCF calculation. In fairness to Dr. Woolridge, however, it is not clear from his testimony to what extent, if any, he relied on sustainable growth rates in deriving his DCF estimates. Indeed, Dr. Woolridge's sustainable growth rate of 3.7 percent for his proxy group of electric utilities is substantially lower than Dr. Woolridge's final choice of growth rate of 5.25 percent for the same proxy group. The same is true for Dr. Woolridge's other two proxy groups of

[32] *See* Dr. Roger A. Morin, *New Regulatory Finance* ch. 9 (Public Utilities Reports, Inc. 2006).

utilities. As previously mentioned, Dr. Woolridge gives primary weight to the projected earnings per share growth rates of Wall Street analysts in his DCF results,[33] despite his condemnation of such forecasts.

4. Dr. Woolridge Uses an Ambiguous and Arbitrary Growth Rates in His DCF Analyses

Q. Please comment on Dr. Woolridge's growth proxies.

A. As previously shown on Table 1, the average of the twelve growth rates used by Dr. Woolridge for the electric utilities in his proxy group is 4.4 percent. Dr. Woolridge's recommended growth rate for his proxy group of thirty electric utilities, however, is 5.25 percent.[34] It is not clear as to why Dr. Woolridge chose 5.25 percent as the recommended growth rate when nine of the twelve growth rates reported by Dr. Woolridge for his electric utility proxy group are significantly less than 5.25 percent, as shown on Table 3[35] of his testimony.

The same is true for Dr. Woolridge other two proxy groups. Table 2 replicates the growth rates for his three proxy groups of utilities, and adds Dr. Woolridge's recommended growth rates for each of the proxy groups at the bottom of the table.

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[33] *See* Woolridge, Exh. JRW-1T, at 37:11-14.

[34] *See id.* at 37:8-14.

[35] *See id.* at 38:Table 3.

Table 2. Dr. Woolridge DCF Growth Rate Indicators[36]

Growth Rate Indicator	Electric Group	Morin Group	Gas Group
Historic Value Line Growth in Earnings Per Share, Dividends Per Share, and Book Value of Equity Per Share	4.3%	4.9%	5.4%
Projected Value Line Growth in Earnings Per Share, Dividends Per Share, and Book Value of Equity Per Share	4.8%	5.1%	5.4%
Sustainable Growth Return on Equity × Retention Rate	3.9%	4.2%	4.2%
Projected Earnings per Share Growth from Yahoo, Zacks, and Reuters - Mean/Median	4.5%/5.4%	5.5%/5.6%	6.1%/6.5%
Woolridge Final Choice of Growth Rates	**5.25%**	**5.5%**	**6.0%**

As is evident from Table 2, there is little, if any, connection between the estimated growth rates and Dr. Woolridge final recommended growth rate for each proxy group shown on the last row of Table 2. For example, for the proxy group of electric utilities, the estimated growth rates are 4.3 percent, 4.8 percent, 3.9 percent, and between 4.5 and 5.4 percent from the various growth rate indicators. From these four indicators, Dr. Woolridge somehow selects 5.25 percent as the recommended growth rate for his DCF estimate for the group. There is no rationale provided for this arbitrary choice of growth rates.

In contradiction to his own position on this issue, his final choice of growth rates for all three peer groups is almost identical to his estimates of analysts' growth

[36] *See* Woolridge, Exh. JRW-12, at 6.

forecasts which Dr. Woolridge severely criticizes throughout his testimony. Dr. Woolridge cannot have it both ways on this issue.

Q. Were you able to replicate Dr. Woolridge's recommended growth estimates from the data?

A. No. I was unable to replicate Dr. Woolridge's recommended growth rates from the data for any of the three proxy groups. There is simply no way to connect the twelve growth indicators with Dr. Woolridge's final recommended growth rates. The choice of optimal growth rate proxy should be guided by objective scientific research and be easily reproducible, unlike Dr. Woolridge's growth proxies. Dr. Woolridge's "shotgun" approach to growth rates is unreliable and arbitrary and should be rejected by the Commission. Since his final recommendation is based primarily on the results of his flawed DCF analysis, it should be treated with extreme caution by the Commission.

Q. What do you conclude from Dr. Woolridge's growth rate analysis?

A. It is unreliable, impossible to replicate scientifically, contradictory, and should be given very little, if any, weight. It is problematic that Dr. Woolridge ends up selecting growth rates that are virtually identical to analyst growth forecasts in his final choice of DCF growth rates while at the same time he severely criticizes my use of analyst growth forecast. More on this later in my rebuttal.

C. Dr. Woolridge's CAPM Results Should be Given Very Little, If Any, Weight Because Dr. Woolridge Has Relied on Erroneous Data Inputs.

Q. Does Dr. Woolridge perform a CAPM analysis?

A. Yes. Dr. Woolridge performs a CAPM analysis. Dr. Woolridge uses a risk-free rate of 3.75 percent,[37] betas of 0.55, 0.55, and 0.65 for the electric, Morin, and gas proxy groups respectively,[38] and a market risk premium of 5.75 percent.[39]

Dr. Woolridge does not appear to rely on the CAPM to arrive at his return on recommendation, presumably because his CAPM analyses suggest that (i) the returns on equity for the two proxy groups of electric utilities are only 6.9 percent and (ii) the return on equity for the proxy groups of gas utilities is only slightly higher at 7.5 percent.[40] These results are a mere 310 to 370 basis points (3.10 percent to 3.70 percent) above Dr. Woolridge's own risk-free of 3.75 percent. I am not aware that such an anemic risk premium would induce investors to purchase utility common stocks. Indeed, it appears that Dr. Woolridge implicitly agrees with this conclusion because he appears to ignore the estimates produced by his CAPM analysis. I am not sure why Dr. Woolridge devotes more than ten pages the CAPM only to reject its results.

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37 *See* Woolridge, Exh. JRW-1T, at 41:2.

38 *See id.* at 42:19-20.

39 *See id.* at 50:13-14.

40 *See id.* at 51:Table 4.

1. Dr. Woolridge Should Have Relied on Projected Long-Term Treasury Interest Rates in Selecting a Risk-Free Rate for His CAPM Analyses

Q. Is Dr. Woolridge's risk-free rate estimate of 3.75 percent reasonable for the CAPM analysis?

A. No, not quite. Dr. Woolridge's risk-free rate assumption of 3.75 percent is low for purposes of applying the CAPM. Interest rate forecasts are higher. All the economic forecasts of which I am aware call for a substantial increase in interest rates. As shown in my prefiled direct testimony in this proceeding, each of the Congressional Budget Office, the U.S. Department of Labor, the U.S. Energy Information Administration, Global Insight, and Value Line projects higher long-term Treasury interest rates, with an average of 4.2 percent.[41]

Dr. Woolridge should have similarly relied on projected long-term Treasury interest rates for the simple reason that investors price securities on the basis of long-term expectations, including interest rates. Cost of capital estimates, including CAPM estimates, are prospective (i.e. forward-looking) in nature and must take into account current market expectations for the future. Dr. Woolridge understates his CAPM projections by using a risk-free rate that is 40 basis points (4.2% - 3.8% = 0.4%) lower than projected.

[41] *See* Morin, Exh. RAM-1T, at 38:Table 2.

2. CAPM Market Risk Premium

Q. How does Dr. Woolridge estimate the market risk premium component of the CAPM?

A. In order to determine the market risk premium component of the CAPM, Dr. Woolridge compiles a list of selected empirical studies of equity risk premiums published in academic and trade publications. The average market risk premium from all these studies is 4.83 percent.[42] If the studies prior to 2010 are discarded, the average market risk premium is 5.24 percent.[43] From these results, Dr. Woolridge arbitrarily uses 5.75 percent as his final estimate of the market risk premium for his CAPM analyses.[44]

Q. Were you able to replicate Dr. Woolridge's market risk premium of 5.75 percent?

A. No, I was not. As was the case with his DCF growth rates, his choice of input data in the CAPM is arbitrary and difficult to replicate. Moreover, this estimate is somewhat removed from the conventional wisdom on the subject.

[42] *See* Woolridge, Exh. JRW-10, at 5.

[43] *See* Woolridge, Exh. JRW-1T, at 46:19-22.

[44] *See id.* at 50:11-18.

Q. What is the prevalent academic consensus on the magnitude of the market risk premium?

A. In their widely-used authoritative textbook, following a comprehensive review of the rich and fertile market risk premium literature, Richard Brealey, Stewart Myers, and Franklin Allen state as follows:

> Brealey, Myers, and Allen have no official position on the issue, but we believe that a range of 5 to 8 percent is reasonable for the risk premium in the United States.[45]

My own survey of the market risk premium literature is also quite consistent with this range.[46]

Q. What is fundamentally wrong with Dr. Woolridge's market risk premium estimate of 5.75 percent?

A. The fundamental flaw of a market risk premium estimate of 5.75 percent is that it is based on a summary of historical results from a selected variety of academic and trade studies based on an entirely different set of capital market conditions. Those capital market conditions are not representative of current market conditions or of what is likely to occur prospectively.

[45] Richard A. Brealey, *et al.*, *Principles of Corporate Finance* 167 (11th ed. 2014).

[46] *See* Roger A. Morin, *The New Regulatory Finance* ch. 5 (2006).

Q. Does Dr. Woolridge's market risk premium estimate of 5.75 percent contain other infirmities?

A. Yes. In addition to ignoring current or prospective market conditions, Dr. Woolridge's market risk premium estimate of 5.75 percent contains several other infirmities. First, several market risk premium studies imply considerably larger estimates that are not reported by Dr. Woolridge. Second, many of the historical studies selected by Dr. Woolridge rely on geometric average returns rather than arithmetic average returns. Third, many of the historical studies selected by Dr. Woolridge rely on the total return component of bond returns rather than on the income component. Fourth, Dr. Woolridge's market risk premium estimate of 5.75 percent is inconsistent with the market risk premia implied in regulatory decisions

a. Dr. Woolridge Selectively Cites to Academic Studies in an Attempt to Justify His Unreasonably Low Market Risk Premium of 5.75 Percent

Q. Are there studies of market risk premia that imply larger estimates Dr. Woolridge either misrepresents or ignores?

A. Yes. Several studies suggest market risk premia in the range between 6 and 8 percent and much higher than Dr. Woolridge's recommended market risk premium of 5.75 percent.

A 2006 study by Elroy Dimson, Paul Marsh, and Mike Staunton[47] reports returns over the period 1900 to 2005 for twelve countries, representing 90 percent of today's world market capitalization. They report (i) an average risk premium over long-term bond returns of 6.5 percent for the U.S. and (ii) the market risk premium was generally higher for the second half of the 20th Century than for the first half of the 20th Century. For example, the market risk premium for the U.S. was 5.0 percent in the first half of the 20th Century, and the market risk premium for the U.S. was 7.5 percent in the second half of the 20th Century. The market risk premium of 7.5 percent for the U.S. in the second half of the 20th Century is well in excess of the median historical market risk premium of 4.83 percent reported by Dr. Woolridge.[48] Richard Brealey, Stewart Myers, and Franklin Allen updated the Dimson study and found an average market risk premium of 6.5 percent for the U.S.[49]

Another study of market risk premia not mentioned by Dr. Woolridge was published by Rajnish Mehra, which concludes that the market risk premium over the 1889-2000 period is likely to be similar to its historical estimate of between 6.0 and 8.0 percent.[50] The Mehra study predated the unprecedented 2008-2009 financial crisis, which has undoubtedly increased the market risk premium.

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47 Elroy Dimson, *et al*., "The Worldwide Equity Premium: A Smaller Puzzle," in Rajnish Mehra (ed.), *Handbook of the Equity Risk Premium* 467–514 (2008).

48 *See* Woolridge, Exh. JRW-1T, at 46:9-10; *see also* Woolridge, Exh. JRW-10, at 5.

49 Richard A. Brealey, *et al.*, *Principles of Corporate Finance* (11th ed. 2014).

50 Rajnish Mehra, "The Equity Risk Premium: Why Is It a Puzzle?" 59 *Financial Analysts' Journal* 54-69 (2003).

Another study not cited by Dr. Woolridge measured the market risk premium by subtracting the risk-free rate from the expected future long-term returns on the overall equity market. This study by Robert Harris and Felicia Marston[51] resulted in a market risk premium of 6.5 percent, which is reasonably close to the market risk premium of 7.0 percent used in my testimony and far removed from Dr. Woolridge's market risk premium of 5.75 percent.

Finally, a study by Steven Kaplan and Richard Ruback[52] based on investment studies of companies involved in management buyouts and leveraged recapitalization found a median market risk premium estimate of 7.8 percent based on a careful analysis of actual major investment decisions rather than on realized market returns. This estimate again exceeds Dr. Woolridge's market risk premium estimate of 5.75 percent.

[51] Robert S. Harris & Felicia C. Marston, "Estimating Shareholder Risk Premia Using Analysts' Growth Forecasts," 21 *Financial Management* 63-70 (1992).

[52] Steven N. Kaplan & Rischard S. Ruback, "The Valuation of Cash Flow Forecasts: An Empirical Analysis," 50 *Journal of Finance* 1059-93 (1995).

Q. Can you comment on the study by Rajnish Mehra and Edward Prescott study cited by Dr. Woolridge?

A. Yes. Dr. Woolridge refers to a "famous" study by Rajnish Mehra and Edward Prescott in which the authors first questioned the magnitude of historic equity risk premiums relative to fundamentals.[53] Dr. Woolridge, however, fails to acknowledge a more recent study by the same authors that squarely contradicts Dr. Woolridge's view that historical market risk premia are unrepresentative and somehow irrelevant:

> Even if the conditional equity premium given current market conditions is small, and there appears to be general consensus that it is, this in itself does not imply that it was obvious either that the historical premium was too high or that the equity premium has diminished.
>
> In the absence of this [knowledge of the future], and based on what we currently know, we can make the following claim: over the long horizon the *equity premium is likely to be similar to what it has been in the past* and the returns to investment in equity will continue to substantially dominate that in T-bills for investors with a long planning horizon.[54]

Dr. Woolridge should heed these authors' more recent advice on the magnitude of the market risk premium, which is likely to be similar to historical averages in the range of 6.0 and 8.0 percent.

[53] *See* Woolridge, Exh. JRW-1T, at 43:8-10 (referring to Rajnish Mehra & Edward C. Prescott, "The Equity Premium: A Puzzle," 15 *Journal of Monetary Economics* 145-161 (1985)).

[54] Rajnish Mehra & Edward C. Prescott (2003), "The Equity Premium in Retrospect," in George M. Constantinides, *et al*. (eds.), *Handbook of the Economics of Finance*, 926 (2003).

Q. Do you have any comment on the historical studies cited by Dr. Woolridge?

A. Yes. Dr. Woolridge cites several studies based on very long time data series,[55] including historical data prior to 1900, some even dating back to 1872.[56] An obvious question is whether data on capital market behavior from the 19th Century is relevant for estimating return in the 21st Century. The major concern with data for a period beginning in 1872 is the reliability of the data. The stock market of the 1800s was severely limited, embryonic in scope, with very few issues trading, and few industries represented. Dividend data were unavailable over most of this early period and stock prices were based on wide bid-ask spreads rather than on actual transaction prices. The difficulties inherent in stock market data prior to the Great Depression are discussed in an article by G. William Schwert.[57]

Q. Should the Commission place any weight on survey techniques to estimate the market risk premium in the CAPM analysis?

A. No, the Commission should not place any weight on survey techniques to estimate the market risk premium in the CAPM analysis. Dr. Woolridge compiles a list of studies on the magnitude of the market risk premium, including studies

[55] *See* Woolridge, Exh. JRW-10, at 5.

[56] *See, e.g.,* Ivo Welch & Amit Goyal, "A Comprehensive Look at The Empirical Performance of Equity Premium Prediction," 21 *Review of Financial Studies* 1455-1508 (2008).

[57] G. William Schwert, "Indexes of U.S. Stock Prices from 1802 to 1987," 63 *Journal of Business* 399-426 (1990).

based on surveys.[58] Surveys of academics and investment professionals, provide another technique of estimating the market risk premium. While this technique has the benefit of being forward-looking, it is subject to the well-known shortcomings of survey techniques. There are several reasons to place little weight on survey results relative to the results from other approaches. First, return definitions and risk premium definitions differ widely. Second, survey responses are subject to bias. Third, subjective assessments about long-term market behavior may well place undue weight on recent events and immediate prospects.

b. Dr. Woolridge's Market Risk Premium Estimate of 5.5 Percent Inappropriately Relies on Geometric Mean Market Risk Premiums

Q. Is it appropriate to use geometric averages in measuring historical market risk premium?

A. No. It is inappropriate to use geometric averages in measuring historical market risk premium. Amidst the myriad studies cited by Dr. Woolridge,[59] some studies report arithmetic mean returns over a given period, and some studies rely on geometric mean returns over that same period. Only arithmetic means are appropriate for forecasting and estimating the cost of capital, while geometric means are not.[60] Indeed, the Duff & Phelps publications alluded to by

[58] *See* Woolridge, Exh. JRW-10, at 5.

[59] *See id.* at 5.

[60] *See* Roger A. Morin, *The New Regulatory Finance* ch. 4 (2006); Richard A. Brealey, *et al*., *Principles of Corporate Finance* (9th ed. 2008).

Dr. Woolridge's testimony contain a detailed and rigorous discussion of the impropriety of using geometric averages in estimating the cost of capital.

There is no theoretical or empirical justification for the use of geometric mean rates of return. Briefly, the disparity between the arithmetic average return and the geometric average return raises the question as to what purposes should these different return measures be used. The answer is that the geometric average return should be used for measuring historical returns that are compounded over multiple time periods. The arithmetic average return should be used for future-oriented analysis, where the use of expected values is appropriate. It is inappropriate to average the arithmetic and geometric average return; they measure different quantities in different ways.[61]

Q. What is the effect of Dr. Woolridge's reference to the geometric mean market risk premium instead of the arithmetic mean market risk premium?

A. Several of the market risk premium studies referenced by Dr. Woolridge[62] report the geometric mean market risk premium rather than the arithmetic mean market risk premium, thus significantly understating the market risk premium by some 150 basis points (i.e., 1.50 percent). The 150 basis points is the historical

[61] Please see Roger A. Morin, *The New Regulatory Finance*, at chapter 4 (2006) for a complete discussion regarding the theoretical underpinnings, empirical validation, and the consensus of academics on why geometric means are inappropriate for forecasting and estimating the cost of capital.

[62] *See* Woolridge, Exh. JRW-10, at 5:column G.

difference between the geometric and arithmetic mean typically reported in historical studies, for example in the Duff & Phelps Valuation Yearbooks.[63] Since at least half of the studies rely on geometric means, the net impact is that Dr. Woolridge has understated the market risk premium by 75 basis points (i.e., 0.75 percent) from these studies. In other words, Dr. Woolridge's market risk premium of 5.75 percent is understated by 75 basis points from this correction alone and becomes 6.50 percent instead of 5.75 percent. The impact on PSE's cost of equity CAPM estimate is 45 basis points (0.45 percent) using Dr. Woolridge's average beta for his three groups of utilities of 0.60:

$$\beta_{PSE} \times (\text{Arithmetic Mean} - \text{Geometric Mean})$$

$$0.60 \times (6.50\% - 5.75\%) = 0.60 \times 0.75\% = 0.45\%.$$

Q. Is Dr. Woolridge correct that arithmetic mean returns are biased and should be disregarded?

A. No. Dr. Woolridge erroneously argues that arithmetic mean return measures are biased and should be disregarded.[64] Dr. Woolridge's arguments reflect a fundamental misunderstanding of how geometric and arithmetic means are used in financial analysis. Geometric means are properly used in evaluating historic performance of stocks or portfolios of stocks, whereas determining investor

[63] *See*, *e.g.*, Duff & Phelps, LLC, *2019 Valuation Handbook – U.S. Industry Cost of Capital* (2019) (the "Duff & Phelps 2019 Valuation Handbook").

[64] *See* Woolridge, Exh. JRW-1T, at 67:15 – 69:28.

expectations, which define the cost of equity capital, requires use of arithmetic means.[65]

Q. Please explain how the issue of what is the proper "mean" arises in the context of analyzing the cost of equity.

A. The issue arises in applying methods that derive estimates of a utility's cost of equity from historical relationships between bond yields and earned returns on equity for individual companies or portfolios of several companies. Those methods produce series of numbers representing the annual difference between bond yields and stock returns over long historical periods. The question is how to translate those series into a single number which can be added to a current bond yield to estimate the current cost of equity for a stock or a portfolio. Calculating geometric and arithmetic means are two ways of converting series of numbers to a single, representative figure.

Q. If both are "representative" of the series, what is the difference between the two?

A. Each represents different information about the series. The geometric mean of a series of numbers is the value which, if compounded over the period examined, would have made the starting value to grow to the ending value. The arithmetic

[65] Please see Roger A. Morin, *The New Regulatory Finance*, at chapter 4 (2006),which explains this issue in detail, provides illustrative mathematical examples, and cites authoritative financial texts, all of which confirm the need to use arithmetic means, and not geometric means, to properly estimate a utility's return on equity.

mean is simply the average of the numbers in the series. Where there is any annual variation (volatility) in a series of numbers, the arithmetic mean of the series, which reflects volatility, will always exceed the geometric mean, which ignores volatility. Because investors require higher expected returns to invest in a company whose earnings are volatile than one whose earnings are stable, the geometric mean is not useful in estimating the expected rate of return which investors require to make an investment.

The following table compares the geometric and arithmetic mean returns of a hypothetical Stock A, whose yearly returns over a ten-year period are very volatile, with those of a hypothetical Stock B, whose yearly returns are perfectly stable during that period. Consistent with the point that geometric returns ignore volatility, the geometric mean returns for the two series are identical (11.6 percent in both cases), whereas the arithmetic mean return of the volatile stock (26.7 percent) is much higher than the arithmetic mean return of the stable stock (11.6 percent):

Table 3. Geometric vs. Arithmetic returns

Year	Stock A	Stock B
2009	50.0%	11.6%
2010	-54.7%	11.6%
2011	98.5%	11.6%
2012	42.2%	11.6%
2013	-32.3%	11.6%
2014	-39.2%	11.6%
2015	153.2%	11.6%
2016	-10.0%	11.6%
2017	38.9%	11.6%
2018	20.0%	11.6%
Arithmetic Mean Return	**26.7%**	**11.6%**
Geometric Mean Return	**11.6%**	**11.6%**

If Dr. Woolridge were correct in arguing for the use of geometric means, investors would require the same expected return to invest in both of these stocks, even though the volatility of returns in Stock A is very high while Stock B exhibits perfectly stable returns. That is clearly contrary to the most basic financial theory, that is, the higher the risk the higher the expected return.

Q. Does Dr. Woolridge provide an example that attempts to show that geometric means accurately compute the return that an investor might realize from investing in a volatile portfolio?

A. Yes. Dr. Woolridge offers a numerical example aimed at justifying the use of the geometric mean.[66] As demonstrated below, Dr. Woolridge's numerical example fails miserably.

Dr. Woolridge's example posits a scenario where the return on a portfolio declines by 50 percent in one year and doubles the next. The investor in that portfolio will realize a return equal to the geometric mean of the two returns (i.e., zero percent). However, that example addresses achieved returns, not expected returns. Based on experience, an investor may expect returns to vary between -50 percent and + 100 percent but will be uncertain in any future year what the outcome will be. Assuming a 50 percent chance of either outcome, the investor's expected return in any single year will be the arithmetic mean, or average, of the two possible outcomes (i.e., 25 percent ((-50% + 100%) ÷ 2). Thus, the required expected return, or return on equity, is equal to the arithmetic mean return of 25 percent, even though, in hindsight, the achieved return could turn out to be zero percent. Stated in everyday practical terms, it seems unlikely that an investor viewing the volatile returns on an investment of -50 percent in

[66] *See* Woolridge, Exh. JRW-1T, at 68:5-15.

year one and +100 percent in year two would conclude that the expected return in year three is zero as Dr. Woolridge would suggest.

The example actually proves my point that if relying on geometric means, investors would require the same expected return to invest in both of these stocks, even though the volatility of returns in Stock A is very high while Stock B exhibits perfectly stable returns. That is clearly contrary to the most basic financial theory; that is, the higher the risk, the higher the expected return.

c. Dr. Woolridge Should Have Used Historical Market Risk Premium Estimates That Use the Income Component of Bond Returns

Q. Should historical market risk premia be estimated using the income component of bond returns?

A. Yes. Dr. Woolridge erroneously states that I have relied on bond income returns in calculating a historical market risk premium that even the source of my data (Duff & Phelps) indicates is an incorrect method to measure an expected market risk premium.[67] This is totally incorrect. In the Duff & Phelps' 2019 Valuation Yearbook,[68] Duff & Phelps strongly advocates the use of the income component of bond returns when calculating a market risk premium contrary to Dr. Woolridge's statement.

[67] *See* Woolridge, Exh. JRW-1T, at 57:20-22.

[68] *See*, *e.g.*, Duff & Phelps 2019 Valuation Handbook, note 63, *infra*.

As discussed in my direct testimony, the income component (i.e., the coupon rate) is a far better estimate of expected return than the total return (i.e., the coupon rate plus capital gains) because realized capital gains/losses are largely unanticipated by investors. For that very reason, the aforementioned Duff & Phelps publication which Dr. Woolridge cites in his testimony recommends use of the *income* return on government bonds. In other words, bond investors focus on income rather than realized capital gains/losses.

d. Regulatory Decisions

Q. Is Dr. Woolridge's market risk premium estimate of 5.75 percent consistent with regulatory decisions of state utility commissions?

A. No. Dr. Woolridge's market risk premium estimate of 5.75 percent is inconsistent with regulatory decisions of state utility commissions. It is useful to examine the market risk premium estimates implicit in allowed returns on equity implicit in decisions by state utility commissions. The CAPM framework can be used to quantify the market risk premium implicit in the allowed returns on equity. According to the CAPM, the risk premium is equal to beta times the market risk premium:

$$\text{Risk Premium} = \beta \times (R_M - R_F)$$

$$\text{Risk Premium} = \beta \times \text{Market Risk Premium}$$

Solving for Market Risk Premium, we obtain:

$$\text{Market Risk Premium} = \text{Risk Premium} \div \beta$$

I examined the market risk premia implied in a large number of regulatory decisions for electric utilities in the United States over the period 1986-2018. Using the average risk premium of 5.6 percent in these decisions[69] over that period and a beta of 0.60 for electric utilities, the implied market risk premium is 9.3 percent (i.e., 5.6% ÷ 0.60 = 9.3%). Using the long-term average beta of 0.70 for electric utilities, the implied market risk premium is 8.0 percent, a significance difference from Dr. Woolridge's 5.75 percent.

Q. What can the Commission conclude from Dr. Woolridge's market risk premium estimate of 5.75 percent?

A. The Commission can conclude first that Dr. Woolridge's market risk premium estimate of 5.75 percent is understated, relies in part on technical errors, and is inconsistent with regulatory decisions. All in all, I echo the official position of Richard Brealey, Stewart Myers, and Franklin Allen that a market risk premium in the range of 5.0 percent and 8.0 percent is reasonable for the market risk premium in the United States, with the upper end of the range highly likely at this time, as Dr. Woolridge himself points out from more recent studies of the market risk premium. Second, the Commission can conclude that Dr. Woolridge's market risk premium estimate of 5.75 percent is contradictory and inconsistent with his own data. Although Dr. Woolridge reports mean results of 4.8 percent[70] and

[69] *See* Morin, Exh.RAM-10 at Column 3.

[70] *See* Woolridge, Exh. JRW-10, at 5.

5.0 percent[71] from his studies, he arbitrarily selects a market risk premium of 5.75 percent.

3. Dr. Woolridge Erroneously Relies Exclusively on the Plain Vanilla Version of the CAPM

Q. Do you agree with Dr. Woolridge's exclusive use of plain vanilla version of the CAPM to estimate returns on equity?

A. No. The plain vanilla version of the CAPM should be supplemented by the more refined version of the CAPM in estimating returns on equity. There have been countless empirical tests of the CAPM to determine to what extent security returns and betas are related in the manner predicted by the CAPM. The results of the tests support the idea that beta is related to security returns, that the risk-return tradeoff is positive, and that the relationship is linear. The contradictory finding is that the risk-return tradeoff is not as steeply sloped as the predicted CAPM. That is, low-beta securities earn returns somewhat higher than the CAPM would predict, and high-beta securities earn less than predicted. In other words, a CAPM-based estimate of the cost of capital underestimates the return required from low-beta securities and overstates the return from high-beta securities, based on the empirical evidence.

The empirical form of the CAPM that I used in my direct testimony refines the standard form of the CAPM to account for this phenomenon. As discussed in the Seventh Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin,

[71] *See* Woolridge, Exh. JRW-10, at 6.

Exh. RAM-10, my own empirical investigation of the relationship between return and Value Line adjusted betas is quite consistent with the general findings of the literature.

The downward-bias inherent in the CAPM is particularly significant for low-beta securities, such as the three groups of utilities used by Dr. Woolridge. Dr. Woolridge's CAPM estimates of equity costs are understated by about 50 basis points (i.e., 0.5 percent) from this bias alone.

D. Dr. Woolridge's Criticisms of My Direct Testimony are Unfounded, are Without Merit, and Should be Ignored by the Commission

1. Dr. Woolridge's Denunciation of Analysts' Growth Forecasts as Unreasonable Proxies for the DCF Growth Rate is Without Foundation and is Inconsistent with the Empirical Finance Literature on the Subject

Q. Please comment on Dr. Woolridge's criticism of your DCF analysis.

A. Dr. Woolridge criticizes the use of the analysts' earnings growth forecast as a proxy for the growth component and claims that my DCF analyses have ignored historical and projected growth rates in dividends and book value. Dr. Woolridge argues that:

> It is highly unlikely that investors today would rely exclusively on the EPS growth rate forecasts of Wall Street analysts and ignore other growth rate measures in arriving at their expected growth rates for equity investments.[72]

[72] *See* Woolridge, Exh. JRW-1T, at 60:6-7.

Yet, that is exactly what Dr. Woolridge appears to do in adopting growth rates of 5.25 percent for the electric proxy group, 5.5 percent for the Morin proxy group, and 6.0 percent for the gas proxy group. Looking back at Dr. Woolridge's Table 1, these estimates are virtually identical to the analysts growth forecasts. I find Dr. Woolridge's criticism surprising, given that he himself ends up relying almost exclusively on Value Line forecasts and analysts' growth forecasts contained in the Yahoo and Zacks Web sites. Dr. Woolridge also relies on Value Line forecasts to specifying the growth component of the DCF model.

Q. What does the published academic literature say on the subject of analysts' growth rate forecasts in the DCF model?

A. My direct testimony discussed the merits of using consensus analysts' earnings growth forecasts in the DCF model and the supportive empirical literature. Published studies in the academic literature demonstrate that (i) analysts' growth rate forecasts are reasonable indicators of investor expectations and (ii) investors rely on such forecasts.

Q. How do you respond to Dr. Woolridge's criticisms that your DCF analysis because it relies on overly-optimistic earnings growth projections?

A. Dr. Woolridge erroneously denounces the use of financial analysts' earnings forecasts on the grounds that such forecasts are overly-optimistic[73], at least for regulated utility companies. I have three comments on this position.

[73] *See* Woolridge, Exh. JRW-1T, at 39:13-17 and at 64:2-8.

First, the issue is not whether forecasts turn out to be correct or overstated; it is whether these forecasts are reflected in investor expectations and stock prices. There is an abundance of evidence attesting to the importance of earnings in assessing investors' expectations. The sheer volume of earnings forecasts available from the investment community relative to the scarcity of dividend forecasts attests to their importance. To illustrate, Value Line, Zacks Investment Research, First Call, Thompson Reuters, Yahoo Finance, and Multex provide comprehensive compilations of investors' earnings forecasts, to name some. The fact that these investment information providers focus on growth in earnings rather than growth in dividends indicates that the investment community regards earnings growth as a superior indicator of future long-term growth. Also, Value Line's principal investment rating assigned to individual stocks, Timeliness Rank, is based primarily on earnings, accounting for 65 percent of the ranking. The best proxy for the growth component of the DCF model is analysts' long-term earnings growth forecasts. These forecasts are made by large reputable organizations. The data is readily available to investors and are representative of the consensus view of investors.

Second, as I discussed earlier, published studies in the academic literature demonstrate that growth forecasts made by security analysts are reasonable indicators of investor expectations, and that investors rely on analysts' forecasts.

Third, I disagree with Dr. Woolridge that financial analysts' earnings forecasts are overly-optimistic, at least for utility stocks. The published academic literature

does not support such a claim. I note that the studies cited by Dr. Woolridge on the accuracy of analyst forecasts are not focused specifically on the utility industry.

While earlier academic research found evidence of analysts' optimism bias, there is more recent evidence that regulatory reforms have eliminated the issue. A more recent paper by Hovakimina and Saenyasiri[74] found that recent efforts to reduce analysts' incentive to publish rosy forecasts have worked, so the analyst bias may be a problem of the past.

While the academic literature demonstrates that analyst forecasts may be optimistic for volatile stocks, emerging companies, and companies whose prospects are uncertain, these characteristics certainly do not apply to utility companies, given their regulatory nature, oversight, and wide dissemination of information.[75] In short, the optimism bias purported to exist by Dr. Woolridge is inapplicable to regulated utilities.

[74] Armen Hovakimian & Ekkachai Saenyas, "Conflicts of Interest and Analyst Behavior: Evidence from Recent Changes in Regulation," 66 *Financial Analysts Journal* 96 (2010).

[75] These studies include the following: (i) Paul Hribar & John McInnis, "Investor Sentiment and Analysts' Earnings Forecast Errors," 58 *Management Science* 293 (2012); (ii) Anna Scherbina, "Analyst Disagreement, Forecast Bias and Stock Returns" (2004), available at http://hbswk.hbs.edu/item/5418.html; and (iii) Jean-Sébastien Michel & J. Ari Pandes, "Are Analysts Really Too Optimistic?" (2012), available at https://pdfs.semanticscholar.org/3ba8/b7bcd71f3236812fdd8cf957594f6afa51a3.pdf.

Q. What can the Commission conclude from Dr. Woolridge's denunciation of analysts' growth forecasts?

A. Dr. Woolridge's denunciation of analysts' growth forecasts as unreasonable proxies for the DCF growth rate is without foundation and is inconsistent with the empirical finance literature on the subject. It is paradoxical that Dr. Woolridge ends up selecting growth rates for his proxy groups that are nearly identical to analyst growth forecasts in his final choice of DCF growth rates. Dr. Woolridge does not explain this inconsistency in his approach.

2. Contrary to the Erroneous Assertions of Dr. Woolridge, the Empirical CAPM Has Been Theoretically and Empirically Validated Refereed Journals

Q. Please comment on Dr. Woolridge's assessment of the empirical CAPM presented in your direct testimony.

A. Dr. Woolridge argues that the empirical CAPM "has not been theoretically or empirically validated in any refereed journals."[76] He also asserts that "the ECAPM is nothing more than an ad hoc version of the CAPM."[77] I was astonished by these statements for one of the most well-known results in finance and widely discussed in most finance textbooks (including the seminal Brealey, Myers, and Allen textbook cited by Dr. Woolridge[78]) is that the CAPM-based estimate of cost of capital underestimates the return required from low-beta

[76] *See* Woolridge, Exh. JRW-1T, at 65:9-10.

[77] *See id.* at 63:4-5.

[78] *See id.* at 26 n. 15.

securities and overstates the return required from high-beta securities, based on the empirical evidence. The empirical CAPM adjusts for this tendency, as discussed in the Seventh Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-10.

My own empirical investigation of the relationship between return and Value Line adjusted betas is quite consistent with the general findings of the literature referred to in the Seventh Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-10. A plain vanilla CAPM will understate the return required for low-beta securities and overstate the return required for high-beta securities. The empirical CAPM refines the plain vanilla CAPM to account for this phenomenon.

Q. Do you agree with Dr. Woolridge that adjusted betas effectively address the empirical issue with the CAPM by increasing the expected returns for low beta stocks and decreasing the returns for high beta stocks[79]?

A. No, I do not. What Dr. Woolridge is essentially saying is that the ECAPM analysis is inappropriate because I have relied on adjusted betas. The reason for using the ECAPM is to allow for the tendency of betas to regress toward the mean value of 1.00 over time. Because Value Line betas are adjusted for such trend, the ECAPM analysis somehow results in double-counting according to Dr. Woolridge.

[79] *See* Woolridge, Exh. JRW-1T, at 63:9-13.

I do not share Dr. Woolridge's view that the ECAPM is equivalent to a beta adjustment. The ECAPM is a return adjustment and not a beta adjustment. For utility stocks with betas less than one, the CAPM understates the return. The downward-bias is particularly significant for low-beta securities such as utilities. The ECAPM is consistent with both theory and with a huge body of empirical evidence, and has the added advantage of computational simplicity.

In short, Dr. Woolridge errs in his view that the use of the ECAPM results in double-counting risk. Further Dr. Woolridge states that he is unaware of any tests of the CAPM that use adjusted betas such as those used by myself.[80] I would refer Dr. Woolridge to pages 7-13 of the Eighth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, for such tests.

3. Dr. Woolridge Incorrectly Asserts that Little Weight Should be Placed on Interest Rate Forecasts in Projecting the Risk-Free Rate for CAPM Analyses

Q. Is Dr. Woolridge correct that little weight should be placed on interest rate forecasts in projecting the risk-free rate for CAPM analyses?

A. No. Dr. Woolridge erroneously argues that investors place little weight on interest rate forecasts because they are often wrong[81] and therefore should not be used as proxies for the risk-free rate in implementing the CAPM. Dr. Woolridge does not

[80] *See* Woolridge, Exh. JRW-1T, at 63:10-11.

[81] *See id.* at 63:17-20.

offer any supportive evidence for that statement. I have three comments to this point of view.

First, Dr. Woolridge himself again contradicts his position by using 3.75 percent as the risk-free rate in his CAPM analysis,[82] which is significantly higher than the current level of interest rates.

Second, investors' required returns can and do shift over time with changes in capital market conditions, hence the importance of considering interest rate forecasts. The fact that organizations such as Value Line, IHS (Global Insight), and U.S. Energy Information Administration devote considerable expertise and resources to developing an informed view of the future, and the fact that investors are willing to purchase such expensive services confirms the importance of economic/financial forecasts in the minds of investors. Moreover, the empirical evidence demonstrates that stock prices do indeed reflect prospective financial input data.

Third, the CAPM is a prospective (i.e., forward-looking) model, and the use of projected long-term Treasury interest rates is entirely appropriate because investors price securities on the basis of long-term expectations, including interest rates. Capital cost estimates are forward-looking and must take into account current market expectations for the future. In short, interest rate forecasts are

[82] *See* Woolridge, Exh. JRW-1T, at 46:8-9.

appropriate proxies for the risk-free rate in any risk premium analysis such as the CAPM.

Fourth, given that this proceeding is to provide return on equity estimates for future proceedings, forecast interest rates are far more relevant.

4. Dr. Woolridge's Criticisms of My Market Risk Premium Are Without Merit and Should be Disregarded

Q. Is Dr. Woolridge correct in arguing that the use of annual bond income return is erroneous?

A. No. Dr. Woolridge incorrectly argues that the use of annual bond income return is erroneous.[83] The more accurate way to estimate the market risk premium from historic data is to use the *income* return, not *total* returns on government bonds, as explained in Duff & Phelps Valuation Yearbook, one of Dr. Woolridge's own source of data. The long-horizon (1926-2018) market risk premium (based on income returns, as required) is specifically calculated to be 6.9 percent, rather than 6.0 percent. Duff & Phelps recommends the use of the latter as a more reliable estimate of the historical market risk premium. I concur with this viewpoint because the income component of total bond return (i.e. the coupon rate) is a far better estimate of expected return than the total return (i.e. the coupon rate + capital gain), as realized capital gains/losses are largely unanticipated by bond investors.

[83] *See* Woolridge, Exh. JRW-1T, at 66:15-20.

Q. Is Dr. Woolridge correct that historical market risk premium studies are upward-biased by the so-called "survivorship bias"?

A. Dr. Woolridge also argues on that there are myriad problems in relying on historical returns, including the so-called survivorship bias, the arithmetic vs geometric mean issue, and the time horizon issue.[84] I have previously addressed the issue of the arithmetic vs geometric mean and demonstrated that only the arithmetic mean is relevant when measuring the current cost of capital.

Dr. Woolridge argues that historical estimates are inappropriate because the stock market index used in such studies includes only companies that have survived,[85] and as a result the average realized excess return is overestimated.[86] However, a study by Philippe Jorion and William Goetzmann not discussed by Dr. Woolridge finds that the "survivorship bias" is only 29 basis points (i.e., 0.29 percent).[87] A more recent working paper by Elroy Dimson, Paul Marsh, and Mike Staunton find a survivorship bias of only 10 basis points (i.e., 0.1 percent).[88]

[84] *See* Woolridge, Exh. JRW-1T, at 67:1-13.

[85] *See id.* at 67:17-18.

[86] *See id.* at 67:7-9.

[87] Philippe Jorion & William N. Goetzmann, "Global Stock Markets in the Twentieth Century," 54 *Journal of Finance* 953-80 (1999).

[88] Elroy Dimson, *et al*., "The Worldwide Equity Premium: A Smaller Puzzle," in Rajnish Mehra (ed.), *Handbook of the Equity Risk Premium* 467–514 (2008).

Q. Is time horizon an issue when using historical return?

A. No. Time horizon is not an issue when using historical return so long as long time periods are used. Historical risk premium studies have been around for a long time and are standard tools used in estimating market risk premium s. Duff & Phelps have been tracking realized rates of return on various classes of securities for many years, now including data over the period from 1926 to 2018.[89] This long period of time encompasses many different market economic circumstances (expansions, depressions, recessions, war, prosperity, financial crises, etc.). As stated in my book:

> over long periods investor expectations and realizations converge. Otherwise, investors would never commit investment capital. Investors' expectations are eventually revised to match historical realizations, as market prices adjust to bring anticipated and actual investment results into conformity.[90]

The long-term estimate of realized returns is therefore a plausible estimate of expected future returns that is easily verifiable.

Q. Did you rely on Duff & Phelps' estimate of the market risk premium?

A. No. Dr. Woolridge correctly points out that I have not relied on Duff & Phelps's in-house market risk premium recommendation of 5.5 percent.[91] Because Duff & Phelps do not rely only on historical studies of the market risk premium to arrive at their in-house market risk premium recommendation, I have chosen instead to

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89 *See* Duff & Phelps 2019 Valuation Handbook, note 63, *infra*.

90 Roger A. Morin, *The New Regulatory Finance* 116 (2006)

91 *See* Woolridge, Exh. JRW-1T, at 71:7-13.

rely on verifiable historical data rather than on speculative expected market risk premium data.

But I do point out that in the current 2019 version of the Duff & Phelps Valuation Yearbook,[92] Duff & Phelps rely on a market risk premium of 6.91 percent in implementing its building blocks approach to quantifying the market risk premium. This estimate is reasonably close to my own market risk premium estimate of 7.5 percent and exceeds Dr. Woolridge's 5.75 percent estimate.

5. Dr. Woolridge Incorrectly Argues that My Allowed Risk Premium Study is a Gauge of Commission Behavior and Not Investor Behavior

Q. Is Dr. Woolridge correct in arguing that your allowed risk premium study is a gauge of commission behavior and not investor behavior?

A. No. Dr. Woolridge is incorrect in arguing that my allowed risk premium study is a gauge of commission behavior and not investor behavior.[93] This variation of the risk premium approach is reasonable because allowed returns by regulators are presumably based on the results of market-based methodologies (DCF, CAPM, Risk Premium, *etc.*) presented to regulators in rate hearings and on the actions of objective unbiased investors in a competitive marketplace.

[92] *See* Duff & Phelps 2019 Valuation Handbook, note 63, *infra*, at Exhibits 10.2 & 10.9.

[93] *See* Woolridge, Exh. JRW-1T, at 73:17 – 75:3.

6. Market-to-Book Ratios are Largely Irrelevant in Establishing Rates of Regulated Utilities, and Dr. Woolridge's Views on the Role of Market-to-Book Ratios in Regulation are Misguided

Q. Please discuss Dr. Woolridge's views on market-to-book ratios.

A. Dr. Woolridge's testimony variously argues that because current market-to-book ratios for electric utilities tend to exceeds 1.0, allowed returns by regulators exceed the cost of equity capital for utilities.[94] In other words, Dr. Woolridge is implying that the state utility commissions should lower the allowed return on equity so that the stock price will decline to book value.

I presume from these statements that Dr. Woolridge finds it desirable that stock prices drop from the current market-to-book in excess of 1.0 for most electric and gas utilities, to the desired market-to-book ratio range of near 1.0. There are several reasons why market-to-book ratios are largely irrelevant in establishing rates of regulated utilities, and Dr. Woolridge's views on the role of market-to-book ratios in regulation are misguided.

First, Dr. Woolridge's position implies that regulators should set a return on equity to produce a market-to-book ratio of near 1.0. This is erroneous. The stock price is set by the market, not by regulators. The market-to-book ratio is the *result* of regulation, not its starting point. The regime of regulation envisioned by Dr. Woolridge (i.e., that the regulator will set an allowed rate of return so as to produce a market-to-book ratio of close to 1.0) presumes that investors commit

[94] *See* Woolridge, Exh. JRW-1T, at 20:2 – 21:7; *see also id*. at 22:23 – 23:3, and at 68:8 – 75:3.

capital to a utility with a market-to-book ratio in excess of 1.0, knowing full well that they will be inflicted a capital loss by regulators. Such behavior on the part of investors is certainly not a realistic or accurate view of investment or regulation.

Second, the traditional market-to-book ratio does not reflect the replacement cost of a company's assets. Consistent with *Bluefield*[95] and *Hope*,[96] the fundamental goal of regulation should be to set the expected economic profit for a public utility equal to the level of profits expected to be earned by firms of comparable risk, in short, to emulate the competitive result, so as to assure the firm's credit and to attract needed capital. For unregulated firms, the natural forces of competition will ensure that in the long-run the market value of these firm's securities equals the replacement cost of their assets. This suggests that a fair and reasonable price for a public utility's common stock is one that produces equality between the market price of its common equity and the replacement cost of its physical assets. The latter circumstance will not necessarily occur when the market-to-book ratio is near 1.0. Only when the market value of the firm's common equity equals the value of the firm's equity at replacement cost will equality hold.

In an inflationary period, the replacement cost of a firm's assets may increase more rapidly than its book equity. To avoid the resulting economic confiscation of shareholders' investment in real terms, the allowed rate of return should produce a market-to-book ratio which provides a Q-ratio of 1 or a Q-ratio equal to that of

[95] *Bluefield Water Works Co. v. Pub. Serv. Comm'n.*, 262 U.S. 679 (1923).

[96] *Federal Power Comm'n. v. Hope Natural Gas Co.*, 320 U.S. 591 (1944).

comparable firms.[97] It is quite likely that market-to-book ratios will exceed 1.0 if inflation increases the replacement cost of a firm's assets at a faster pace than book equity. This explains in part why utility market-to-book ratios have remained well above 1.0 over the past three decades.

Stock prices above book value are common for utility stocks, and indeed for all of the major market indexes. It is obvious that investors and regulators through their rate case decisions do not subscribe to Dr. Woolridge's position that utilities that have market prices above book value are over-earning. Otherwise, regulators would not grant rate increases for any utility whose stock price was above book value, and investors would never bid up the price of stock above book value.

Finally, Dr. Woolridge's views on the role of market-to-book ratio are certainly not corroborated by the historical facts. Utility market-to-book ratios have been consistently above 1.0 for over three decades.

Q. Please comment on Dr. Woolridge's criticism of your DCF growth rates because they exceed the long-term growth of the macroeconomy.

A. In a protracted discussion, Dr. Woolridge criticizes my use of analysts' growth rates on the grounds that they exceed the long-term sustainable growth rate of the

[97] The relationship between the market value of a firm's securities and the replacement cost of its assets is embodied in the Q-ratio. The Q-ratio is defined as the market value of a firm's securities divided by the replacement cost of its assets. If Q > 1.0, a firm has an incentive to invest because the value of the firm's securities exceeds the replacement cost of assets, that is, the firm's return on its investments exceeds its cost of capital. Conversely, if Q < 1.0, a firm has a disincentive to invest in new plant. In final long-run equilibrium, the Q-ratio is driven to 1.0.

economy.[98] Dr. Woolridge contends that projected growth in Gross Domestic Product (GDP) constitutes a high-end, sustainable growth rate for a utility over an indefinite period of time.

My first reaction is why did Dr. Woolridge not depend on such growth rates in his own DCF analyses. Dr. Woolridge assumes that a GDP growth rate in the range of 4.0 percent to 5.0 percent is appropriate.[99] Yet, his final choice of growth rates previously provided in Table 1 exceed this estimated range. In other words, why did Dr. Woolridge use DCF growth rates in the range of 5.3 percent to 6.0 percent when he advocates GDP growth rates in the 4.0 to 5.0 percent range. Dr. Woolridge does not explain this contradiction.

My second reaction is that I am not aware of any financial literature supporting the notion that that utility earnings per share would grow at the average growth of the economy, or match GDP growth. To the best of my knowledge, there is no empirical support for the notion that the earnings and dividends of utility companies, in general, or electric utilities, in particular, or indeed any specific company or industry, track GDP growth. Nor am I aware of any evidence that the investment community looks to GDP growth over the next several decades when evaluating utility investments.

My third reaction is that based upon the wealth of empirical and academic literature that supports the superiority of analysts' forecasts as measures of

[98] *See* Woolridge, Exh. JRW-1T, at 73:15 – 84:8.

[99] *See id.* at 76:19-20.

investor expectations for the use of such forecasts in the DCF model, current earnings growth forecasts are the appropriate growth rates to use in a DCF analysis. As discussed in my direct testimony and earlier in my rebuttal, there is considerable empirical evidence in the academic literature that support the superiority of analysts' forecasts of earnings per share as measures of investor expectations. Besides, to the extent that economic trends influence growth, they are already captured in analysts' growth estimates for electric utilities. Be that as it may, analyst growth rates are the growth rates impounded in stock prices, whether I or Dr. Woolridge agree or disagree with the use of such growth rates.

Q. Do you have any more comments on the use of GDP growth in the DCF model?

A. Yes, I do. I have the following additional comments.

First, Dr. Woolridge assumes a single generic growth rate of between 4.0 and 5.0 percent for all the utility companies, including the ones in his three proxy groups. Hence, if Dr. Woolridge's view that all utility companies will grow at a long-term growth of between 4.0 and 5.0 percent, there is really no need for a proxy group at all.

Second, it is difficult to accept Dr. Woolridge's notion that investors believe that every company will grow at the same rate of between 4.0 and 5.0 percent forever. Dr. Woolridge's growth rate of between 4.0 and 5.0 percent is generic nature and does not account for the different risks and prospects of the peer group companies or for the entire utility industry for that matter.

Third, if we accept the current and prospective inflation rate of 2.0 percent estimated by Dr. Woolridge,[100] a GDP growth rate of between 4.0 and 5.0 percent becomes only about 2.0 to 3.0 percent in real inflation-adjusted terms. I find hard to believe that investors would assume the risk of common stocks in exchange for a mere 2.0 to 3.0 percent more than expected inflation. An investor would be better off buying bonds under that scenario.

Fourth, the DCF model assumes that changes in the growth rate are inversely related to the dividend yield. There are two moving interrelated parts in the DCF model: (i) the growth rate and (ii) the dividend yield. As the expected growth increases, the stock price increases and the dividend yield decreases. The reverse is true as well. As growth decreases, the stock price decreases, and the dividend yield increases. If we believe that Dr. Woolridge's growth rate of between 4.0 and 5.0 percent applies to all the utility companies in his three peer groups in contrast to analyst growth rates in the range of 5.0 and 6.0 percent range embedded in current stock prices, it behooves us to accept that the dividend yield will increase from its base level of 3.0 percent.

In short, Dr. Woolridge's suggested DCF analysis would be incomplete because it would erroneously assume that one factor can change while all others remain constant. Dr. Woolridge assumes that all utility companies have a growth rate between 4.0 and 5.0 percent and that none of those companies' dividend yield would change as their expected growth rates decline. If a growth rate of between

[100] *See* Woolridge, Exh. JRW-1T, at 76:10.

4.0 and 5.0 percent were to apply to utility companies, one must make assumptions as to their dividend yield, which Dr. Woolridge fails to do.

E. Dr. Woolridge's Return on Equity Recommendation Should be Treated with Extreme Caution by the Commission

Q. What can the Commission conclude from Dr. Woolridge's testimony?

A. In summary, there is a fatal Achilles heel in Dr. Woolridge' return on equity recommendation. The DCF growth rates that constitute the crux of his return on equity recommendation cannot be replicated, do not match his numerous growth estimates, and are arbitrary. Therefore, Dr. Woolridge's return on equity recommendation should be treated with extreme caution by the Commission.

Q. What returns are investors expecting for Dr. Woolridge's proxy groups of utilities?

A. Dr. Woolridge's own evidence demonstrates that investors are expecting an average return on equity of 10.8 percent for the electric proxy group, an average return on equity of 11.2 percent for the Morin Proxy group, and an average return on equity of 10.3 percent for the gas proxy group.[101]

[101] *See* Woolridge, Exh. JRW-12, at 4 (column with the heading "Return on Equity").

Q. What is the average allowed return on equity for Dr. Woolridge's proxy group of electric utilities?

A. As previously shown in Figure 1 and provided in the First Exhibit to the Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-13, the average allowed return on equity for Dr. Woolridge's proxy group of thirty electric utilities is 9.9 percent.

Q. What was the average allowed return on equity for electric utilities in recent orders of state utility commissions?

A. The average allowed return on equity for electric utilities in recent orders of state utility commissions is 9.6 percent.[102]

III. REBUTTAL TO MR. PARCELL'S TESTIMONY

Q. Please summarize Mr. Parcell's return on equity recommendation.

A. Mr. Parcell recommends a return on equity for PSE in a range of 8.85 and 9.50 percent, with a midpoint of around 9.2 percent.

In determining PSE's cost of equity, Mr. Parcell applies a DCF analysis to two groups of utilities. For the growth component of his DCF analysis, Mr. Parcell uses a blend of analysts' growth forecasts, historical growth rates, and the earnings retention method. From his DCF estimates, Mr. Parcell concludes that

[102] *See RRA Regulatory Focus Major Rate Case Decisions – January-September 2019*, footnote 13, *infra*.

the DCF estimate of PSE's return on equity lies in a range of between 8.7 and 9.0 percent, with a midpoint of around 8.85 percent.

Mr. Parcell also applies a CAPM analysis to the same two groups of companies, using long-term Treasury bond yields as proxies for the risk-free rate and Value Line beta estimates. Mr. Parcell seems to place little, if any, weight on the CAPM results, which would place PSE's return on equity in the range of between 6.5 and 7.0 percent, with a midpoint of 6.75 percent.

Finally, Mr. Parcell performs a comparable earnings analysis on a sample of utilities and a sample of unregulated industrial companies.

From these various analyses, Mr. Parcell concludes that the return on equity for PSE lies in the range of between 8.85 and 9.50 percent. From this range, Mr. Parcell proposes a return on equity at about the midpoint of this proposed range, 9.2 percent.

Q. Please summarize your specific concerns with Mr. Parcell's testimony.

A. Although I agree with several of Mr. Parcell's methodologies, I have the following comments:

1. **Mr. Parcell understates dividend yield by using a spot dividend yield inflated by one-half of the expected dividend growth.** Mr. Parcell's dividend yield component is understated because it is not consistent with the annual form of the DCF model. It is inappropriate to increase the dividend yield by adding one-half of the future growth rate (1 + 0.5g) to the spot dividend yield. The appropriate manner of computing the expected dividend yield when using the basic annual DCF model is to add the full growth rate rather than one-half of the growth rate. This adjustment

also allows for the failure of the annual DCF model to allow for the quarterly timing of dividend payments. As previously discussed in Section II.B.1., this error understates the DCF results by some 10 basis points (i.e., 0.1 percent).

2. **Mr. Parcell uses the retention growth method, a method that should be given little, if any, weight.** The retention growth method for estimating the growth component of the DCF calculation is suspect because one is forced to assume the answer to implement the method. From Mr. Parcell's own evidence, investors expect substantially higher returns for utilities than what he recommends.

3. **Mr. Parcell's historical growth rates should be given little, if any weight.** Investors are expecting substantially higher growth rates than Mr. Parcell's growth rates for the sample companies. Using analysts' consensus growth forecasts increases the DCF estimate of the cost of common equity by 130 basis points (1.30 percent).

4. **Mr. Parcell's risk-free rate proxy in his CAPM analysis is inappropriate.** Mr. Parcell should have relied on projected interest rates rather than on historical spot rates in selecting a risk-free rate proxy in his CAPM analysis. Yields on long-term Treasury securities are expected to increase. Using the appropriate risk-free rate, Mr. Parcell's CAPM estimates must be raised by 20 basis points (i.e., 0.2 percent) for this correction alone.

5. **Mr. Parcell's market risk premium of 5.9 percent slightly understates the market risk premium.** There are conceptual blemishes in Mr. Parcell's three market risk premium proxies.

6. **Capital Structure/Return on Equity Adjustment**. Mr. Parcell did not adjust his recommended return on equity to reflect the fact that PSE's capital structure possesses more debt than the average capital structure of his two comparable groups of electric utilities. Such a required adjustment raises his return on equity recommendation from 9.20 percent to 9.78 percent from this omission alone.

7. **Unfounded criticisms**. Mr. Parcell's criticisms of my direct testimony are unfounded.

A. Mr. Parcell's DCF Results Should be Treated with Caution Because Mr. Parcell Has Relied on Erroneous Data Inputs

1. Mr. Parcell Understates Dividend Yield by Using a Spot Dividend Yield Inflated By One-Half of the Expected Dividend Growth

Q. Please discuss Mr. Parcell's dividend yield component in the DCF model.

A. The annual DCF model states very clearly that the expected rate of return on a stock is equal to the expected dividend at the end of the year divided by the current price of the stock, plus the expected growth rate. Thus, the appropriate dividend to use in a DCF model is the full prospective dividend to be received at the end of the year. As discussed earlier in in Section II.B.1 of this rebuttal testimony, Mr. Parcell's mathematical adjustment fails to measure the full dividend flow expected by the investor and underestimates the cost of equity by approximately 10 basis points (i.e., 0.1 percent). Also, Mr. Parcell alleges that he multiplied the dividend yield by (1 + 0.5g) instead of by (1 + g) in order to account for the quarterly nature of dividend payments. This is incorrect. Please see my earlier discussion of the correct quarterly version of the DCF model in Section II.B.1 of this rebuttal testimony.

2. Mr. Parcell Uses the Retention Growth Method, a Method that Should Be Given Little, If Any, Weight

Q. Please describe Mr. Parcell's methodology for specifying the growth component of the DCF model.

A. Mr. Parcell employs five proxies as a proxy for the expected growth component of the DCF model: (i) historical earnings retention ratio, (ii) projected earnings retention ratio, (iii) five-year historical growth rates in dividends, earnings, and book value, (iv) projected growth rates in dividends, earnings, and book value, and (v) analysts' forecasts of earnings per share growth as reported in First Call.[103]

Q. Can you comment on Mr. Parcell's earnings retention growth estimate in the DCF model?

A. The retention growth methodology used by Mr. Parcell is similar to the sustainable growth methodology used by Dr. Woolridge. As discussed earlier in rebuttal of Dr. Woolridge's sustainable growth methodology in Section II.B.3 of this rebuttal testimony, the retention growth method has several conceptual and empirical infirmities, and the results of this method should be given little, if any, weight.

[103] *See* Parcell, Exh. DCP-1T, at 32:19 – 33:16.

3. Mr. Parcell's Historical Growth Rates Should Be Given Little, If Any, Weight

Q. Are historical growth rates of electric utilities reliable proxies for expected future growth?

A. No. Historical growth rates of electric utilities are not reliable proxies for expected future growth. Mr. Parcell uses historical growth rates in dividends, earnings, and book value as proxies for expected growth.[104]

If historical growth rates are to be representative of long-term future growth rates, they must not be biased by non-recurring events. This is certainly the case for utilities, where growing competition, declining customer usage, increased reliance on renewables, acquisitions, restructurings and write-off activities have exerted a dilutive effect on historical earnings and dividends. In such cases, it is obvious that analysts' growth forecasts provide a more realistic and representative growth proxy for what is likely to happen in the future than historical growth.

In any event, historical growth rates are somewhat redundant given that analysts formulate their growth expectations based in part on historical patterns.

In conclusion, Mr. Parcell's historical growth rates should be given considerably less, if any, weight.

[104] *See* Parcell, Exh. DCP-9 at 3 (first three columns).

Q. What does the published academic literature say on the subject of growth rates in the DCF model?

A. As discussed in Section II.D.1 of this rebuttal testimony, published studies in the academic literature demonstrate that (i) analysts' growth rate forecasts are reasonable indicators of investor expectations and (ii) investors rely on such forecasts.

Q. Are investors expecting growth rates equal to Mr. Parcell's range?

A. No. The best evidence shows that investors are expecting growth rates higher than Mr. Parcell has found. For his proxy group of utilities, Mr. Parcell has found mean growth rates ranging from 3.4 percent to 5.2 percent, with a mean of only 4.3 percent.[105] For my proxy group of utilities, Mr. Parcell has found mean growth rates ranging from 2.6 percent to 7.0 percent, with a mean of only 4.7 percent.[106]

As addressed in Section II.B.2 of this rebuttal testimony, historical growth rates should be given considerably less weight, which leaves us with (i) the mean Value Line growth forecast (i.e., the 2020-2022 projections of earnings per share, dividends per share, and book value per share) growth and (ii) the mean consensus analyst forecast (i.e., the five-year projections of earnings per share growth per First Call).

[105] *See* Parcell, Exh. DCP-10, at 4.

[106] *See id*.

For Mr. Parcell's proxy group, the mean Value Line growth forecast is 4.8 percent, and the mean consensus analyst forecast is 4.4 percent.[107] These growth forecasts produce a range of between 4.8 percent and 4.4 percent for the group, with a midpoint of 4.6 percent. The midpoint of 4.6 percent is 30 basis points (i.e., 0.3 percent) above Mr. Parcell's mean estimate of 4.3 percent.

For my proxy group, the mean Value Line growth forecast is 5.8 percent, and the mean consensus analyst forecast is 4.9 percent.[108] These growth forecasts produce a range of between 4.9 percent and 5.8 percent for the group, with a midpoint of 5.4 percent. The midpoint of 5.4 percent is 70 basis points (i.e., 0.7 percent) above Mr. Parcell's mean estimate of 4.7 percent.

This understatement alone causes Mr. Parcell's DCF cost of equity estimates for the two groups of companies to be downward-biased by 30 to 70 basis points (midpoint of 50 basis points (i.e., 0.50 percent), even without factoring in the appropriate expected dividend yield component which is understated by 10 basis points (0.1 percent).

[107] *See* Parcell, Exh. DCP-10, at 4.

[108] *See id.* at 4.

B. Mr. Parcell's CAPM Results Should Be Given Very Little, If Any, Weight

Q. How much weight should be accorded to the CAPM results under current market circumstances?

A. Mr. Parcell appears to largely ignore his CAPM estimates in making his final return on equity recommended for PSE. To the extent that Mr. Parcell has accorded any weight to his CAPM results (and it does not appear that he did), he should have derived a much higher estimate. If the Commission were to accord any weight to Mr. Parcell's CAPM results, the following comments on Mr. Parcell's CAPM analysis are germane.

1. Mr. Parcell's Risk-Free Rate Proxy in His CAPM Analysis Should Be Predicated on Interest Rate Forecasts.

Q. Does Mr. Parcell use an appropriate risk-free rate proxy in his CAPM analysis?

A. No. Mr. Parcell's risk-free rate proxy in his CAPM analysis is not appropriate for this proceeding. As a proxy for the risk-free rate, Mr. Parcell uses 1.96 percent, which is the average yield on 20-year Treasury bonds for the three-month period August 2019 to October 2019.[109] For the reasons discussed in Section II.C.2 of this rebuttal testimony, Mr. Parcell should have used the consensus interest rate forecast of 4.20 percent. This correction alone would raise his CAPM estimates by 1.67 percent (4.20% – 1.96% = 2.24%).

[109] *See* Parcell, Exh. DCP-1T, at 31:8-11; *see also* Parcell, Exh. DCF-12.

2. Mr. Parcell's Beta Estimate in His CAPM Analysis Is Reasonable

Q. Does Mr. Parcell use an appropriate beta estimate in his CAPM analysis?

A. Yes. Mr. Parcell used the most recent Value Line betas for each company in the proxy groups, which is appropriate.[110]

3. Mr. Parcell's Market Risk Premium of 5.9 Percent Understates the Market Risk Premium

Q. How does Mr. Parcell estimate the market risk premium component of his CAPM analysis?

A. In order to determine the market risk premium component of his CAPM analysis, Mr. Parcell relies on three estimates. First, Mr. Parcell examines the difference between the accounting returns on book equity for the S&P 500 Index companies group over the 1978-2018 period and the contemporaneous level of 20-year Treasury bond yields.[111] The average spread (i.e., the market risk premium) is 7.26 percent.[112] Second, Mr. Parcell relies on a long-term historical market risk premium of 6.0 percent tabulated by Duff & Phelps for the 1926-2018 period based on arithmetic averages.[113] Third, Mr. Parcell relies on the long-term historical market risk premium of 4.5 percent reported in the same publication for

[110] *See* Parcell, Exh. DCP-1T, at 31:13-18; *see also* Parcell, Exh. DCP-12.

[111] *See* Parcell, Exh. DCP-1T, at 32:4-10.

[112] *See id.* at 32:11-17.

[113] *See id*.

the same period but this time based on geometric averages.[114] From these three estimates, Mr. Parcell concludes that the market risk premium is 5.9 percent (i.e., the average of these three market risk premium estimates).[115]

Q. Is Mr. Parcell's first market risk premium of 7.26 percent reasonable?

A. Yes. Mr. Parcell's first market risk premium of 7.26 percent is reasonable and is identical to the market risk premium used in my CAPM analysis.

Q. Is Mr. Parcell's second market risk premium of 6.0 percent reasonable?

A. No. Mr. Parcell's second market risk premium estimate of 6.0 percent is understated. For his second market risk premium estimate, Mr. Parcell used total returns (i.e., dividends/interest plus capital gains/losses) for the S&P 500 group as well as for long-term government bonds, as tabulated by Duff & Phelps using arithmetic means. As previously discussed in the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1Tr, and in Section II.C.3 of this rebuttal testimony, the more accurate way to estimate the market risk premium from historical data is to use the *income* return, not *total* returns, on government bonds.[116] The long-term market risk premium based on *income* returns is 6.9 percent, which is 90 basis points (i.e., 0.9 percent) higher than the 6.0 percent estimate based on total bond returns reported by Mr. Parcell.

[114] *See* Parcell, Exh. DCP-1T, at 39:10-15.

[115] *See id.* at 32:19-21.

[116] *See id.* at 39:10-15.

Q. Is Mr. Parcell's third market risk premium of 4.5 percent reasonable?

A. No. Mr. Parcell's third market risk premium of 4.5 percent is not reasonable whatsoever. For his third market risk premium, Mr. Parcell uses the aforementioned Duff & Phelps historical market risk premium, only this time relying on the geometric average of historical returns instead of the arithmetic average of historical returns.[117]

Q. Is it appropriate to use geometric averages in measuring expected return?

A. No. As discussed in Section II.C.2.b of this rebuttal testimony, arithmetic means are appropriate for forecasting and estimating the cost of capital, whereas geometric means are not.

Q. What market risk premium estimate should Mr. Parcell have used in his CAPM analysis.

A. The average of Mr. Parcell's first market risk premium estimate of 7.26 percent and his amended second market risk premium estimate of 6.90 percent (and ignoring the estimate based on geometric returns) results in a market risk premium of 7.1 percent. Therefore, Mr. Parcell should have relied on a market risk premium of 7.1 percent for his CAPM analyses.

[117] *See* Parcell, Exh. DCP-1T, at 32:16-18.

Q. What is the effect of Mr. Parcell's use of the corrected market risk premium of 7.1 percent on his CAPM results?

A. Mr. Parcell's use of a market risk premium of 5.9 percent instead of a reasonable market risk premium of 7.1 percent understates his CAPM estimates by 74 basis points (i.e., 0.74 percent) alone. Using Mr. Parcell's beta of 0.62 for his peer group of companies, the understatement is calculated as follows:

$$\beta_{PSE} \times (\text{Correct MRP} - \text{Original MRP})$$

$$0.62 \times (7.1\% - 5.9\%) = 0.62 \times (1.2\%) = 0.74\%$$

Adding the understatement of 2.24 percent due to the improper choice of risk-free rate to the understatement of 0.74 percent due to the improper choice of market risk premium, the total understatement of Mr. Parcell's CAPM estimates is 2.98 percent.

C. Capital Structure Adjustment

Q. Did Mr. Parcell adjust his recommended return on equity to account for the greater leverage he assigns to PSE compared to that of comparable companies?

A. No. Mr. Parcell should have increased his recommended return on equity of 9.20 percent to reflect the higher relative risk associated with PSE's slightly more leveraged capital structure. It is a rudimentary tenet of basic finance that the greater the amount of financial risk borne by common shareholders, the greater the return required by shareholders in order to be compensated for the added

financial risk imparted by the greater use of senior debt financing. In other words, the greater the debt ratio, the greater is the return required by equity investors. Higher risk means higher return!

Q. What is the magnitude of the required return adjustment to account for PSE's more leveraged capital structure?

A. PSE's capital structure consists of 48.50 percent common equity, compared to an average capital structure that consists of 52.50 percent common equity for the electric utilities in Mr. Parcell's first comparable group.[118] Therefore, the differential between the common equity component of PSE's capital structure and the common equity component of the average capital structure for the electric utilities in Mr. Parcell's comparable group is 4.0 percent.

Several researchers have studied the empirical relationship between the cost of capital, capital-structure changes, and the value of the firm's securities.[119] The results of these studies suggest that, as the debt ratio increases from 40 percent to 50 percent, the required equity returns increase between 34 to 237 basis points. The empirical studies suggest an average increase of 76 basis points, or 7.6 basis points per one percentage point increase in the debt ratio. The theoretical studies suggest an average increase of 138 basis points, or 13.8 basis points per one percentage point increase in the debt ratio. In other words, equity return

[118] *See* Parcell, Exh. DCP-8.

[119] *See* Roger A. Morin, *The New Regulatory Finance* ch 16 (2006) for a summary of the comprehensive and rigorous empirical studies of the relationship between cost of capital and leverage for public utilities.

requirements increase between 7.6 and 13.8 basis points for each increase in the debt ratio by one percentage point, and more recent studies indicate that the upper end of that range is more indicative of the repercussions on required equity returns.

The average common equity ratio for Mr. Parcell's sample of electric utilities is 52.5 percent, and the common equity ratio of PSE is 48.50 percent, a difference of 4.0 percent. The above-described research suggests that Mr. Parcell should adjust his recommended ROE upward by approximately 30 basis points (7.6 x 4.00) to 55 basis points (13.8 x 4.00) to reflect PSE's more leveraged capital structure. Mr. Parcell should have adjusted his return on equity upward by 0.30 to 0.55 percent to account for the more leveraged capital structure of PSE. That in itself would bring Mr. Parcell's return on equity recommendation from 9.20 percent to a range of 9.50 to 9.75 percent from this correction alone.

D. Mr. Parcell's Criticisms of My Direct Testimony are Unfounded, are Without Merit, and Should be Ignored by the Commission

1. DCF Growth Rates

Q. Please comment on Mr. Parcell's criticism of your DCF analysis.

A. Mr. Parcell takes issue with the fact that my direct testimony has used only one indicator of growth in the DCF analysis—analyst growth projections—and did not include historical and projected growth rates in dividends and book value.[120]

[120] *See* Parcell, Exh. DCP-1T, at 41:18-21.

Because earnings growth drives dividend growth and because of the scarcity of dividend forecasts, I have ignored dividend growth and focused on earnings instead. After all, it is earnings that are the driving force behind dividends.

Section II.D.1 of this rebuttal testimony discussed the merits of using consensus analysts' earnings growth forecasts in the DCF model and the supportive empirical literature, and I do not repeat the discussion here. Briefly, historical growth patterns are already embedded in analyst growth forecasts, and the finance literature strongly supports the use of such forecasts.

2. Interest Rate Forecasts

Q. Please comment on Mr. Parcell's assessment of using interest rate forecasts in determining the risk-free rate in the CAPM.

A. Mr. Parcell disagrees with the use of interest rate forecasts in the CAPM and argues that I should have relied on current interest rates.[121] He posits that this is analogous to using current dividend yields in the DCF analysis. I disagree. The use of interest rate forecasts is far more analogous to the use of projected growth rates on which Mr. Parcell relies than on current dividend yields.

As discussed in Section II.D.3 of this rebuttal testimony, given that this proceeding is to provide return on equity estimates for future proceedings, forecast interest rates are far more relevant. Reliance on projected long-term Treasury interest rates is required for the simple reason that investors price

[121] *See* Parcell, Exh. DCP-1T, at 43:18-19.

securities on the basis of long-term expectations, including interest rates. Cost of capital models, including CAPM estimates, are prospective (i.e. forward-looking) in nature and must take into account current market expectations for the future because investors price securities on the basis of long-term expectations, including interest rates.

Q. Did you provide interest rate forecasts in your direct testimony as claimed by Mr. Parcell?

A. I relied on a variety of forecasts including those of Value Line, IHS (formerly Global Insight), the Congressional Budget Office, the Bureau of Labor Statistics, the Economic Report of the President, the 2019 White House budget, and the U.S. Energy Information Administration which all project higher long-term Treasury bond rates in the future.

Mr. Parcell suggests that little weight should be accorded to interest rate forecasts because they are often wrong, implying that they should not be used as proxies for the risk-free rate in implementing financial models.[122] By analogy, both Mr. Parcell and I rely on analyst growth forecasts, which often turn out to be wrong as well, in our DCF growth rate analyses.

To be clear, I relied on projected long-term Treasury interest rates for the simple reason that investors price securities on the basis of long-term expectations, including interest rates. Cost of capital models, including the CAPM, are

[122] *See* Parcell, Exh. DCP-1T, at 43:8-17.

prospective (i.e. forward-looking) in nature and must incorporate current market expectations for the future because investors price securities on the basis of long-term expectations, including interest rates. The important factor is not whether interest rate forecasts are accurate but whether or not they are incorporated in stock prices and investor expectations.

3. Market Risk Premium Calculation

Q. Please respond to Mr. Parcell's criticism of your market risk premium calculation in the CAPM.

A. Mr. Parcell argues that I have incorrectly used "income returns" from the Duff & Phelps study rather than total returns when calculating historical risk premiums.[123] I was surprised with this criticism given that the Duff & Phelps study recommends the use of income returns when calculating historical risk premiums. As Duff & Phelps explains,[124] only the annual cash payments associated with government bonds are truly risk free, and income returns are therefore appropriate for calculating the market risk premium. To calculate the market risk premium using total returns on long-term government bonds is erroneous because such returns include capital appreciation returns resulting from interest rate fluctuations and are therefore risky. Thus, only historical income returns accurately reflect the risk-free rate of interest expected by investors when investing in long term government bonds.

[123] *See* Parcell, Exh. DCP-1T, at 45:6-9.

[124] *See* Duff & Phelps 2019 Valuation Handbook, note 63, *infra*, at 10-22.

For reasons discussed in Section II.C.2.b of this rebuttal testimony, I also disagree with Mr. Parcell's suggestion that I should have used geometric average returns.[125] As previously stated, only arithmetic average returns are relevant when measuring the cost of equity.

4. Empirical CAPM

Q. Do you have any comments regarding Mr. Parcell's concerns with your Empirical CAPM analysis?

A. Yes. On Mr. Parcell states that "the ECAPM does not use the actual betas of the proxy companies, but rather calculates hypothetical betas."[126] This is totally incorrect. The ECAPM uses the usual Value Line betas as the CAPM does. Mr. Parcell's concern with the ECAPM analysis arises from his confusing the adjustment of beta with the empirical CAPM. As discussed in the Eighth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-9, there is considerable academic and regulatory support for the use of the ECAPM. As explained in my direct testimony and supporting exhibit, it is essential to take into account the reality that the empirical Security Market Line described by the traditional CAPM is not as steeply sloped as the predicted Security Market Line. Contrary to Mr. Parcell's claim that the ECAPM is a beta adjustment, the empirical CAPM is thus a return adjustment which accounts for this reality and is

[125] *See* Parcell, Exh. DCP-1T, at 45:12-15.

[126] *Id.* at 46:1-3.

not an adjustment to beta which is an x-axis adjustment accounting for regression bias.

5. Risk Premium Methodology

Q. How do you respond to Mr. Parcell's disagreement with the risk premium methodology because economic conditions today are different and risk premiums are unstable from year to year?

A. Mr. Parcell critiques the risk premium method on two grounds: (i) the method assumes that past is prologue,[127] and (ii) the method assumes that the risk premium is constant over time whereas in fact the risk premium results are dominated by the influence of capital gains in many years.[128]

The first criticism is unwarranted. I employed returns realized over long time periods rather than returns realized over more recent time periods. Realized returns can be substantially different from prospective returns anticipated by investors, especially when measured over short time periods. A risk premium study should consider the longest possible period for which data are available. Short-run periods during which investors earned a lower risk premium than they expected are offset by short-run periods during which investors earned a higher risk premium than they expected. Only over long time periods will investor return

[127] *See* Parcell, Exh. DCP-1T, at 47:5-14.

[128] *See id.* at 51:18 – 52:8.

expectations and realizations converge, or else, investors would never commit any funds.

I have ignored realized risk premiums measured over short time periods because they are heavily dependent on short-term market movements. Instead, I have relied on results over periods of enough length to smooth out short-term aberrations, and to encompass several business and interest rate cycles. By using the entire study period to estimate the appropriate market risk premium, subjective judgment is minimized and many diverse regimes of inflation, interest rate cycles, and economic cycles spanned.

Mr. Parcell's second concern is also unwarranted. The influence of unexpected capital losses offsets the influence of unexpected capital gains. To the extent that the estimated historical equity risk premium follows what is known in statistics as a random walk, one should expect the equity risk premium to remain at its historical mean. Thus, the best estimate of the future risk premium is the historical mean.

E. Mr. Parcell's Return on Equity Recommendation is Understated

Q. What do you conclude from Mr. Parcell's return on equity recommendation?

A. Mr. Parcell's recommended return on equity is understated.

Recognition of the proper functional form of the DCF model (10 basis points or 0.1 percent), the use of analysts' growth forecasts in the DCF analysis (60 basis points or 0.60 percent), the use of a forecast risk-free rate in the CAPM analysis

(167 basis points or 1.67 percent), and the appropriate market risk premium in the CAPM analysis (74 basis points or 0.74 percent), would suggest much higher returns on equity that are quite close to my own recommended return on equity of 9.5 percent in this rebuttal testimony. Moreover, Mr. Parcell did not account for PSE's more leveraged capital structure relative to that of his first peer group.

I have replicated below the final results of Mr. Parcell's three return on equity analyses from page 38 of his testimony:

Table 4. Mr. Parcell's Original Results

	Midpoint	Range
DCF	8.35%	7.8% – 8.9%
CAPM	5.55%	5.5% – 5.6%
CE	9.50%	9.0% – 10.0%

I summarize below the final results of Mr. Parcell's three return on equity analyses amended for the aforementioned understatements: a total of 60 basis points (i.e., 0.6 percent) for the DCF results and a total of 298 basis points (i.e., 2.98 percent) for the CAPM results. The amended results produce a range of between 9.0 and 10.0 percent, which encompasses my own return on equity recommendation of 9.5 percent in this rebuttal testimony. Adding a further 30 – 55 basis points in order to recognize PSE's more leverage capital structure relative to its peers, Mr. Parcell's amended range becomes 9.30 – 10.55 percent, with a midpoint of 9.9 percent, which is higher than the 9.5 percent recommended in this rebuttal testimony and the 9.8 percent

recommended in the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T.

Table 5. Mr. Parcell's Amended Results

	Midpoint	Range
DCF	8.95%	8.4% – 9.5%
CAPM	8.53%	8.3% – 8.4%
CE	9.50%	9.0% – 10.0%

IV. UPDATED ANALYSES

Q. What is the purpose of this section of this prefiled rebuttal testimony?

A. The purpose of this section of this prefiled rebuttal testimony is to update the return on equity recommendation in view of the appreciable changes that have occurred in capital market conditions since the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T, was filed on June 20, 2019.

Q. Please describe the behavior of stock prices and interest rates since the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-1T, was filed on June 20, 2019.

A. In short, stock prices have increased and forecast interest rates have decreased. As seen from Table 6 below and shown in the accompanying exhibits, the DCF results for the electric utilities have decreased in response to higher stock prices (lower dividend yields) and lower expected growth rates.

The level of U.S. Treasury 30-year long-term bond yield forecast is 3.9 percent, versus 4.2 percent as of June 20, 2019. This slight decrease in forecast interest

rates lowers the CAPM, ECAPM, Historical Risk Premium, and Allowed Risk Premium results in my direct testimony by 30 basis points (4.2% - 3.9% = 0.30%).

Q. What has happened to electric utility betas since you prepared your direct testimony in this proceeding?

A. Electric utility betas have decreased very slightly from 0.60 to 0.59, thus slightly lowering the CAPM and ECAPM results.

Q. Has the market risk premium changed since you prepared your direct testimony?

A. Yes, the market risk premium has increased slightly from—7.4 percent to 7.8 percent—in response to the lower level of forecast interest rates. This partially offsets the decrease in interest rates in the CAPM and ECAPM analyses.

Q. Please summarize your updated results from the various methodologies.

A. The net result of these capital market changes is a net decrease in the cost of common equity. Alongside the original results, the updated cost of common equity estimates as of December 2019 are summarized in Table 6 below.

Table 6. Return on Equity Results of Dr. Roger A. Morin

Methodology	Direct Testimony	Rebuttal Testimony
CAPM	8.9%	8.5%
Empirical CAPM	9.6%	9.3%
Historical Risk Premium Electric Utility Industry	10.3%	10.0%
Allowed Risk Premium	10.4%	10.2%
DCF Elec Utilities Value Line Growth	9.7%	9.3%
DCF Elec Utilities Analyst Growth	8.3%	8.2%

The updated average result from the analyses presented in Table 6 above is 9.3 percent. If one were to remove the outlying result of 8.2 percent, the average result is 9.5 percent.

Q. Have you prepared exhibits to this prefiled rebuttal testimony that support these updated analyses?

A. Yes. Please see the following:

(i) The Second Exhibit to the Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-14, presents an updated DCF analysis using Value Line growth projections for the twenty companies in PSE's proxy group. Please note that this exhibit updates the Fourth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-5, filed on June 20, 2019.

(ii) The Third Exhibit to the Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-15, for an updated DCF analysis using analysts' consensus growth forecasts for the twenty companies in PSE's proxy group. Please note that this exhibit updates the Fifth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-6, filed on June 20, 2019.

(iii) The Fourth Exhibit to the Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-16, for updated beta estimates of the proxy group for PSE. Please note that this exhibit updates the Sixth Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-7, filed on June 20, 2019.

(iv) The Fifth Exhibit to the Prefiled Rebuttal Testimony of Dr. Roger A. Morin, Exh. RAM-17, for a prospective DCF analysis to the dividend-paying stocks that make up the S&P 500 index using Value Line's screening software. Please note that this exhibit updates the Seventh Exhibit to the Prefiled Direct Testimony of Dr. Roger A. Morin, Exh. RAM-8, filed on June 20, 2019.

V. CONCLUSION

Q. Has the testimony of Dr. Woolridge or Mr. Parcell caused you to revise your analyses or change your recommended return on equity for PSE?

A. None of the testimony of Dr. Woolridge or Mr. Parcell, caused me to revise my analyses or change my recommended return on equity for PSE. Based on current capital market conditions and the application of my professional judgment, however, it is my opinion that a just and reasonable return on the common equity capital of PSE's electric utility operations in the State of Washington is 9.5 percent.

Q. Does this conclude your rebuttal testimony?

A. Yes.