BEFORE THE

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION Complainant, v. NORTHWEST NATURAL GAS COMPANY, Respondent.	DOCKET UG-_____

NORTHWEST NATURAL GAS COMPANY

Direct Testimony of Dr. Bente Villadsen

RATE OF RETURN ON EQUITY

Exh. BV-1CT

REDACTED VERSION

December 18, 2020

DIRECT TESTIMONY OF DR. BENTE VILLADSEN

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I. INTRODUCTION

Q1: Please state your name, occupation, and business address for the record.

A1: My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts, 02108.

Q2: Briefly describe your education and professional qualifications.

A2: I have more than 20 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance, and accounting issues. I am the co-author of the text, "Risk and Return for Regulated Industries" and a frequent speaker on regulated finance at conferences and webinars. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, Michigan, New Mexico, New York, Oregon, and Washington, as well as before the Bonneville Power Administration, Federal Energy Regulatory Commission ("FERC"), the Surface Transportation Board, the Alberta Utilities Commission, the Ontario Energy Board, and Mexico's Comisión Reguladora de Energía. I have provided white papers on cost of capital to the regulators in Australia, Canada, and Europe. I have testified or filed testimony on regulatory accounting issues before FERC, the Regulatory Commission of Alaska, the Michigan Public Service Commission, the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management.

I hold a Ph.D. from Yale University and as BS/MS from University of Aarhus, Denmark. Exhibit BV-2 (Exh. BV-2) contains more information on my professional qualifications as well as a list of my prior testimonies and publications.

Q3: What is the purpose of your testimony in this proceeding?

A3: Northwest Natural Gas Company d/b/a/ NW Natural ("NW Natural" or the "Company") has asked me to estimate the cost of equity that the Washington Utilities and Transportation Commission (the "Commission") should allow NW Natural an opportunity to earn on the equity financed portion of its regulated gas utility rate base in Washington for the period beginning November 1, 2021 to coincide with the effective date of the annual Purchased Gas Adjustment ("PGA") rate change. I also consider the relative risk of the Company and its proposed regulatory capital structure ratio to arrive at my recommendation for the allowed Return on Equity ("ROE").

II. SUMMARY OF CONCLUSIONS

Q4: Do you have any preliminary comments regarding the appropriate ROE?

A4: The current determination of NW Natural's allowed ROE takes place during uncertain economic and financial conditions due to the ongoing impacts of the COVID-19 pandemic, which has led to unprecedented low U.S. Treasury bond yields, substantial stock and commodity price declines, while at the same time measures of volatility spiked to all-time highs and remain elevated compared to long-term averages. Measures of the premium that investors require over and above the risk-free rate to invest in equities and bonds have increased as well. Going forward, the length and extent of the impacts of the pandemic are not known and will depend on how measures impacting commerce stay in place and when a vaccine becomes widely available.[1] In light of this uncertainty, it is important to assure investors that the allowed ROE and

[1] I acknowledge that all of society has been impacted to a degree not seen in decades, but I focus my discussion on the financial and economic impacts in this report.

capital structure is such that NW Natural can continue to raise the needed capital to continue to provide safe, adequate and reliable service to its customers, while also providing a return that is comparable to those that investors expect.

NW Natural's allowed ROE in its most recent approved Washington rate case dated October 21, 2019[2] was determined in an all-party settlement at 9.4 percent approved by the Commission. At that time, the Chicago Board of Options Exchange's CBOE Volatility Index ("VIX") was 14.0 whereas just a few months later on March 16, 2020, the VIX reached an all-time high of 82.69 and has remained at an elevated level since then. The VIX is currently at 23.84 and has averaged approximately 30.15 in 2020 (to November 18).[3] Similarly, Bloomberg's estimation of the market risk premium ("MRP") was at 7.0 percent in October 2019 and reached a high of 9.8 percent in March 2020 and is currently at 7.69 percent.[4] Simply put, the financial markets are in extreme turmoil, which has had negative impacts on investors, not just in terms of returns but also with regard to volatility and risk. However, it is important to look to stability in investors' allowed returns and recognize that the currently low Treasury yields are not reflective of a low cost of equity. Specifically, the data points to a higher return on equity today than at the time of the implementation of NW Natural's prior Commission-approved rate case settlement in October 2019. That is, if we assume that 9.4 percent was appropriate in October 2019, then the ROE estimated today must be

[2] Washington Utilities and Transportation Commission v. Northwest Natural Gas d/b/a NW Natural, Docket UG-181053, Order 06 (Oct. 21, 2019).

[3] Bloomberg, as of November 18, 2020.

[4] *Id*., measured over a 10-year bond.

higher. I provide more discussion of the current capital market conditions and their impact on the ROE for NW Natural in Washington in Section IV.

When evaluating the cost of equity, it is also important to consider business risks as long-term development for natural gas distribution utilities, such as NW Natural. These long-term business risks have become more uncertain. While cities within NW Natural's Washington service territory have not imposed bans on gas hook-ups, cities such as Berkeley, California, have imposed bans on natural gas hook-ups in new buildings. At the same time, the construction of natural gas infrastructure has become increasingly challenging, which makes the natural gas utility industry face higher risks. I further discuss how these and other business risk factors affect the cost of equity in Section VI.

Q5: Please summarize your recommendations for NW Natural's ROE.

A5: I find a lower bound for NW Natural's cost of equity is the ROE granted most recently, 9.4 percent, and an upper bound of is 10.25 percent on 49 percent equity and recommend conservatively that NW Natural's cost of equity is 9.9 percent at the requested 49 percent equity capital structure.[5] The recommendation is based on my finding that a reasonable range for gas local distribution companies ("LDCs") cost of equity is in the range of slightly below 9½ to 10¼ percent and reflects NW Natural's business risk. This recommendation is based on my implementation of standard cost of capital estimation models including two versions each of the Discounted Cash Flow ("DCF") model and the Capital Asset Pricing Model ("CAPM"), as well as an Implied

[5] I note that in the Direct Testimony of Zachary Kravitz (Exh. ZDK-1T), NW Natural is requesting a ROE of 9.4 percent.

Risk Premium analysis and an analysis of NW Natural's business risk. Figure 1 below summarizes the model results using the requested 49 percent equity capital structure. The table also presents the corresponding reasonable ranges, which I discuss further in Section V below. Based on my consideration of the results from the various cost of capital estimation models as well as the context of Washington and NW Natural's specific risk, I believe it is appropriate to place NW Natural's allowed return in the upper half of the reasonable ranges.

Figure 1: Summary of Reasonable Ranges of Estimates at 49% Equity

	Gas Sample	**Full Sample**
CAPM/ ECAPM	9.5% - 10.25%	9.5% - 10.0%
DCF	9.9% (9.5% – 10.25%)	8.7% - 9.9%
Risk Premium	9.3% - 9.5%	N/A

Note: Full sample considers both natural gas and water proxy companies

Using NW Natural's requested 49 percent equity capital structure, I find a range of about 9.4 percent to 10.25 percent rate of return on equity to be within a reasonable range using a sample of regulated natural gas distribution utilities. Consequently, a lower bound on NW Natural's cost of equity is that currently allowed. I further support that range by using a sample of highly regulated water utilities, which confirm the reasonable range of estimates. In the current environment, where there has been considerable consolidation of the natural gas industry and regulatory initiatives to switch from natural gas to alternative sources of energy, I find it beneficial to confirm the estimates by additional companies using a sample of highly regulated water utilities

that are in my opinion the closest to a gas LDC sample. I provide a further explanation in Section V below.

Q6: Given your recommendation to set the Company's ROE at 9.9 percent, how do you view the Company's proposal to maintain its current Commission approved ROE of 9.4 percent?

A6: Based on my understanding of NW Natural's proposal, the Company is taking the unusual step of seeking to establish the Company's ROE at the lowest point on my recommended range of ROE at 9.4 percent to maintain its most recently approved ROE. While this is unusual for a utility to divert from my recommended ROE – in this case 9.9 percent – these are unusual times, and I understand the broader context of NW Natural's decision. The COVID-19 pandemic is an extraordinary event that has reshaped most of our lives, and many have faced health and financial hardships that could never be anticipated just one year ago. The Company's requested ROE of 9.4 percent seeks to limit the rate impact of this rate case on its customers by proposing the lowest ROE on my recommended range, which would maintain its current ROE through the Company's rate plan and until its next rate case. While in my expert witness capacity, I would not recommend utilizing the lowest point of my range, I recognize the Company's proposal is based on factors outside of my analysis. Finally, the Company's proposal is still within my recommended range, and thus supported by my testimony.

Q7: How is the remainder of your testimony organized?

A7: Section III formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section IV discusses conditions

and trends in capital markets and their impacts on the cost of capital. Section V explains my analyses and presents the results. Section VI discusses NW Natural's business risk characteristics, unique risks facing Washington-based natural gas utilities and other business risks specific to NW Natural that are relevant to my recommended allowed ROE. Finally, Section VII concludes with a summary of my recommendations.

III. COST OF CAPITAL PRINCIPLES AND APPROACH

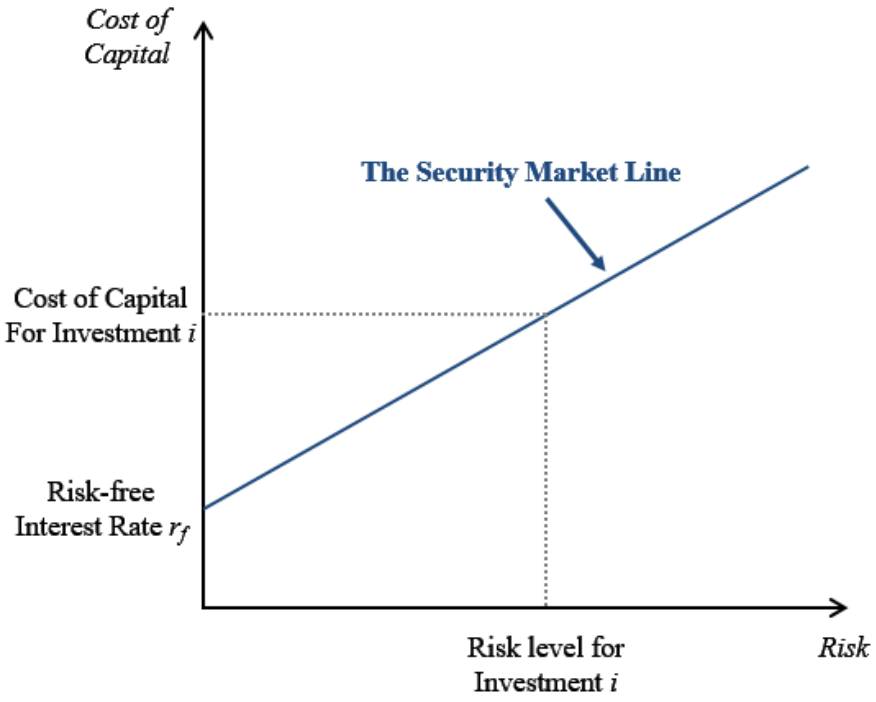
A. Risk and the Cost of Capital

Q8: How is the "Cost of Capital" defined?

A8: The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Put differently, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 2 below. The higher the risk, the higher the cost of capital required.

Figure 2: The Security Market Line



Q9: What factors contribute to systematic risk for an equity investment?

A9: When estimating the cost of equity for a given asset or business venture, two categories of risk are important. The first is business risk, which is the degree to which the cash flows generated by the business (and its assets) vary in response to moves in the broader market. In context of the CAPM, business risk can be quantified in terms of an "assets beta" or "unlevered beta." For a company with an assets beta of 1, the value of its enterprise will increase (decrease) by 1 percent for a 1 percent increase (decline) in the market index.

The second category of risk relevant for an equity investment depends on how the business enterprise is financed and is called financial risk. Section B below explains how financial risk affects the systematic risk of equity.

Q10: What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A10: The seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases,[6] which found that:

- The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[7]
- The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
- The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[8]

Q11: How does the standard for a just and reasonable allowed rate of return relate to the cost of capital?

A11: The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly aligned with the financial concept of the opportunity cost of capital.[9] The cost of capital

[6] Bluefield Water Works & Improvement Co. v. Public Service Com'n of West Virginia, 262 U.S. 679 (1923)("Bluefield"), and Federal Power Com'n v. Hope Natural Gas Co., 320 U.S. 591 (1944) ("Hope").

[7] Hope, 320 U.S. at 603.

[8] Bluefield, 262 U.S. at 680.

[9] A formal link between the opportunity cost of capital as defined by financial economics and the proper expected rate of return for utilities was developed by Stewart C. Myers, "Application of Finance Theory to Public Utility Rate Cases," Bell Journal of Economics & Management Science 3:58-97 (1972).

is the rate of return investors can expect to earn in capital markets on alternative investments of equivalent risk.[10]

By investing in a regulated utility asset, investors are tying up some capital in that investment, thereby foregoing alternative investment opportunities. Hence, the investors are incurring an "opportunity cost" equal to the returns available on those alternative investments. The allowed return on equity needs to be at least as high as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead. If it is not, the utility's ability to raise capital and fund its operations will be negatively impacted. This is a fundamental concept in cost of capital proceedings for regulated utilities such as NW Natural.

Q12: Please summarize how you considered risk when estimating the cost of capital.

A12: To evaluate comparable business risk, I looked to a proxy group of regulated natural gas and water utilities. The natural gas and water utilities I consider have a high proportion of regulated assets and revenue with the majority having more than 80 percent of assets subject to regulation. Additionally, they all have a network of assets that are used to serve end-use customers and they are capital intensive (meaning that each dollar in revenue requires substantial investment in fixed assets). Further (as explained in Section B below), I analyzed and adjusted for differences in financial risk due to different levels of financial leverage among the proxy companies and between the capital structures of the proxy companies and the regulatory capital structure that

[10] The opportunity cost of capital is also referred to as simply the "cost of capital," and can be equivalently described in terms of the "required return" needed to attract investment in a particular security or other asset (i.e., the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

will be applied to NW Natural for ratemaking purposes. To determine where in the estimated range of NW Natural's ROE reasonably falls, I compared the business risk of NW Natural to that of the proxy group companies.

B. Financial Risk and the Cost of Equity

Q13: How does capital structure affect the cost of equity?

A13: Debt holders in a company have a fixed claim on the assets of the company and are paid prior to the company's owners (equity holders) who hold the inherently variable residual claim on the company's operating cash flows. Because equity holders only receive the profit that is left over after the fixed debt payments are made, higher degrees of debt in the capital structure amplify the variability in the expected rate of return earned by equity-holders. This phenomenon of debt resulting in financial leverage for equity holders means that, all else equal, a greater proportion of debt in the capital structure increases risk for equity holders, causing them to require a higher rate of return on their equity investment, even for an equivalent level of underlying business risk.

Q14: How do differences in financial leverage affect the estimation of the cost of equity?

A14: The DCF models and the CAPM rely on market data to estimate the cost of equity for the proxy companies, so the results reflect the value of the capital that investors hold during the estimation period (market values).

The authorized ROE is applied to the regulatory equity portion of NW Natural's rate base. Because the cost of equity is measured using a group of proxy companies, it may well be the case that these companies finance their operations with a different debt

and equity proportion than the proportion the Commission allows in NW Natural's rate base. Specifically, the DCF models (and the CAPM) measure the cost of equity using market data and consequently are measures of the cost of equity using the proportion of debt and equity that is inherent in that data. Therefore, I consider the impact of any difference between the financial risk inherent in those cost of equity estimates and the capital structure used to determine NW Natural's required return on equity.

Differences in financial risk due to the different degree of financial leverage in NW Natural's regulatory capital structure compared to the capital structures of the proxy companies mean that the equity betas measured for the proxy companies must be adjusted before they can be applied in determining NW Natural's return on equity. Similarly, the cost of equity measured by applying the DCF models to the proxy companies' market data requires adjustment if it is to serve as an estimate of the appropriate allowed ROE for NW Natural at the regulatory capital structure the Commission grants.

Importantly, taking differences in financial leverage into account does not change the value of the rate base. Rather, it acknowledges the fact that a higher degree of financial leverage in the regulatory capital structure imposes a higher degree of financial risk for an equity investment in NW Natural's rate base than is experienced by equity investors in the market-traded stock of the less leveraged proxy companies.

Q15: How specifically do you consider financial risk in your analysis using market data for the proxy group companies?

A15: The impact of financial risk is taken into account in an analysis of cost of equity using market-based models such as the DCF and CAPM in several manners.[11] One way is to determine the after-tax weighted-average cost of capital for the proxy group using the equity and debt percentages as the weight assigned to the cost of equity and debt. Financial theory holds that for a given level of business risk, the weighted average cost of capital is constant over a broad set of capital structures, i.e., the weighted average cost of capital is the same at, for example, 55 and 45 percent equity, as the cost of equity increases as the percentage of equity decreases. I estimate the weighted cost of capital for each utility in the proxy group based on that utility's capital structure. I then evaluate the average weighted cost of capital across the proxy group. Once the weighted cost of capital is determined for the proxy group, I can then determine the cost of equity that is required at NW Natural's capital structure. This approach assumes that the after-tax weighted average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.

A second approach was developed by Professor Hamada, who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structures using beta. Specifically, in the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity

[11] The impact of financial leverage on the risk premium model needs to be considered separately as it uses regulatory data rather than market data, meaning that differences in regulatory capital structures are relevant for this model.

financed firm to obtain a so-called all-equity or assets beta and then re-lever the beta to determine the beta associated with the regulatory capital structure. This requires an estimate of the systematic risk associated with debt (i.e., the debt beta), which is usually quite small. In Exhibit BV-3 (Exh. BV-3), I set forth additional technical details regarding the methods that can be used to account for financial risk when estimating the cost of capital.

Q16: Can you provide a numerical illustration of how the cost of equity changes, all else being equal, when the degree of leverage changes?

A16: Yes. I constructed a simple example below, where only the leverage of a company varies. I assumed the return on equity is 11.00 percent at a 50 percent equity capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45 percent.

Figure 3: Illustration of the Impact of Financial Risk on ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b]	$500	$450
Debt	[c]	$500	$550
Total Cost of Capital (8%)	[d] = [a] × 8%	$80.0	$80.0
Cost of Debt (5%)	[e] = [c] × 5%	$25.0	$27.5
Equity Return	[f] = [d] - [e]	$55.0	$52.5
Rate of Return on Equity (ROE)	**[g] = [f] / [b]**	**11.00%**	**11.67%**

Figure 3, above, illustrates how financial risk[12] affects returns and the ROE. The overall return remains the same for Company A and B at $80. But Company B with

[12] Financial risk is risk that a company has due to its capital structure; specifically, the higher a company's debt, the larger the financial risk.

the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk to equity investors caused by the higher degree of leverage. Importantly, regardless of the equity percentage, customers will pay $80 in capital costs – the only difference between the two companies is how that $80 is sourced between equity and debt holders.

The principle illustrated in Figure 3 is an example of the first adjustment I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to NW Natural.

Q17: Does this approach apply to the risk premium analysis?

A17: Yes, to the extent that there are differences between the capital structures of the companies used to determine the benchmark ROE and NW Natural, I need to consider whether I am comparing apples to apples. However, because the allowed ROE usually applied to book value capital structures, it is the book value capital structure that is relevant for the risk premium method. Further, the average book value capital structure for natural gas utilities for which I have allowed ROE data for, the past has been close to that of NW Natural, I do not need to make any adjustments to the estimated ROE. I note, however that for 2020, the average and median allowed equity percentage was 52.2 percent and 52.9 percent, respectively.[13] Given NW Natural's lower than average or median equity percentage, the Company's ROE ought to exceed that of the average and median, all else equal.

[13] S&P Global Market Intelligence, "Rate Case History" Online version as of October 1, 2020.

C. Approach to Estimating the Cost of Equity

Q18: Please describe your approach for determining the cost of equity for NW Natural.

A18: As stated above, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for NW Natural focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by NW Natural. Because certain models require market data, my consideration of comparable companies is restricted to those that have publicly traded stock. To this end, I have selected two proxy groups consisting of publicly traded companies. The first proxy group consists of companies providing primarily regulated natural gas distribution services and the second proxy group consists of highly regulated companies in the water utility industry.[14] I consider both the natural gas distribution sample and the full sample when deriving estimates of the representative cost of equity according to standard financial models, including two versions of the DCF.

[14] I consider both a natural gas distribution utility sample (because NW Natural is a natural gas distribution utility) and a sample including water utilities. The latter sample has the advantage of being highly regulated and, like gas distribution utilities, being engaged in distributing a commodity through an extensive network of pipes. Additionally, there is no substitute for water, while there are initiatives to substitute gas for renewable sources. As a result, the estimates from water companies are less influenced by individual state policies or changing federal policies than those of the natural gas companies – i.e., they reflect to a larger degree the fundamental risks of regulated utilities. Lastly, the number of companies in the natural gas distribution industry has been reduced due to mergers and acquisitions, so the water utility industry serves to increase the number of available, fully regulated utilities that serve customers through a network of pipes.

I also perform an analysis of historical allowed ROEs for gas LDCs in relation to prevailing risk-free interest rates at the time the ROE was authorized, and use the implied allowed risk-premium relationship to estimate a utility cost of equity consistent with current economic conditions. The results of this implied risk premium analysis (sometimes referred to herein as the "Risk Premium" model) are an additional consideration that supports my recommendation and serves as a check on the reasonableness of my market-based results.

IV. CAPITAL MARKET CONDITIONS AND THE COST OF CAPITAL

Q19: What do you cover in this section?

A19: In this section, I address recent changes in capital market conditions, the increased volatility in equity and debt markets, how these factors affect the cost of equity and its estimation. Specifically, I address (i) interest rate developments; (ii) recent changes in utility credit spreads; and (iii) investors perception of the market risk premium.

Q20: Why do you discuss capital market conditions in a testimony aimed at determining NW Natural's ROE?

A20: Capital market conditions are important to cost of equity estimation methodologies and can affect the inputs to the cost of equity models. Inputs to the DCF models are affected by the economy in general as economic growth will affect growth rates and utility stock prices. Consequently, the capital market developments affect the growth rates, dividend yield, and the assessment of estimates' reasonableness.

Furthermore, the risk-free rate is an input to the risk premium model and CAPM, so that recent and expected developments in government bond yields are important to assess the validity of any measure of the risk-free rate. Similarly, the MRP

is an input to the CAPM, so factors that affect the MRP (e.g. volatility and changes in investors' risk perceptions) are vital for accurate determination of the ROE.

Q21: Can you provide a summary of recent events, which have impacted capital market conditions?

A21: Capital markets have seen historic changes since NW Natural's last rate case in Washington was effective in November 2019. Starting in January 2020, long-standing trade tensions that were weighing on the economy began to ease. The U.S. signed Phase 1 of the U.S.-China Trade Agreement and also the United States-Mexico-Canada Agreement ("USMCA"). However, around the same time, a novel virus was beginning to spread in China and Europe. By March 2020, the World Health Organization declared that the COVID-19 outbreak was a pandemic. Many governments around the world, including in the U.S., sought measures to limit the health and economic impacts from the pandemic. By mid-March, local and state governments began issuing stay-at-home orders and major portions of the U.S. economy were shut down. As a result, over 65 million people in the U.S. have filed initial unemployment claims since March 21.[15] To help mitigate the economic impacts, the U.S. Federal Government passed the $2.1 trillion CARES Act on March 27, 2020.[16] The U.S. Federal Reserve also cut its policy rate to 0 to 0.25 percent and announced "unlimited" quantitative easing and emergency

[15] U.S. Department of Labor, "Unemployment Insurance Weekly Claims," New Release, November 12, 2020.

[16] The White House, "Statement by the President," March 27, 2020, accessed October 2, 2020, https://www.whitehouse.gov/briefings-statements/statement-by-the-president-38/.

liquidity programs to support financial markets.[17] Despite this, the U.S. economy contracted substantially in the first half of 2020. According to the Bureau of Economic Analysis ("BEA") first and second quarter 2020 GDP decreased by annualized rate of 5.0 percent and 31.4 percent, respectively.[18] By June 2020, the National Bureau of Economic Research declared the U.S. was in a recession. As of September 2020, the U.S. unemployment rate stands at 7.9 percent with permanent job losses at 3.8 million, up 2.5 million since February.[19]

Q22: What are the expectations going forward?

A22: The extent and length of the economic and financial impacts from COVID-19 are still unknown. The impacts on the economy and unemployment will depend on how long social-distancing measures are required and how long it takes to develop and distribute a vaccine. Recent surveys by economists, such as in the *Blue Chip Economic Indicators* survey, indicate that the nominal U.S. GDP will decline by 3.0 percent in 2020 before recovery by 5.5 percent in 2021.[20] The Congressional Budget Office expects nominal GDP will contract by 5.7 percent in 2020 before recovery by 6.2

[17] U.S. Federal Reserve, "Federal Reserve Announces Extensive New Measures to Support the Economy," Press Release, March 23, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm.

[18] Bureau of Economic Analysis, "Gross Domestic Product, 2nd Quarter 2020 (Third Estimate); Corporate Profits, (Revised), U.S. Department of Commerce, September 30, 2020. Accessed October 2, 2020, https://www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual.

[19] U.S. Department of Labor, "The Employment Situation – September 2020," News Release, October 2, 2020, https://www.dol.gov/newsroom/economicdata/empsit_10022020.pdf.

[20] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, pp. 2-3.

percent in 2021.[21] Longer term, the forecasted nominal GDP growth remains at a bit over 4 percent,[22] and that is the figure that impacts the cost of equity estimate in the DCF model. In August, the U.S. Federal Reserve announced a policy change whereby they would target inflation at 2 percent *on average* indicating the Federal Reserve may hold interest rates for longer.[23] After their September 2020 meeting, the Federal Reserve released economic projections indicating that policy rates would remain at current levels through 2023.[24] This will likely continue to exert downward pressure on interest rates over the near to medium term. While the length and extent of the economic impacts from COVID-19 are currently unknown, the impacts are expected to persist for some time until a vaccine or some other effective treatment is developed.[25]

Q23: How does this impact the cost of equity estimation for NW Natural?

A23: It is important to remember that the cost of equity and capital structure established for NW Natural in this proceeding is expected to be in effect beyond the current extraordinary impacts of the COVID-19 pandemic. The analysis and recommendations

[21] Congressional Budget Office, "An Update to the Economic Outlook: 2020 to 2030," U.S. Department of Commerce, July 2020. Accessed September 1, 2020, https://www.cbo.gov/publication/56465.

[22] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 14 shows a long-term nominal GDP growth of 4.1 percent. The most recent Congressional Budget Office outlook shows a long-term real growth of 2.2 percent and an inflation rate of 2.0 percent for a nominal growth over 4 percent.

[23] U.S. Federal Reserve, "Federal Open Market Committee announces approval of updates to its Statement on Longer-Run Goals and Monetary Policy Strategy," August 27, 2020, accessed October 2, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200827a htm.

[24] U.S. Federal Reserve, "Table 1. Economic Projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assumptions of projected appropriate monetary policy, September 2020," September 15, 2020, accessed October 2, 2020, https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20200916.pdf.

[25] The Federal Reserve in their September 16, 2020 FOMC statement said, "The ongoing public health crisis will continue to weight on economic activity, employment, and inflation in the near term, and poses considerable risks to the economic outlook over the medium term." https://www.federalreserve.gov/newsevents/pressreleases/monetary20200916a htm.

should reflect expected market conditions that will prevail over the relevant rate period and not exclusively current market conditions. As discussed further below, many of the inputs to the cost of equity estimation methodologies are currently at unprecedented levels. Sole reliance on current economic and financial conditions to estimate NW Natural's cost of equity would unfairly lock NW Natural and their customers into the current economic and financial environment. Doing so would also not provide a fair return, especially when compared to other utilities that did not undergo a cost of capital proceeding during this period. However, the current conditions create an exorbitant amount of uncertainty about the future and, if the financial crisis can be used as a guide, investors' heighted perception of risk are likely to linger.

A. Interest Rates

Q24: How do interest rates affect the cost of equity?

A24: The current interest rate environment affects the cost of equity estimation in several ways. Most directly, the CAPM takes as one of its inputs a measure of the risk-free rate (see Figure 2). The estimated cost of equity using the CAPM decreases (increases) by one percentage point when the risk free rate decreases (increases) by one percentage point. Therefore, to the extent that prevailing government yields are depressed due to economic uncertainties related to COVID-19 or the monetary policy responses, using current yields as the risk-free rate will depress the CAPM estimate below what is representative of the forward-looking cost of equity, which will be in effect during the relevant regulatory period. Put another way, with current government bond yields downwardly biased due to flight-to-quality behavior by investors and "unlimited" quantitative easing programs by the U.S. Federal Reserve, using current yields in the

CAPM will also downward bias the cost of equity estimate. At the same time, a low interest rate is associated with a high market risk premium, so that these two measures offset one another to a degree. To avoid any bias in the cost of equity estimate, it is important to use a forecasted risk-free rate and consider whether the rate needs to be normalized (or the risk premium investors require needs to be adjusted) to ensure the resulting CAPM estimate reflects a non-biased estimate of NW Natural's cost of equity over the relevant regulatory period. As the economy begins to recover, as forecasted, in 2021 interest rates are expected to increase from current lows. Therefore, the allowed fair return on equity for utilities should reflect the future interest rate environment.

Q25: What are the relevant developments regarding interest rates?

A25: Interest rates are currently near historic lows due to flight-to-quality behaviors by investors as well as the Federal Reserve's expansion of its quantitative easing programs. Interest rates on 10-year U.S. Government bonds were at 1.86 percent at the end of 2019.[26] As large parts of the economy began to shut down in response to the pandemic, investors fled riskier assets for safer assets. This demand for U.S. government bonds caused bond yields to decrease rapidly. On March 9, 2020, the entire U.S. yield curve fell below 100 bps for the first time in history and the 10-year U.S. government bond yield hit a record low of 0.339 percent.[27] Since then, long-term

[26] Bloomberg accessed September 1, 2020.

[27] Sunny Oh, "Treasury yield curve sinks below 1% after oil and coronavirus worries rout stocks," *Market Watch*, March 9, 2020, accessed March 31, 2020, https://www marketwatch.com/story/30-year-treasury-yield-tumbles-below-1-after-oil-and-coronavirus-worries-rout-stocks-2020-03-09

government bond yields have increased somewhat—10 year U.S. Government bond yields are currently at 0.85 percent.[28]

Most economists expect the economy to begin to recover in 2021.[29] This is expected to cause interest rates to rise from near-historic lows. Blue Chip Economic Indicators' ("BCEI") October 2020 edition forecasts that the yield on 10-year treasury bonds will increase to 0.9 by 2021.[30] That is, the consensus forecast is that the yield on long-term treasury bonds will increase from current levels of 0.85 percent.[31] BCEI projects the 10-year government bond yield will be 1.4 and 1.7 in 2022 and 2023, respectively (Figure 4).[32] The expectations for 2021 and onward is what is relevant for this proceeding as rates are expected to be in effect starting in November 2021. Because the risk-free rates are an input to several cost of equity estimation models, the relationship between current and forecasted risk-free rates is an important consideration.

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[28] Bloomberg as of November 18, 2020.

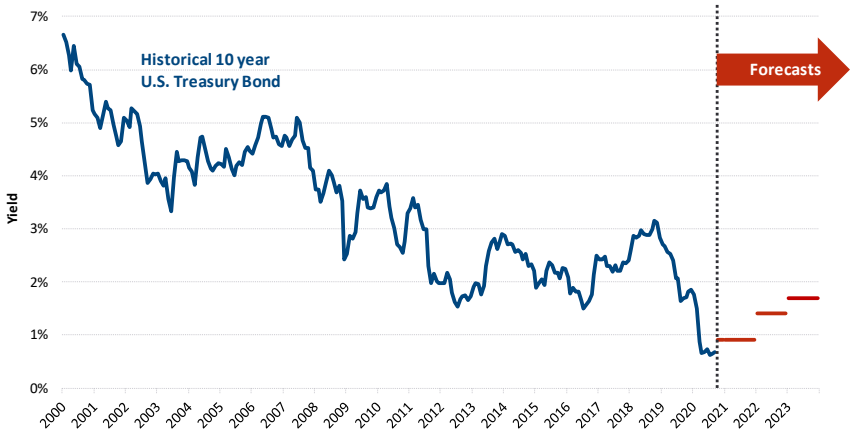
[29] For example, Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020 collects GDP growth data from 40 financial institutions, academic institutions and other entities – all of whom predict a positive growth for 2021 with an average of 5.5 percent.

[30] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 3. The historical maturity premium for a 20-year treasury bond over a 10-year treasury bond is approximately 50 basis points.

[31] Bloomberg, as of November 18, 2020.

[32] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 14.

Figure 4: Historical and Projected Ten-Year Treasury Bond Yields[33]



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators October 2020.

B. Yield Spreads

Q26: Why are bond yield spreads relevant to your cost of equity analysis?

A26: Bond yield spreads (also called credit spreads) reflect the premium that investors demand to hold debt securities (specifically corporate or utility bonds) that are not risk free. Analogously, the Market Risk Premium (MRP)—which is a key input to the CAPM cost of equity estimation—represents the risk premium that investors require to hold equities rather than risk-free government bonds.

If bond yields are influenced to some extent by the same underlying market factors that drive the systematic risk premium for equities, shifts in directly observable credit spreads can assist with inference about changes in the MRP, which itself must be estimated.[34] More specifically, if both credit spreads and equity premiums are determined in part by the general premium required by investors for bearing systematic

[33] Id.

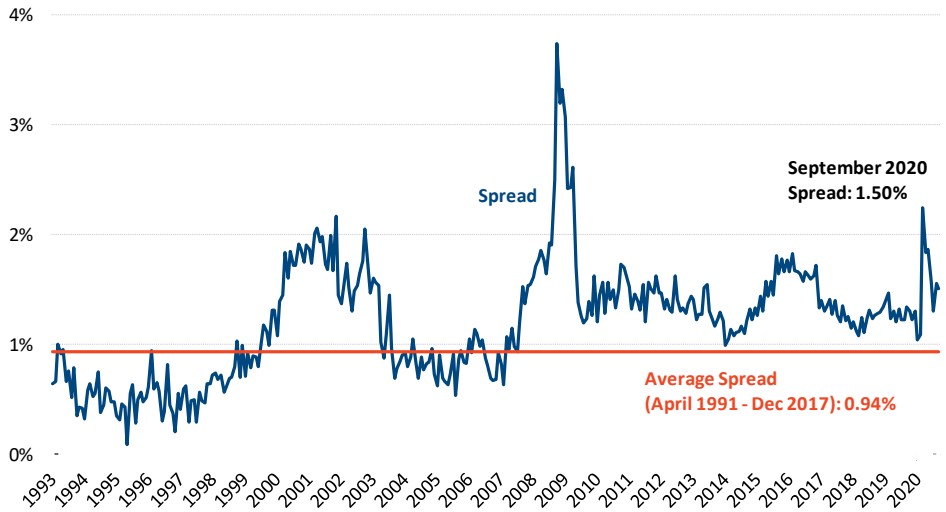
[34] This is the same issue as in cost of capital estimation more generally: the cost of debt can often be directly observed in the form of market bond yields, whereas the cost of equity must be estimated based on financial models.

risk, then an increase in credit spreads may indicate an increase in the forward-looking MRP.

Q27: How does the current spread between utility and U.S. government bond yields compare to historical spreads?

A27: Utility bond yield spreads have increased substantially recently as investors require additional compensation to hold non-government debt due to the increased business risks and economic uncertainties. As shown in Figure 5 below, the spread between 20-year A-rated utility bond yields and 20-year U.S. government bond yields are currently at 1.50 percent, approximately 56 basis points above the pre-financial crisis average of 0.94 percent. I note that the spread increased dramatically in early 2020, but has since declined some.

Figure 5: Yield Spread Between Utility A-rated Bond Yields and 20 Year U.S. Treasury Bonds

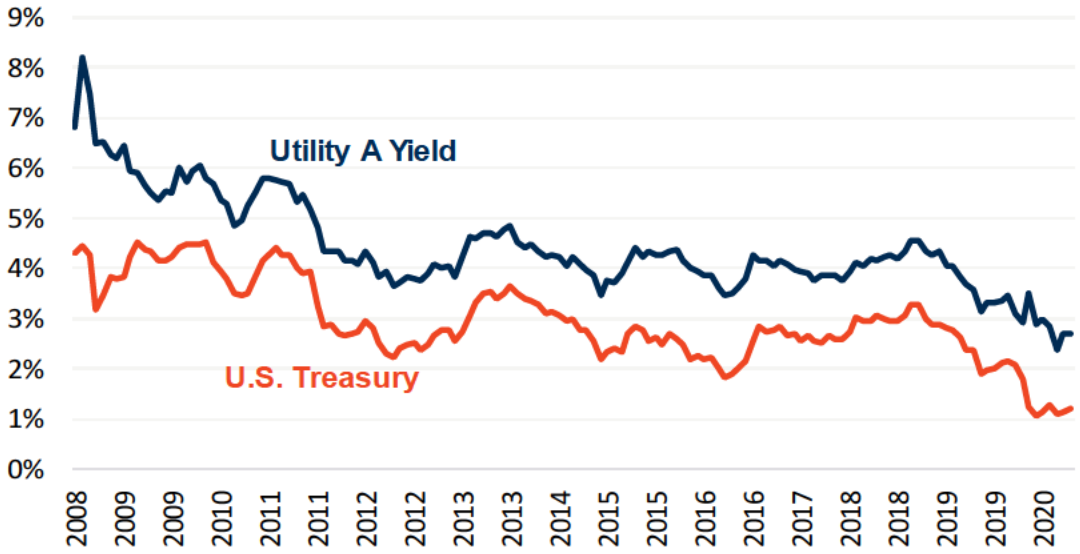


Source: Bloomberg as of 9/30/2020.

The yield spread is commonly thought to be explained by default risk, taxes, downward pressure on government bond yields due to monetary policy, or the equity risk premium. Hence, an increase in the spread could be caused by any or all of these

components. As the default risk has not changed materially for highly rated utility bonds[35] and taxes are a very small portion of the spread, the remaining components: downward pressure and the equity risk premium must explain the majority of the spread increase. Figure 6 below illustrates that the increased spread is attributable both to lower yields on government bonds and also an increased premium required by investors to hold riskier assets.

Figure 6: Utility A-rated Bond Yields and 20 Year U.S. Treasury Yields



Source: Bloomberg, data as of September 30, 2020.

While spreads have narrowed since the height of the COVID-19 pandemic in March and April, they remain elevated compared to the pre-COVID-19 period indicating lingering uncertainty and elevated risk. On April 2, 2020, S&P Global Ratings downgraded the outlook for North American utilities from "stable" to

[35] S&P Ratings reports Utility defaults are down slightly in 2020 versus 2019 year to date. S&P Global Ratings, "Corporate Defaults Slow In The Third Quarter While The Oil and Gas Total Remains High," October 2, 2020.

"negative" due to COVID-19 risks, citing concerns about the adequacy of utilities' financial cushions to weather the financial downturn.[36] With heightened concern about utility credit, spreads and risk premiums are likely to remain elevated.

C. Risk Premiums

Q28: What is the current evidence regarding market volatility?

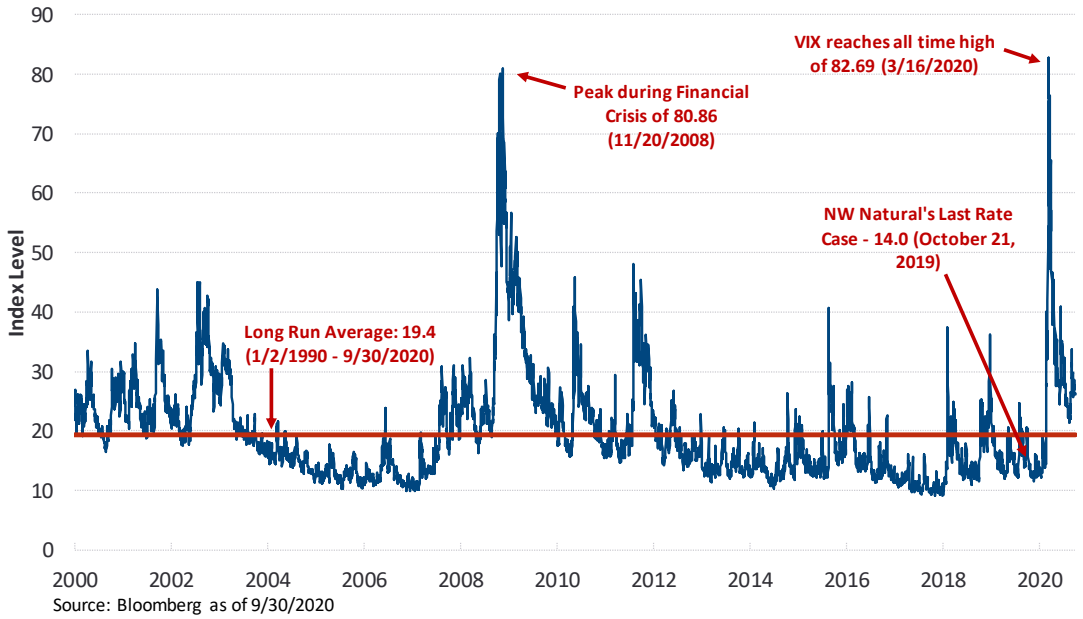
A28: Recently, financial markets have become extremely volatile as shown in near-term common volatility measures, such as the VIX (Figure 7 below), which is frequently referred to as the market's fear index. The VIX reached an all-time high of 82.69 on March 16, 2020, which was higher than the peak of 80.86 during the Financial Crisis. Although the VIX has slowly retreated from recent highs to 23.84 currently, it remains elevated relative to the long run average of 19.4.[37] Comparably, at the time of NW Natural's last rate case in Washington (all-party settlement filed October 2019), the VIX stood at approximately 14.0. Clearly, investors are faced with substantially higher volatility today than during NW Natural's most recent rate case and higher volatility implies a higher risk premium.

[36] For clarity, S&P Global Ratings did not change the outlook for specific utilities, instead the April 2020 outlook revision was for the North American utility industry.

S&P Global Market Intelligence, "S&P lowers North American utilities outlook to negative on coronavirus risk," April 2, 2020, Accessed April 3, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477.

[37] Bloomberg, as of November 18, 2020.

Figure 7: VIX

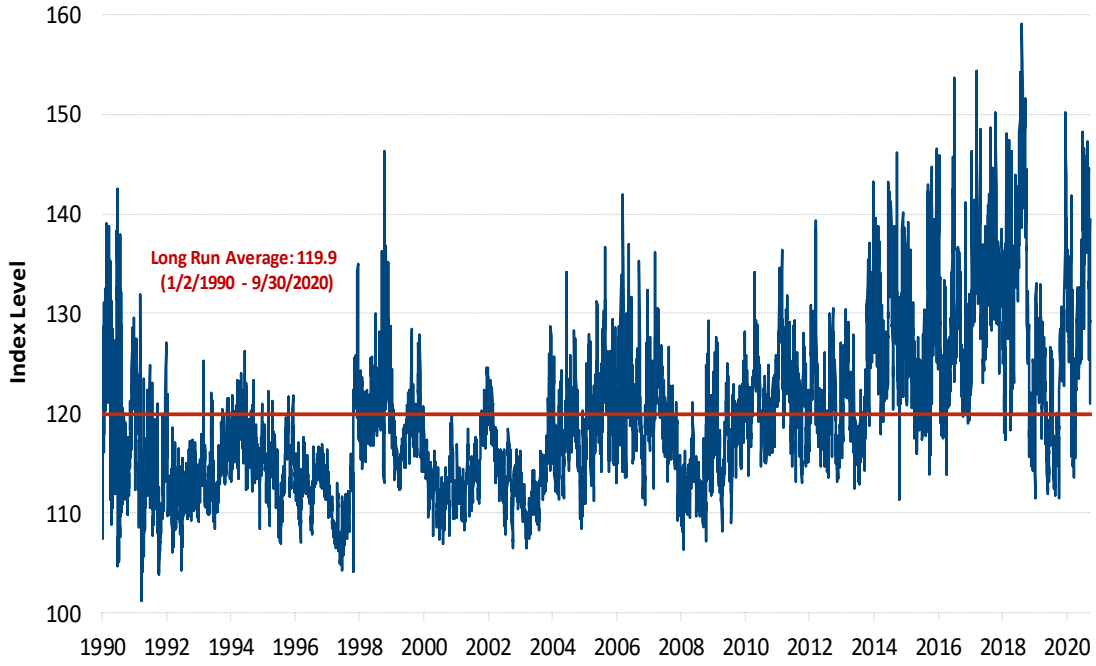


Source: Bloomberg as of 9/30/2020

Similarly, the SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (i.e., sudden substantial downturns),[38] shows that investors are cautious. A SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW increases, the probability of outlier returns becomes more significant. Figure 8 below shows the development in the SKEW since 2005 and that the index has recently increased following a period of declining SKEW. The index spiked over 148.3 on June 30, 2020, which is 28 points above its long run average of 119.9. The recent spike in the SKEW shows that investors are willing to pay for protection against downside risks.

[38] For example, http://www.cboe.com/products/vix-index-volatility/volatility-indicators/skew.

Figure 8: SKEW



Source: Bloomberg as of 9/30/2020

The currently very high level of both the VIX and SKEW is consistent with day-to-day observations of volatile financial markets and shows that investors are cautious about investing in equity. Such circumstances lead investors to require a higher premium to invest in assets or financial instruments that are not risk-free.

Q29: What is the Market Risk Premium?

A29: In general, a risk premium is the amount of "excess" return—above the risk-free rate of return—that investors require to compensate them for taking on risk. As illustrated in Figure 2, the riskier the investment, the larger the risk premium investors will require.

The MRP is the risk premium associated with investing in the market as a whole. Since the so-called "market portfolio" embodies the maximum possible degree

of diversification for investors,[39] the MRP is a highly relevant benchmark indicating the level of risk compensation demanded by capital market participants. It is also a direct input necessary to estimating the cost of equity using the CAPM and other risk-positioning models.

Q30: Please explain the current evidence related to the Market Risk Premium.

A30: The heightened volatility has increased the premium that investors require to hold risky assets, especially when measured utilizing forward-looking methodologies that estimate expected market returns with reference to current dividend yields. This year, Bloomberg's forward-looking estimate of the MRP for the U.S. (Figure 9 below) increased to as high as 9.84 percent in March 2020 and is currently at 7.69 percent.[40] At the same time, the MRP measured using FERC's methodology consistent with FERC Order 569-A increased to 9.00 percent as of September 30, 2020.[41] This is consistent with an increase in the MRP of over 185 basis points relative to the historic average.[42]

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[39] In finance theory, the "market portfolio" describes a value-weighted combination of all risky investment assets (e.g., stocks, bonds, real estate) that can be purchased in markets. In practice, academics and financial analysts nearly always use a broad-based stock market index, such as the S&P 500, to represent the overall market.

[40] Bloomberg, as of November 18, 2020. Measured over a 10-year U.S. Treasury bond.

[41] FERC Opinion No. 569-A, Docket No. EL14-12-004, EL15-45-013, May 21, 2021, FERC Order on Rehearing, see also BV-4, Scheduled BV-18.

[42] The long-term historical average arithmetic MRP as calculated by Duff & Phelps using the Ibbotson method is 7.15 percent. Source: Duff & Phelps 2019.

Figure 9: Bloomberg's Daily Market Risk Premium and Risk Free Rate (Nov. 2019 to Sep. 2020)

Q31: Are higher risk premiums relevant given that treasuries are near historic lows?

A31: Yes—this is highly relevant for cost of equity estimation as current risk-free rates are extremely low. On March 9, 2020, the entire U.S. yield curve settled below 1.00 percent for the first time in history.[43] Since then, U.S. Government bond yields have increased somewhat with the 20-year and 30-year bond yields at or slightly above 1.00 percent. This decrease in bond yields has occurred as investors fled to safer assets due to the heightened market uncertainty. As shown above in Figure 9, the MRP has also increased as risk-free rates decreased.

[43] According to the Federal Reserve, the yield on the 10-year, 20-year, and 30-year Treasury bonds on March 9, 2020 was 0.54 percent, 0.87 percent, and 0.99 percent respectively. These yields have since increased slightly. Source: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

Further, as shown in both academic and industry analysis, the allowed risk premium over the risk-free rate is inversely related to the risk-free rate. For example, Villadsen et al. (2017) found that the allowed risk premium increases by approximately 0.44 percent for each 1 percent decline in the risk-free rate.[44] Morin finds that the risk premium increases by 0.52 percent for each 1 percent decline in the risk-free rate.[45] Thus, the risk premium is likely to increase as the risk-free rate declines. As shown in Figure 9 above, this phenomenon is also documented in the forward-looking market risk premium calculated by Bloomberg. According to Bloomberg, the current market risk premium is 7.69 percent,[46] which is substantially higher than the historical average MRP of about 7.15 percent. It is also an increase over the forward-looking MRPs at the end of 2019 of 6.48 percent, which were much more in line with the historical average MRP.[47]

Q32: Is there evidence that the MRP will remain elevated going forward?

A32: Yes. In 2015, Duarte and Rosa of the Federal Reserve of New York performed a study that aggregated the results of many models of the required MRP in the United States and tracked them over time.[48] This analysis found a very high MRP after the financial crisis, relative to time periods prior the crisis.

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[44] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "*Risk and Return for Regulated Industries*," Academic Press, 2017, pp. 118-119.

[45] Roger A. Morin, "*New Regulatory Finance*," Public Utilities Reports, Inc., 2006, pp. 123-125.

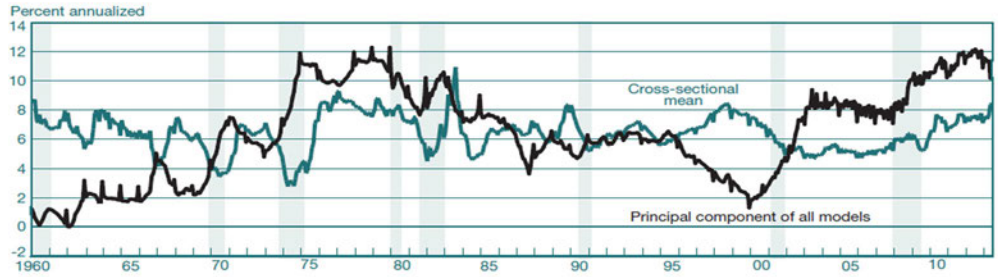
[46] Bloomberg, as of November 18, 2020.

[47] Ibid., accessed November 18. 2020.

[48] Fernando Durate and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 ("Duarte and Rosa, 2015") https://www.newyorkfed.org/research/staff_reports/sr714 html.

The authors estimated the MRP that resulted from a range of models each year from 1960 through the time of their study. The authors then reported the average as well as the first principal component of the results.[49] The authors found that the models used to determine the risk premium were converging to provide comparable estimates and that the average annual estimate of the MRP had reached an all-time high in 2012-2013 (Figure 10 below is a copy of the summary chart from Duarte and Rosa's 2015 paper). These directional trends identified by Duarte and Rosa are reasonably consistent with those observed from Bloomberg and they further support the proposition that the elevation of the MRP over its historical pre-crisis levels was a persistent feature of capital markets in the time following the financial crisis. Specifically, the financial crisis saw high volatility and a flight to quality – similar to conditions seen in 2020 in response to the COVID-19 pandemic. Therefore, it is reasonable to expect that the current MRP will remain elevated compared to historical levels, especially given the uncertainty related to the extent of economic and financial impacts from COVID-19 and the historically low interest rates.

Figure 10: Duarte and Rosa's Chart 3
One-Year Ahead MRP and Cross-Sectional Mean of Models



[49] Duarte and Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the variability among the 20 models over time.

Q33: Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require.

A33: Utilities rely on investors in capital markets to provide funding to support their capital expenditure programs and efficient business operations. Investors consider the risk-return tradeoff in choosing how to allocate their capital among different investment opportunities. It is therefore important to consider how investors view the current economic conditions, including the plausible developments in the risk-free rate and the growth in the U.S. GDP.

These investors have been dramatically affected by the ongoing market uncertainty, so there are reasons to believe that their risk aversion remains elevated relative to pre-COVID-19 levels. As NW Natural is expected to be compensated as a utility on the equity component of its rate base, the same factors would affect NW Natural's equity.

V. ESTIMATING THE COST OF EQUITY

A. Proxy Group Selection

Q34: How do you identify proxy companies of comparable business risk to NW Natural?

A34: NW Natural is primarily engaged in the regulated natural gas distribution business. The business risk associated with these endeavors depends on many factors, including the specific characteristics of the service territory and regulatory environment in which the provider of these services operates. Consequently, it is not possible to identify publicly traded proxy companies that replicate every aspect of NW Natural's risk

profile. However, selecting companies with business operations concentrated in regulated industries or having similar lines of business and/or business environments is an appropriate starting point for selecting one or more proxy groups of comparable risk to NW Natural. As a second step, I must evaluate NW Natural or Washington-specific risks to ensure that the Company's ROE is placed appropriately relative to the sample companies.

To this end, I have selected a sample of natural gas distribution utilities and water utilities. Jointly these companies comprise the "Full Sample." I also report results for the gas distribution utilities that are included in the Full Sample and refer to that sample as the "Gas Sample." The proxy companies are similar to NW Natural in that they are rate regulated by state utility commissions, provide customers a product through a network of pipeline assets, and rely on substantial capital to provide service; i.e., they are capital intensive as is NW Natural.

It is important that a proxy group used to assess the cost of equity for NW Natural (absent of any unique Washington or Company characteristics) is regulated, because regulation tends to place substantial requirements and also protections on the companies. I also believe the physical characteristics of the industry – e.g., network, capital intensive, serving different customer groups (residential, commercial, industrial) – is a characteristic of NW Natural and of the selected natural gas distribution and water utilities. The network characteristic implies that assets cannot readily be employed in a different capacity, capital intensity affects the operating risks through the split between fixed and variable costs, and the customer composition affects the demand risk. For example, many natural gas and water utilities face

declining per-customer demand due to conservation, and regulation (legislation or voluntary commitments) has in many jurisdictions, including Washington, resulted in the moratoriums on service disconnections due to non-payment during the declared COVID-19 public-health emergency or for a specified period of time. Consequently, the amount of uncollected revenue has increased.

Q35: Why are you including water utilities when evaluating the cost of capital for a natural gas utility?

A35: For several reasons. First, the natural gas distribution industry and the water utility industry share many characteristics such as the fact that both are highly regulated and commonly by the same regulatory entity, based on a network of pipes and mains, capital intensive, and serving residential, commercial and industrial customers. Second, investors make comparisons across regulated companies, so it becomes important to consider whether the returns awarded NW Natural are comparable not only to other natural gas utilities but also to other similar risk benchmarks – I consider a broader sample of natural gas and water utilities a reasonable such benchmark. Third, the natural gas distribution industry is expected to undergo substantial changes as customers, regulators and the legislature focus on carbon reductions. This means that initiatives in a specific state influence stock prices and analysts' evaluations along with more fundamental operating and market conditions. I therefore select a group of water utilities, where there are no carbon considerations, to assess whether the estimates from the gas LDCs are reasonable. While the call for reductions in natural gas use in home heating etc. has yet to receive substantial attention in NW Natural's service territory in Washington, the focus on climate policy initiatives to reduce greenhouse gas (GHG)

emissions and limit the development of natural gas infrastructure in many jurisdictions does impact all natural gas utilities. In addition, NW Natural is smaller in size as measured by revenue or equity than the comparable companies. I therefore believe these companies provide a useful benchmark when evaluating the cost of equity for NW Natural.

Water utilities are better proxies for natural gas utilities than, for example, electric utilities for several reasons: (i) water utilities serve customers through a network of pipes similar to gas utilities, (ii) water utilities are highly regulated while some electric utilities own unregulated generation, (iii) water utilities and gas utilities are currently undertaking substantial investment in pipe replacement, and (iv) water utilities have generally had stable credit ratings similar to those of gas utilities.

I note that my recommended ROE for NW Natural is fully supported by the gas utility sample but I find the water sample provides additional confirmation on the numbers.

Q36: Please summarize how you selected the members of the Full Sample and the Gas Sample.

A36: To identify companies suitable for inclusion in the Full Sample, I started with the universe of publicly traded companies in the natural gas and water utility industry as identified by Value Line Investment Analyzer ("Value Line"). I started with Value Line's list of publicly traded companies classified as gas LDCs or water utilities. Next, I reviewed business descriptions and financial reports of these companies and eliminated companies that had less than 50 percent of their assets dedicated to regulated utility activities in their industry; e.g., natural gas or water utility services.

Within this group of companies, I applied further screening criteria to eliminate companies that have had recent significant events that could affect the market data necessary to perform cost of capital estimation. Specifically, I identified companies that have cut their dividends or engaged in substantial merger and acquisition ("M&A") activities over the relevant estimation window.[50] I eliminated companies with such dividend cuts because the announcement of a cut may produce disturbances in the stock prices and growth rate expectations in addition to potentially being a signal of financial distress. I eliminated companies with significant M&A activities because such events typically affect a company's stock price in ways that are not representative of how investors perceive its business and financial risk characteristics. For example, a utility's stock price will commonly jump upon the announcement of an acquisition to match the acquirer's bid.

Further, I require companies have an investment grade credit rating[51] and more than $300 million in annual revenues for liquidity purposes.[52] A final, and fundamental, requirement is that the proxy companies have the necessary data available for estimation.

[50] As described in Sections V.B and V.C, the CAPM requires five years of historical data, while the DCF relies on current market data.

[51] In some cases, a proxy company does not have a credit rating from any of the major rating agencies. However, if they were to be rated, they would receive an investment grade rating. In these instances, I assign the company the average credit rating of the rest of the proxy group.

[52] I relax my $300 million annual revenue screening criteria to include two more companies—Middlesex Water and York Water Company—in recognition that these companies have very stable finances despite relatively low revenue.

Q37: What are the characteristics of the Gas and Water Utility Proxy Group?

A37: I calculate my results for both the gas proxy group and for the combined Gas and Water Utility Proxy Group. The proxy group(s) are comprised of gas and water utilities whose primary source of revenues and majority of assets are subject to regulation. The final proxy group consists of the nine gas and six water utilities listed in Figure 11 below.

All companies are engaged in the distribution of a commodity to end customers through a network of pipes and mains. While the product differs across gas and water utilities, they are all focused on distribution, have a mix of residential, commercial and industrial customers and all are regulated. Further, the proxy group companies have an average credit rating of approximately A, which is slightly above NW Natural's credit rating of Baa1 from Moody's (broadly equivalent to BBB+).

Figure 11 reports the proxy companies' annual revenues for the most recent four quarters as of 2Q 2020 and also reports the market capitalization, credit rating, beta and growth rate. The annual revenue as well as the market cap was obtained from Bloomberg. The credit rating is reported by Bloomberg.[53] The growth rate estimate is a weighted average between estimates from Thomson Reuters and *Value Line*. Betas were obtained from *Value Line*.

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[53] In cases where a company does not have a S&P rating from Bloomberg, Moody's rating was obtained from Moody's, annual reports, or Bloomberg.

Figure 11: Gas and Water Utility Proxy Group

Company	Annual Revenue (Q2 2020) ($MM)	Regulated Assets	Market Cap. (Q2 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	$2,790	MR	$12,331	0 80	A	6 9%
Chesapeake Utilities	$474	R	$1,396	0 75	A	9 0%
New Jersey Resources	$2,033	R	$3,056	0 90	AA-	6 0%
NiSource Inc	$4,897	R	$8,852	0 85	BBB+	6 9%
Northwest Natural	$758	MR	$1,724	0 80	BBB+	6 0%
ONE Gas Inc	$1,503	R	$4,039	0 80	A	6 5%
South Jersey Inds	$1,518	R	$2,510	1 00	BBB	12 2%
Southwest Gas	$3,167	MR	$3,767	0 90	BBB+	7 6%
Spire Inc	$1,829	R	$3,426	0 80	A-	15 1%
Amer States Water	$478	R	$2,849	0 65	A+	5 6%
Amer Water Works	$3,690	R	$23,036	0 85	A	7 3%
California Water	$710	R	$2,287	0 65	A+	17 7%
Middlesex Water	$138	R	$1,170	0 70	A	3 8%
SJW Group	$503	R	$1,758	0 80	A-	14 8%
York Water Co (The)	$53	R	$600	0 80	A-	5 3%
Average	$1,636		$4,853	0 80	A-	8 7%

Sources and Notes:
[1]: Latest Bloomberg data available as of September 30, 2020
[2]: Key R - Regulated (80% or more of assets regulated)
MR - Mostly Regulated (less than 80% of assets regulated)
[3]: See Schedule No BV-3 Panels A through I
[4]: See Schedule No BV-10
[5]: Latest Bloomberg data available as of September 30, 2020
[6]: See Schedule No BV-5

I note that I included NW Natural in the proxy group for comparability, but I ensure the Company does not unduly influence the estimated cost of equity.

Q38: How do the proxy companies compare to NW Natural in terms of financial metrics?

A38: NW Natural's regulated gas operations are expected to generate revenue of [redacted] in 2020,[54] while NW Natural Holdings had revenue of $746 million in 2019.[55] Of the [redacted] in projected operating revenue, approximately [redacted] is earned from NW Natural's Washington operations. Compared to the annual

[54] As provided by NW Natural

[55] NW Natural 2019 10-K, p. 32.

revenues of the proxy companies, NW Natural is smaller. NW Natural's secured credit rating is AA- and A2 from S&P and Moody's, respectively, while NW Natural does not have an unsecured credit rating from S&P, Moody's unsecured credit rating is Baa1,[56] which is towards the lower end of the comparable companies. Lastly, as noted above, NW Natural is a regulated distribution company as are the other proxy companies.

Q39: What regulatory capital structure did you use for NW Natural?

A39: As recommended by NW Natural Company witness Mr. Brody Wilson (Exh. BJW-1T), I use a capital structure including 49 percent equity in my recommendation.[57]

B. The CAPM Based Cost of Equity Estimates

Q40: Please briefly explain the CAPM.

A40: CAPM assumes the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 2 in Section III), in which the required expected return on an asset (above the risk-free return) is proportional to that asset's relative risk as measured by that asset's beta.

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is determined by the risk-free rate plus the stock's

[56] NW Natural, Investor Presentation, September 2020, p. 37 and NW Natural 2019 10-K, p. 58.

[57] See Direct Testimony of Brody J. Wilson (Exh. BJW-1T).

systematic risk (as measured by beta) multiplied by the market risk premium. Mathematically, the relationship is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \qquad (1)$$

- $\boldsymbol{r_S}$ is the cost of capital for investment S;
- $\boldsymbol{r_f}$ is the risk-free interest rate;
- $\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and
- $\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model," which operates on the principle (corroborated by empirical data) that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment, whose returns do not vary relative to market returns, should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 2), whereas investments of the same risk as the overall market (*i.e.*, those that by definition have average systematic market risk) are priced so as to expect to return the risk-free rate plus the MRP. Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the MRP.

1. Inputs to the CAPM

Q41: What inputs does your implementation of the CAPM require?

A41: As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the MRP, as well as a measure of the stock's beta. There are several choices and sources of data that inform the selection of these inputs. I discuss these issues below. (Additional technical detail,

along with a discussion of the finance theory underlying the CAPM is provided in Exh. BV-3.)

Q42: What value did you use for the risk-free rate of interest?

A42: I use the yield on a 20-year U.S. Treasury bond as the risk-free rate for purposes of my analysis. Recognizing the fact that the cost of capital set in this proceeding will be in effect starting November 1, 2021, I rely on a forecast of what Government bond yields will be one year out. In October 2020, the *Blue Chip Economic Indicators* ("*BCEI*") survey estimated the 10-year U.S. Treasury bond yields will be 1.4 percent in 2022 – two months into the new rates.[58] The forecasted risk-free rate for 2023 and 2024 is higher at 1.7 and 2.0 percent, respectively. I then adjust this value upwards by 50 basis points to reflect the historical maturity premium for the 20-year U.S. Treasury bond yield over the 10 U.S. Treasury bond yield.[59] This gives me a risk-free rate of 1.9 percent for 2022.

Additionally, it is important to recognize the implication of higher spreads between utility bond yields and U.S. Government bond yields. As of the end of September, this spread is approximately 50 basis points higher than it was prior to the 2008 financial crisis. One explanation of this is that prevailing government bond yields are depressed relative to longer-term market expectations due to monetary policy and flight-to-quality behaviors by investors. Therefore, I also consider a scenario in which the appropriate risk-free rate is conservatively 0.25 percent higher at 2.15 percent.

[58] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 3.

[59] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Government Bonds over the period 1990-2020, using data from Bloomberg.

Q43: What value did you use for the MRP?

A43: Like the cost of capital itself, the MRP is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can expect to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable. Rather, it must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds over a long historical period.[60] The average market risk premium from 1926 to the present (2019) is 7.15 percent.[61] I use this value of the MRP along with a risk-free rate of 2.15 percent in one of my CAPM scenarios.

However, investors may require a higher or lower risk premium, reflecting the investment alternatives and aggregate level of risk aversion at any given time. As explained in Section IV, there is evidence that investors' level of risk aversion is elevated relative to the time before the COVID-19 pandemic and may remain elevated for some time, even after the pandemic. In recognition of the evidence that forward-looking measures of expected market equity risk premium are higher than the long-term historical average, I also perform a CAPM calculation using Bloomberg's forecasted MRP of 7.47 percent.[62]

[60] The longest period for which Duff & Phelps reports data is 1926 to current. Based on financial textbooks such as Ross, Westerfield and Jaffe, "*Corporate Finance*," 10'th Edition, 2013, pp. 324-327, I use the longest period for which reliable estimates are available – in this case 1926 to 2019.

[61] Duff & Phelps, *Ibbotson SBBI 2019 Valuation Yearbook* 10-21.

[62] Bloomberg as of September 30, 2020.

Q44: Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A44: The parameters are displayed in Figure 12 below. In my CAPM and ECAPM analyses, I consider two sets of scenarios based on the empirical observation that the yield spread is higher than normal as is the forecast MRP, as discussed above in Section IV. The increase yield spreads could reflect the increase in MRP or downward pressure on the yield of government bonds due to monetary policy and flight-to-quality behaviors. Therefore, I use an unadjusted historic average MRP with the increased estimate of the risk-free rate in one scenario; whereas, in the second scenario I use an unadjusted forecasted risk-free rate with a higher estimate of the MRP. To be conservative, I do not simultaneously normalize the risk-free rate and elevate the MRP.

Scenario 1 uses the forecasted 20 year U.S. Treasury rate for 2022 and then adjusted this to include half of the current spread between utility and Government bond yields. This results in a Scenario 1 risk-free rate of 2.15 percent. I pair this with the long-term average historic MRP of 7.15 percent as estimated by Duff & Phelps.

In my second scenario, I use an unadjusted risk-free rate based on the forecasted 20 year U.S. Treasury rate for 2022 of 1.90 percent. I then use Bloomberg's forecasted MRP of 7.47 percent.

Figure 12: CAPM and ECAPM Scenarios

	Scenario 1	Scenario 2
Risk-Free Interest Rate	2.15%	1.90%
Market Risk Premium	7.15%	7.47%

Q45: What betas did you use for the companies in your proxy groups?

A45: I used *Value Line* betas, which are estimated using the most recent five years of weekly historical returns data.[63] The *Value Line* levered equity betas are reported in Figure 11 above. Importantly, these betas—which are measured (by *Value Line*) using the market stock return data of the proxy companies—reflect the level of financial risk inherent in the proxy companies' market value leverage ratios over the estimation period. Because NW Natural's regulatory capital structure includes a substantially higher proportion of debt financing than does the market data on the proxy companies used to estimate the ROE, the financial risk associated with an equity investment in NW Natural's rate base is correspondingly greater than the financial risk borne by investors in the proxy companies' publicly traded stock. Importantly, the DCF model and the CAPM-based models use market data to estimate the ROE, so that it is the market value capital structure that is the relevant comparison across companies. As the risk premium model's ROE estimates are based on book value capital structures, the relevant comparison is across book value capital structures for that model.

Consequently, standard textbook techniques are applied to unlever the *Value Line* betas reported in Figure 11 above and relever the resulting asset betas at NW Natural's regulatory capital structure.[64]

[63] See Value Line Glossary, accessible at http://www.valueline.com/Glossary/Glossary.aspx

[64] The Technical Appendix (Exh. BV-3) to this testimony provides a detailed description of the standard textbook formulas used to implement the "Hamada" technique for unlevering measured equity betas based on the proxy companies' capital structures to calculate "asset betas" that measure the proxy companies' business risk independent of the financial risk impact of differing capital structures. The proxy group average asset betas are then relevered at the target capital structure (i.e., NW Natural's regulatory capital structure), with the precise relevered beta depending on the specific version of the unlevering/relevering formula employed.

2. The Empirical CAPM

Q46: What other equity risk premium model do you use?

A46: Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[65] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

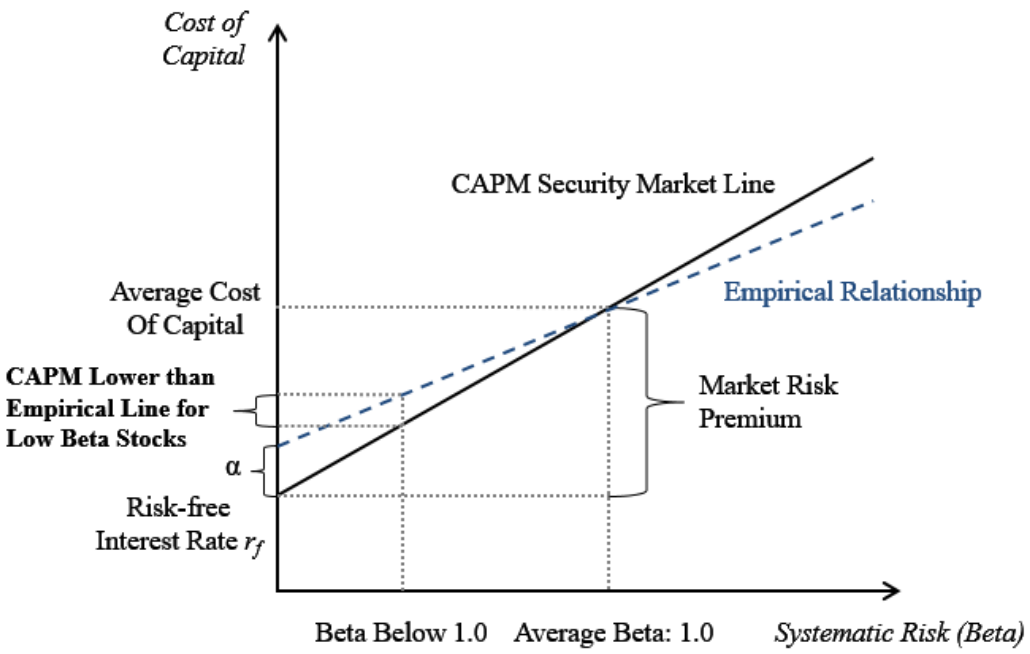
$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 2, which results in a Security Market Line that more closely matches the results of empirical tests. This adjustment is portrayed in Figure 13 below. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

[65] *See* Figure B-3 in Exh. BV-3 for references to relevant academic articles.

Figure 13: The Empirical Security Market Line



Q47: Why do you use the ECAPM?

A47: Academic research finds that the CAPM has not generally performed well as an empirical model. One of its short-comings is directly addressed by the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. In summary, these studies estimate alpha parameters that range between 1 percent[66] and 7.32

[66] Black, Fischer. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

percent.[67] I apply an alpha parameter of 1.5 percent in my application of the ECAPM. Exh. BV-3 provides further discussion of the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

3. Results from the CAPM Based Models

Q48: Please summarize the results of the CAPM-based models.

A48: The results of CAPM and ECAPM estimation for the two proxy groups are presented in Figure 14 below. The ranges of results for each model (CAPM and ECAPM) reflect the application of different specific versions of the textbook formulas used to account for the impact of different financial leverage on financial risk.

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[67] Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

Figure 14: CAPM and ECAPM Summary at 49% Equity Capital Structure

Return on Equity Summary and Sensitivity Analysis Full Sample

Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Full Sample		
Financial Risk Adjusted Method		
CAPM	9.9%	9.9%
ECAPM (α = 1.5%)	10.3%	10.4%
Hamada Adjustment Without Taxes		
CAPM	9.6%	9.7%
ECAPM (α = 1.5%)	9.6%	9.7%
Hamada Adjustment With Taxes		
CAPM	9.3%	9.4%
ECAPM (α = 1.5%)	9.3%	9.4%
Gas Sample		
Financial Risk Adjusted Method		
CAPM	10.0%	10.0%
ECAPM (α = 1.5%)	10.3%	10.3%
Hamada Adjustment Without Taxes		
CAPM	9.7%	9.8%
ECAPM (α = 1.5%)	9.7%	9.7%
Hamada Adjustment With Taxes		
CAPM	9.4%	9.5%
ECAPM (α = 1.5%)	9.4%	9.5%
Water Sample		
Financial Risk Adjusted Method		
CAPM	9.8%	9.8%
ECAPM (α = 1.5%)	10.4%	10.4%
Hamada Adjustment Without Taxes		
CAPM	9.5%	9.6%
ECAPM (α = 1.5%)	9.4%	9.5%
Hamada Adjustment With Taxes		
CAPM	9.1%	9.1%
ECAPM (α = 1.5%)	9.1%	9.2%

Sources and Notes:
[1]: Long-Term Risk Free Rate of 2.15%, Long-Term Market Risk Premium of 7.15%.
[2]: Long-Term Risk Free Rate of 1.90%, Long-Term Market Risk Premium of 7.47%.

Q49: How do you interpret the results of your CAPM and ECAPM Analyses?

A49: The results in Figure 14 above range from 9.0 to 10.25 percent with the majority of the results in the range of 9.5 to 10.0 percent.[68] As I discussed above, the established academic evidence indicates that the traditional CAPM tends to underestimate the cost of equity for lower-than-average risk companies, such as the natural gas and water utilities in Figure 11, so the ECAPM results are more reliable. As a result, I consider a reasonable range of 9.4 (the currently allowed ROE) to 10.25 percent for the Gas Sample, which is supported by a reasonable range of 9.25 to 10.5 percent for the Water Sample (rounding to the nearest ¼ percent and ignoring the highest and lowest results). I also note that the CAPM may underestimate the cost of equity for smaller companies such as NW Natural.[69]

C. DCF Based Estimates

Q50: Please describe the DCF model's approach to estimating the cost of equity.

A50: The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow—literally a

[68] I round to the nearest 0.25 percent when determining ranges of reasonable results. Clearly, there are numbers outside the range of 9.0 to 10.25 percent in Figure 14 but if rounding to the nearest 0.25 percent, I have a small number of observations outside the range. I round to the nearest 0.25 percent because the cost of capital cannot, in my opinion, be determined with greater precision.

[69] I also note that relying on the FERC methodology for the MRP would result in an increase to the CAPM / ECAPM results of 148 to 170 basis points.

stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

$$\boldsymbol{P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots + \frac{D_T}{(1+r)^T}} \quad (3)$$

Where,

$\boldsymbol{P_0}$ is the current market price of the stock;

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate r that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume that the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to directly estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \quad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends.

I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model, in honor of its originator, Professor Myron J Gordon.

Q51: Are there other versions of the DCF model?

A51: Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[70] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [71]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, with that growth then tapering over the next five years toward the growth rate of the overall economy (i.e., the long-term gross domestic product (GDP) growth rate forecasted to be in effect ten years or more into the future).

1. DCF Inputs and Results

Q52: What growth rate information do you use?

A52: The first step in my DCF analysis (either constant growth or multi-stage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates for companies in my proxy group. For the single-stage DCF and for the first stage of the multi-stage DCF, I use investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*.

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[70] The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

[71] See Exh. BV-3 for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term U.S. GDP growth forecast of 4.1 from Blue Chip Economic Indicators.[72] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Additionally, I relied on the dividend yield of the companies, which I estimate using the most recently available dividend information (currently) and the average of the last 15 days of stock prices ending September 30, 2020. As the single largest advantage of the DCF model is that it uses current market information, I find it is important to use a relatively short time period to determine the dividend yield – yet to avoid the bias caused by any one day. I believe a 15-day average accomplishes that goal. Because the stock price of utilities currently is higher than they historically have been and because some companies engage in share buybacks, the dividend yield underestimates the yield on cash distributions to investors.

Q53: Please explain how input data can affect the DCF models.

A53: The Gordon Growth/single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for 3-5 years.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies in my samples use share repurchases, the DCF model using dividend yields will underestimate the cost of equity

[72] See Blue Chip Economic Indicators, October 2020, p. 15.

for these companies. While there are companies in my sample that have engaged in share buybacks in the past, the magnitude is currently not large.

A second issue is that the flight to quality has resulted in higher than usual stock prices for natural gas and water utilities and hence lower than usual dividend yields. As a result, the dividend yield may be downward biased. The multi-stage DCF model additionally requires a measure of the long-term GDP growth.

Q54: Please summarize the DCF-based cost of equity estimates for the proxy groups.

A54: The results of the DCF based estimation for the proxy groups are displayed below in Figure 15.

Figure 15: DCF Model Results at 49% Equity Capital Structure

	Simple	Multi-stage
Gas Sample	13.2%	9.9%
Water Sample	14.0%	8.7%

Q55: How do you interpret the results of your DCF Analyses?

A55: The DCF model estimates presented in Figure 15 range from 8.7 percent to 14.0 percent. As discussed above, there is unprecedented levels of volatility currently in the market. When market prices fall, dividend yields increase and reflect the increased cost of equity. However, the DCF model requires forecasted growth rates that are based on stable economic conditions to satisfy the constant dividend growth assumption. Growth rates may also be slower than dividend yields to reflect market uncertainty. Consequently, I give more weight to the results from the Multi-Stage DCF implementation. For the Gas Sample, the result is 9.9 percent, which is consistent with

the range of the CAPM and ECAPM estimates. The result for the Water Sample is 8.7 percent, which is slightly below but consistent with the range of the CAPM and ECAPM estimates. Given the much higher estimates for the single-stage DCF, I believe the multi-stage DCF results may underestimate the cost of equity at this time, but acknowledge that the cost of equity is below the results obtained from the single-stage model. For example, the averages of the simple and multi-stage results are 11.5 and 11.4 percent, respectively. Consequently, I find that the Gas Sample results are reasonably consistent with a range of about 9.5 to a bit above 10 percent; e.g., 10.25 percent.

D. Risk Premium Model Estimates

Q56: Did you estimate the cost of equity that results from analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A56: Yes. In this type of analysis, sometimes called the "risk premium model," the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \quad (5)$$

Q57: What are the merits of this approach?

A57: First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied-upon figure is directly applicable to a rate base. Second, the allowed returns are readily observable to market participants, who will use this one data input in making investment decisions, so that the information is at the very least a

good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

Q58: How did you use rate case data to estimate the risk premiums for your analysis?

A58: The rate case data from Q1 1990 through Q3 2020 is derived from Regulatory Research Associates.[73] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in gas distribution rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[74] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium = A_0 + A_1 \times (Treausury\ Bond\ Yield) \quad (6)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and found that the regression has a high degree of explanatory power in a statistical sense. I report my results for the respective classifications of rate cases below in Figure 16.[75] I note that the results displayed in Figure 16 below show that the risk

[73] S&P Market Intelligence, as of September 2020.

[74] I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

[75] Exh. BV-4, Schedule BV-16 contains my risk premium analysis.

premium model fits the data well as the R-squared is above 0.87 and R-squared is a measure of how well the data fits the model. An R-squared above 0.8 indicates a solid result.

Figure 16: Implied Risk Premium Model Estimates[76]

	R Squared	Estimate of Intercept (A0)	Estimate of Slope (A1)	Implied Cost of Equity Range	
	[1]	[2]	[3]	[4]	[5]
Natural Gas Utility	0.874	8.52%	-0.565	9.3%	9.5%

Sources and Notes:
[1]-[3]: Estimated Using S&P Market Intelligence, as of September 2020
[4]: Risk-free rate of 1.9%
[5]: Risk-free rate of 2.15% (includes utility yield spread adjustment of 0.25%)

Q59: What conclusions did you draw from your risk premium analysis?

A59: The results in Figure 16 indicate a ROE of 9.3 to 9.5 percent for an average gas distribution utility based on the risk premium model, which is consistent with the reasonable range of CAPM and DCF estimates. While the risk premium model is based on historical allowed returns and not underpinned by fundamental financial principles in the manner of the CAPM and DCF models, I believe that this analysis, when properly designed, executed, and placed in the proper context, is a valid and useful approach to estimating utility ROEs. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision that granted an ROE used in the analysis was issued, it provides a useful benchmark for the cost of equity in

[76] Note: Negative estimate of slope indicates that as the risk-free rate increases (decrease) the estimated risk premium decreases (increase). As discussed in Section IV.C. (Q31:) This inverse relationship between the risk free rate and risk premiums is supported by academic and industry analysis, including Villadsen et. al (2017)(Footnote 445) which found that for each 1 percent decline in the risk free rate the estimated risk premium increased by approximately 0.44 percent, in line with the results shown in Figure 16.

any interest environment. Because it relies on the returns for regulated utilities, I believe this method provides a good way to directly assess whether the ROE is commensurate with that available to alternative regulated investments of similar risk.

E. Summary of Results

Q60: Please summarize your results before considering where to place NW Natural.

A60: Assuming a 49 percent equity capital structure for NW Natural, I find the reasonable range of ROE results displayed in Figure 17. Next, I consider NW Natural and Washington specific risks to inform my recommendation of a reasonable ROE for NW Natural.

Figure 17: Summary of Reasonable Ranges

	Gas Sample	Full Sample
CAPM/ ECAPM	9.5% - 10.25%	9.5% - 10.0%
DCF	9.9% (9.5% – 10.25%)	8.7% - 9.9%
Risk Premium	9.3% - 9.5%	N/A

Note: Full sample considers both natural gas and water proxy companies

VI. NW NATURAL SPECIFIC CIRCUMSTANCES

A. Business Risk Characteristics

Q61: How does the business risk of NW Natural compare to that of the sample?

A61: Like the sample companies, NW Natural's business is concentrated in regulated gas distribution industry. It also has a credit rating that is comparable to that of the sample but is one of the few utilities that have been downgraded over the past couple of years. Regulatory policy plays a role in the business risk of the Company.

To that end, I note that NW Natural does not currently have a decoupling mechanism in Washington State – decoupling mechanisms are common among gas LDCs.[77] Additionally, in the current environment of declining energy demand and an emphasis on decreasing carbon emissions, there is some uncertainty about NW Natural's future demand. Washington has several initiatives to reduce CO2 emissions significantly. Because burning natural gas releases CO2 into the atmosphere, these initiatives create stranded cost risks for NW Natural. Washington is a founding member of the Pacific Coast Collaborative, which calls for reducing emission levels to two tons per capita by 2050. To this end, Washington has committed to reducing the State's greenhouse gas emissions to 45 percent below 1990 levels by 2030, 70 percent by 2040, and net zero or 95 percent below 1990 levels by 2050.[78] Washington also passed Senate Bill 5116, which commits the state to a carbon-natural electricity supply by 2030 with the goal of eliminating fossil generation by 2045.[79]

State level actions have focused on reducing carbon emissions or increasing generation from renewable resources. At a more local level, some cities have shifted their policy focus to reducing reliance on natural gas. For example, Washington cities

[77] See, for example, RRA Regulatory Focus, "Adjustment Clauses: A State-by-State Overview," November 12, 2019.

[78] Washington State Legislature, HB2311-2019-20, https://app.leg.wa.gov/billsummary?BillNumber=2311&Year=2019&Initiative=false.

[79] Washington Governor Jay Inslee, "Policy Brief – Washington Enacts Strongest Clean Electricity Standard in the Nation," May 2019, https://www.governor.wa.gov/sites/default/files/documents/clean-electricity-policy-brief-bill-signing.pdf.

such as Bellingham, Seattle, and Vancouver have contemplated or enacted moratoriums on natural gas infrastructure.[80]

Outside Washington, the City of Berkeley's ban on natural gas hook-ups in new buildings[81] and regulations pertaining to new housing's ability to use renewable resources are being introduced. For example, California has a requirement that all new homes have solar panels by 2020, while other states are considering similar regulations.[82] At the same time, there are substantial efforts to increase non-carbon heating through, for example, incentives for heat pump installation, which will reduce the amount of gas (and/or oil) used for heating.[83] If any of the risks discussed above were to materialize or be at high risk of materializing, the business risk of the gas LDC industry would increase substantially. This risk is not included in my current recommendation.

Q62: What is NW Natural's size relative to the sample companies?

A62: The majority of the publicly traded gas LDCs in the U.S., as well as the companies I select for my full sample, are larger than NW Natural. For example, the average market capitalization of the Gas Sample (including NW Natural) is $4.6 billion. That is nearly

[80] Bellingham and Seattle are not within NW Natural's service territory, but the cities' moratoriums may indicate a movement in that direction more broadly.

[81] Ravani, Sarah, "Berkeley becomes first U.S. city to ban natural gas in new homes," *San Francisco Chronicle*, July 2019. For clarity, my recommended ROE of 10 percent in this proceeding **does not** incorporate the risks of such bans but merely points to potential future risks to the industry.

[82] Los Angeles Times, "Starting in 2020, all new homes in California must come with solar panels" by Jack Flemming, Dec, 14, 2018.

[83] For example, EfficiencyMaine (https://www.efficiencymaine.com/at-home/ductless-heat- pumps/) offers residential customers rebates for installing heat pumps.

three times NW Natural's market capitalization of $1.7 billion.[84] If I were to consider only NW Natural's Washington-regulated portion the difference would be even larger.

Q63: Why does the size of NW Natural matter?

A63: Empirically, investors have required a higher premium to invest in smaller companies than in larger ones. For example, Duff & Phelps data indicate that NW Natural's market capitalization puts it in the 6th size decile, while the average natural gas company in the sample falls in the 4th size decile.[85] Companies in the 6th size decile on average have a return on equity evidence suggests that investors in smaller companies require a higher return than do investors in larger companies. The majority of the sample companies are materially larger than NW Natural. Empirical evidence suggests that investors in NW Natural may require a premium over and above that required for larger companies. Consequently, NW Natural requires a cost of equity higher than the average of that for the sample companies all else equal.

Q64: How have the current market uncertainties impacted NW Natural?

A64: Similar to many other states, Washington began issuing stay-at-home orders and restricting gatherings in early March to mitigate the impacts of COVID-19. As a result, many business activities across the State were restricted. Consumer spending declined by up to 35 percent and over 1.7 million people have filed initial unemployment claims since mid-March.[86] As of the end of September, Washington's unemployment rate

[84] As of the end of Q2 2020. See Figure 11 in Section V for details.

[85] Duff & Phelps, "CRSP Decile Size Study," 2020.

[86] Washington State Department of Commerce, "Economic Recovery Dashboard", accessed November 17, 2020, https://www.commerce.wa.gov/datadashboard/.

stood at 7.4 percent compared to 4.4 percent in January 2020.[87] To protect consumers as unemployment and economic hardships increased, many States implemented moratoriums on utility disconnects due to non-payment. In Washington, Governor Inslee enacted a moratorium on utility disconnections for residential customers due to non-payment, charging late fees, or refusing to reconnect customers. At the end of October, these protections were extended through April 2021.[88]

The risk that utilities face is that they will not be fully compensated for customer non-payments resulting from rising unemployment or business shutdowns. As a result, utilities continue to serve all their customers, even if they are not collecting revenues from all their customers. These impacts will be felt most strongly for utilities with large commercial and industrial customer bases or utilities that serve areas hit hardest by layoffs. NW Natural's sales volumes are comprised approximately 40 percent industrial, 22 percent commercial, and 38 percent residential.[89] In Washington, NW Natural does not have a decoupling mechanism as it does in its Oregon service territory. As a result, NW Natural's Washington operations rely on per-Dth charges to recover fixed costs that are at higher risk of under-recovery due to demand reductions. While decoupling mechanisms may mitigate the impacts, utilities are still at heightened business risk given the broad economic impacts across all customer classes and

[87] Ibid.

[88] Washington Utilities and Transportation Commission, "Order 01 Extending Suspension of Disconnection of Energy Services for Nonpayment and Adopted Related Requirements," October 20, 2020, Docket U-200281.

[89] NW Natural, 2019 10-K, p. 10, https://s23.q4cdn.com/611156738/files/annual/716f1951-3453-912b-2656-5c75ca7f5fa0.PDF.

structural limitations regarding decoupling mechanism (e.g. caps of cost recovery, limitations on sharing across customer classes, or the rate of amortizing balances).

Rating agencies have also noted the increased risk for utilities. On April 2, S&P Global Ratings lowered its outlook for the North American utility industry from "stable" to "negative" citing concerns about the financial cushions of utilities.[90] S&P also said they expect that a prolonged recession may cause utilities to reduce capital spending and potentially cut dividends. This could affect utilities' ability to attract capital and would undoubtedly increase their business risk.

Q65: Can you please summarize your assessment of NW Natural's business risk relative to the sample?

A65: Relative to the gas sample, NW Natural is smaller, has no decoupling mechanism and may, given its location on the US west coast face greater legislative initiatives to reduce carbon and natural gas infrastructure. While the impact of carbon reduction on NW Natural's risk profile could be substantial, I have not taken these aspects into account in my ROE recommendation. I simply note that these are factors that need to be monitored closely as the impact could be substantial in future years. My recommendation does not account for such risks. Consequently, from a business risk perspective, NW Natural is slightly more risky than the sample.

[90] For clarity, S&P Global Ratings did not change the outlook for specific utilities, instead the April 2020 outlook revision was for the North American utility industry.

S&P Global Market Intelligence ,"S&P lowers North American utilities outlook to negative on coronavirus risk," April 2, 2020, Accessed April 3, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477.

VII. COST OF CAPITAL RECOMMENDATION

Q66: Please summarize your conclusion regarding NW Natural's risk and the necessary return.

A66: I find that NW Natural has slightly above average risk compared to the average sample company given its smaller size, lack of decoupling mechanism, and Washington specific risks. I therefore recommend that NW Natural be granted an ROE of at least 9.4 percent as in its most recent rate case and find a range 9.5 – 10.25 percent is the most representative of the sample companies. I note that indications are that the ROE today is higher than at the time of NW Natural's last Washington State rate case, which was settled at 9.4 percent. Thus, the 9.4 percent ROE is at the very bottom of the reasonable range.

Q67: What do you recommend for NW Natural's cost of equity in this proceeding?

A67: The CAPM/ ECAPM and the DCF for the gas sample show a reasonable range of about 9.4 (current ROE) percent to 10.25 percent rounding to the nearest ¼ percent. The Risk Premium model's results are slightly below the range at 9.3 percent to 9.5 percent. As NW Natural is smaller than the average gas sample company and the risk premium results pertain, on average, to a higher equity percentage, I find that a range of 9.4 – 10.25 percent would be within reason for NW Natural and note that the range is supported by the results for the water sample. As a result, my recommendation would be to place NW Natural within that range and recommend conservatively 9.9 percent as the rate of return on the equity portion of its regulated rate base at the requested 49 percent equity capital structure. As explained above, NW Natural has decided to divert from my recommendation of 9.9 percent ROE, and instead, it has proposed to set its

ROE at the lowest end of my recommended range of 9.4 percent. While the Company's proposal is lower than I would recommend, it is still within my recommended range and supported by my analysis.

Q68: Does this conclude your Direct Testimony?

A68: Yes, it does.

VIII. LIST OF EXHIBITS

Exh. BV-2	Resume
Exh. BV-3	Technical Appendix
Exh. BV-4	Cost of Equity Model