

BEFORE THE
PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

APPLICATION OF
PIEDMONT NATURAL GAS COMPANY, INC
FOR ADJUSTMENT OF RATES AND CHARGES

DOCKET NO. 2026-61-G

DIRECT TESTIMONY
OF
AARON L. ROTHSCILD

COST OF CAPITAL

ON BEHALF OF THE
SOUTH CAROLINA DEPARTMENT OF CONSUMER AFFAIRS

July 14, 2026

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I. STATEMENT OF QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Aaron L. Rothschild. My title is President, and my business address is 15 Lake Road, Ridgefield, CT.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am President of Rothschild Financial Consulting (“RFC”).

Q. PLEASE STATE YOUR EDUCATIONAL ACHIEVEMENTS AND PROFESSIONAL DESIGNATIONS.

A. I have a B.A. degree in mathematics from Clark University (1994) and an M.B.A. from Vanderbilt University (1996).

Q. PLEASE DESCRIBE YOUR BUSINESS EXPERIENCE.

A. I performed financial analysis in the telecom industry in the United States and Asia Pacific from 1996 to 2001, investment banking consulting in New York, complex systems science research regarding the power sector at an independent research institute, and I have prepared rate of return testimonies since 2002. See Appendix H below for my resume.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA, OR OTHER STATE COMMISSIONS? IF SO, WHICH COMMISSIONS?

A. Yes. I have testified before the Public Service Commission of South Carolina. My expert witness experience also includes testifying in over 100 cost of capital proceedings before

the following additional state commissions: California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Maryland, New Hampshire, New Jersey, New York, North Dakota, Pennsylvania, Rhode Island, Tennessee, and Vermont. See Appendix I for the list of dockets for each of my testimonies.

Q. ON WHOSE BEHALF ARE YOU PROVIDING THIS TESTIMONY?

A. I am testifying on behalf of the South Carolina Department of Consumer Affairs (“DCA”).

II. INTRODUCTION

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to address the cost of capital for Piedmont Natural Gas Company, Inc (“Piedmont” or the “Company”) which includes the following three components:

1. **Cost of Equity (“COE”):** The return investors require to provide equity capital to a utility with Piedmont’s specific risk profile.
2. **Cost of Debt:** The prevailing market interest rates and terms associated with the Company's debt obligations.
3. **Capital Structure:** The relative proportions of equity and debt used to fund the Company’s operations.

Based on my analysis of the above cost of capital components, I recommend an allowed rate of return (“ROR”) for ratemaking purposes, including an appropriate authorized return on equity (“ROE”), authorized cost of debt, and authorized capital

1 structure. Please see Appendix A for a more detailed definition and discussion of these
2 specific components.

3 **Q. HOW DO YOU DEFINE YOUR ROLE IN PROVIDING THIS ANALYSIS TO THE**
4 **COMMISSION?**

5 **A.** My role is to provide the Commission with an objective analysis of the cost of capital.
6 While I define this fundamentally as the return investors require in exchange for providing
7 funds to a utility with Piedmont’s specific risk profile, my analysis also provides the
8 Commission with a broader market context to ensure a principled and durable decision.
9 The following framework grounds my approach:

- 10 • **The Commission Acts as the Surrogate for Competition:** Because
11 Piedmont operates as a regulated monopoly, the natural price-disciplining
12 pressures of a competitive market are absent. In this vacuum, the
13 Commission must act as a surrogate for the market. This is a significant and
14 often difficult responsibility. It requires the Commission to ensure that the
15 “price” of capital charged to ratepayers reflects its actual market cost; this
16 neither provides an unearned monopoly premium nor deprives the utility of
17 the capital it needs to provide essential services.
- 18 • **Consistency with Legal Requirements:** My recommendation is consistent
19 with the following legal standards set by the United States Supreme Court
20 for a fair rate of return: “[t]he return to the equity owner should be
21 commensurate with returns on investments in other enterprises having

1 corresponding risks”¹ and “sufficient to... support its credit and... raise the
2 money necessary for the proper discharge of its public duties.”² My
3 recommendations fulfill the *Hope* and *Bluefield* requirements that a utility
4 should be able to raise capital on reasonable terms.

- 5 • **Providing an Informed Path Toward Market Alignment:** I provide the
6 market-based information necessary for the Commission to make an
7 informed choice that balances utility health with ratepayer protection. To
8 that end, my testimony provides a primary recommendation based on the
9 COE for the overall market as well as a recommendation based on the COE
10 for a proxy group. My primary recommendation, which is based on the
11 broader, riskier stock market, sits at the high end of what would be
12 considered a reasonable ROE for Piedmont and serves as a transparent
13 upper bound for the Commission to gradually align authorized ROEs with
14 the actual market-based COE over time. An ROE for the company is more
15 accurately represented by the results of my COE models applied to a proxy
16 group. This phased approach allows the Commission to move deliberately,
17 ensuring that the transition toward market-aligned rates is both transparent
18 for stakeholders and sustainable for the utility’s long-term operations.

19 Importantly, keeping authorized ROEs in line with the market-based COE is not
20 just good for residential consumers, it is pro-business and in line with the public interest.

21 Small businesses, industrial customers, and commercial enterprises all rely on affordable,

¹ *Fed. Power Comm’n v. Hope Nat. Gas Co. v. Hope Nat. Gas Co.*, 320 U.S. 591, 603 (1944).

² *Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm’n of the State of W. Va.*, 262 U.S. 679, 692-693 (1923).

predictable utility costs to compete and grow. Aligning Piedmont's authorized ROE with its COE helps businesses manage their costs, which strengthens the state's overall economy.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I provide a summary of my primary and alternative recommendations and an overview of COE concepts. Second, I provide an explanation of the various models I use in my COE calculations. Third, I provide my capital structure and cost of debt recommendation. Fourth, I provide an evaluation of Piedmont's rate of return testimony. Throughout my testimony I reference various appendices. These appendices provide a more in-depth discussion of the technical components that support my methodologies and recommendations.

III. SUMMARY OF RECOMMENDATIONS

Q. PLEASE PROVIDE A SUMMARY OF YOUR RECOMMENDATIONS.

A. The Commission should reject (1) Ms. Nelson's recommended ROE of 10.80%³ because it is higher than Piedmont's market-based COE, and (2) Piedmont's requested capital structure consisting of 55.09% equity and 44.91% long-term debt.⁴

While Company Witness Powers testifies that Piedmont requires rate relief because its existing 9.30% authorized ROE is not sufficient,⁵ that conclusion relies entirely on the financial analyses presented by Ms. Nelson. As Ms. Powers is not a rate-of-return expert

³ Direct Testimony of Jennifer E. Nelson at 4:10-14

⁴ Direct Testimony of Erica Glenn at 10:16.

⁵ Direct Testimony of .Pia Powers at 8:8-11.

1 and does not calculate the cost of equity herself, her request is only as valid as the
2 underlying testimony provided by Ms. Nelson.

3 **ROE Recommendation:** Ms. Nelson's recommended 10.80% ROE is significantly
4 higher than Piedmont's actual market-based cost of equity. Her recommendation is inflated
5 by flawed inputs, including reliance on short-term, optimistic EPS growth forecasts to drive
6 a perpetual growth component of her DCF model, and then uses those upwardly biased
7 results to calculate an excessive market risk premium component of her CAPM.
8 Furthermore, her recommendation ignores the risk-reducing impact of Piedmont's
9 participation in the RSA. Although the RSA does not provide a retroactive true-up,⁶ it
10 functions as a prospective mechanism that allows for annual base rate adjustments, thereby
11 reducing risk and providing a level of protection not available to non-regulated firms.

12 **Capital Structure:** The Company's requested capital structure (approximately
13 55% common equity and 45% long-term debt) is excessive. This common equity ratio is
14 significantly higher than the average common equity ratio used by other gas utility
15 companies in the country (approximately 48.4%)⁷ and is also well above the consolidated
16 capital structure currently utilized by Piedmont's parent, Duke Energy Corporation
17 (approximately 38%).⁸

18 Because Ms. Nelson's testimony overstates the Company's financial risk and its
19 cost of equity, her findings fail the test of market reality. Adopting her recommendations
20 would overcharge consumers by approximately \$15.1 million annually.

⁶ Direct Testimony of Pia Powers at 9:16-18.

⁷ Exhibit ALR-5 at 5.

⁸ Duke Energy Value Line Company Report, May 8, 2026

I recommend a unified Capital Structure and Cost of Debt for Piedmont's natural gas distribution operations, as follows:

- Common Equity: 48.39%
- Long-term Debt: 51.61%
- Cost of Debt: 4.28%

Based on this foundation, I provide two ROE recommendations for the cost of capital for Piedmont's natural gas distribution operations:

Primary Recommendation (9.00% authorized ROE). This is based on the COE for the overall market (S&P 500). It is worth noting that my 9.00% ROE recommendation is only 30 basis points lower than Piedmont's current authorized ROE of 9.30%.⁹ On the other hand, Ms. Nelson's recommended ROE of 10.80% is 150 basis points higher than Piedmont's current authorized ROE.

TABLE 1: ALR RECOMMENDED RANGE MIDPOINT - PIEDMONT NATURAL GAS COMPANY, INC			
Docket No. 2026-61-G			
	Capital Structure Ratios	Cost Rate	Weighted Cost Rate
Long-Term Debt	51.61%	4.28%	2.21%
Short-Term Debt	0.00%	0.00%	0.00%
Preferred Equity	0.00%	0.00%	0.00%
Common Equity	48.39%	9.00%	4.35%
Rate of Return			6.56%

Exhibit ALR-1

Traditional Recommendation (8.44% authorized ROE). This is based on the COE for a proxy group of risk-comparable gas utility companies.

⁹ Direct Testimony of Pia Powers at 9:10.

TABLE 2: ALR TRADITIONAL RECOMMENDATION - PIEDMONT NATURAL GAS COMPANY, INC			
Docket No. 2026-61-G			
	Capital Structure Ratios	Cost Rate	Weighted Cost Rate
Long-Term Debt	51.61%	4.28%	2.21%
Short-Term Debt	0.00%	0.00%	0.00%
Preferred Equity	0.00%	0.00%	0.00%
Common Equity	48.39%	8.44%	4.08%
Rate of Return			6.29%

Exhibit ALR-1

My recommendations are based on the following modeling results.

TABLE 3: COST OF EQUITY MODEL RESULTS		
DCF	Low	High
Constant Growth - Sustainable Growth	9.57%	9.61%
Constant Growth - Option-Implied Growth	7.78%	8.44%
Non-Constant Growth	8.47%	8.53%
CAPM		
Spot (Jun. 30, 2026)		
Risk Free Rate - 3-Month T Bill	5.35%	6.99%
Risk Free Rate - 30-Yr T Bond	6.04%	7.28%
3-Mo. Weighted Average (Apr. to Jun. 2026)		
Risk Free Rate - 3-Month T Bill	5.61%	6.96%
Risk Free Rate - 30-Yr T Bond	6.36%	7.38%
Recommended Range	7.70%	8.50%
Midpoint of Range (Based on Percentiles)	8.44%	

Exhibit ALR-2

Q. PLEASE DESCRIBE YOUR TWO ROE RECOMMENDATIONS.

A. I present two recommendations in this case to provide the Commission with both a conservative safety benchmark and a utility-specific analysis:

Primary recommendation (9.00% ROE): This rests on a fundamental economic boundary condition: if a recommended ROE exceeds the expected return of the S&P 500—a stock market index that includes 500 of the largest U.S. companies—it is economically unsound. Ms. Nelson’s ROE recommendation of 10.80% violates this risk boundary. By

1 bypassing the technicalities of proxy group composition and focusing on the S&P 500
2 directly, I have captured a baseline that is indisputably sufficient for a utility.

3 It is important to clarify that my primary recommendation of 9.00% falls above the
4 midpoint of the COE range for the overall stock market (7.46% to 9.34%)¹⁰. Because a
5 regulated monopoly utility is inherently less risky than the competitive overall market, this
6 range would not only provide a more than reasonable range for Piedmont, but also—given
7 that regulated utilities are less risky than the overall market—it serves as a strict upper
8 bound for the Company’s return.

9 **Traditional Recommendation (8.44% ROE):** This is based on the COE for a
10 proxy group of regulated utility companies (the same group used by Ms. Nelson). This
11 recommendation falls at the upper end of my utility-specific market-based range of 7.70%
12 to 8.50%. This recommendation is more than sufficient to allow Piedmont to raise capital
13 while protecting consumers. If the Commission seeks to authorize a true market-based
14 ROE that reflects the specific lower-risk profile of a regulated utility, it should adopt this
15 8.44% recommendation. Adoption of this recommendation would represent a significant
16 step toward aligning authorized returns with actual, observable market costs.

17 To ensure the robustness and real-world applicability of our findings, I validated
18 these COE model results against the long-term capital market expectations of a broad cross-
19 section of the financial community. As we explore in greater detail later in this testimony,
20 this validation includes data from:

- 21 • Major financial institutions such as J.P. Morgan and Charles Schwab; and

¹⁰ Chart 2 on page 25.

- Institutional investors, specifically the capital market assumptions of 41 major investment firms and institutional asset managers, including Bank of New York Mellon, BlackRock, and Goldman Sachs Asset Management.

As shown in Table 4 below, major financial institutions, fund managers, academics, and major consulting firms are informing their clients to expect returns on the overall market (S&P 500) of 5.9% to 8.65%.

TABLE 4: U.S. EQUITY RETURN EXPECTATIONS AMONG MAJOR FINANCIAL INSTITUTIONS, FUND MANAGERS, ACADEMICS, AND MAJOR CONSULTING FIRMS	
J.P. Morgan Asset Management - Equity Long-Term Returns (2026) [1]	6.70%
Charles Schwab - 10-year U.S. Large Cap Returns (Jan 2026) [2]	5.90%
Horizon Actuarial Services, LLC Survey - 20 Year Horizon (August 2025) [3]	
<i>U.S. Equity - Large Cap (4.8-9.3%, 50% Percentile - 7.1%)</i>	7.10%
<i>U.S. Equity - Small / Mid Cap (4.8-10.0%, 50% Percentile - 7.3%)</i>	7.30%
Aswath Damodaran (July 1, 2026) [4]	8.65%
Duff & Phelps / Kroll (April 2026) [5]	8.50%

Sources:

[1] J.P. Morgan Asset Management - 2026 Long-Term Capital Market Assumptions, 2025, page 12.

<https://am.jpmorgan.com/content/dam/jpm-am-aem/americas/us/en/institutional/insights/portfolio-insights/lcma-full-r>

[2] Schwab's 2025 Long-Term Capital Market Expectations, January 3, 2025.

<https://www.schwab.com/learn/story/whats-10-year-outlook-major-asset-classes>

[3] Horizon Actuarial Services, LLC, Survey of Capital Market Assumptions Survey, August 2024, page 19.

Survey participants Include: Bank of New York Mellon, BlackRock, Goldman Sachs Asset Management, J.P. Morgan Asset Management, Merrill, Morgan Stanley Wealth Management, Royal Bank of Canada, UBS.

[4] New York University, Professor Aswath Damodaran

<https://pages.stern.nyu.edu/~adamodar/>

[5] Kroll Recommended U.S. ERP and Corresponding RFR to be Used in Computing Cost of Capital: January 2008 - Present,

<https://www.kroll.com/en/insights/publications/cost-of-capital/recommended-us-equity-risk-premium-and-corresponding-risk-free-rates>

Note: Duff & Phelps acquired Kroll in 2021 and rebranded itself as Kroll.

Note: J.P. Morgan's 2025 Long-Term Capital Market Assumptions is an annual report.

The fact that market participants, who are responsible for deploying hundreds of billions of dollars in capital, expect returns well below our recommendation of 9.00% provides a high degree of confidence and confirms that a 9.00% ROE is sufficient for Piedmont to attract equity capital.

1 **Q. DO THE LONG-TERM CAPITAL MARKET EXPECTATIONS OF THE**
2 **FINANCIAL COMMUNITY HIGHLIGHT WHY YOUR ROE**
3 **RECOMMENDATION AND MS. NELSON’S ARE SO DIFFERENT?**

4 **A.** Yes. A primary driver of the discrepancy is Ms. Nelson’s reliance on inputs that introduce
5 an upward bias into her market return expectation. To be clear, the overall market return is
6 not the same as the final Return on Equity (ROE) recommended for Piedmont. However,
7 the expected market return is a critical mathematical input used in the Capital Asset Pricing
8 Model (CAPM) to calculate the market risk premium. Because her market return estimates
9 are significantly inflated, they artificially drive up her cost of equity model results and
10 therefore her 10.80% ROE recommendation for the Company.

11 Specifically, her Constant Growth DCF model relies on projected earnings per
12 share (“EPS”) growth rates for the S&P 500 from Value Line, Bloomberg Professional,
13 and S&P’s Earnings and Estimates Report to derive an expected market return, which she
14 calculates at between 16.38% and 19.08%.¹¹

15 Applying these 3-to-5-year, short-term EPS forecasts to a Constant Growth DCF
16 model, which requires a perpetual growth rate, creates a severe horizon mismatch.
17 Nowhere do these financial publications state that the intended purpose of their short-term
18 estimates is to serve as a perpetual growth rate. Assuming a short-term cyclical expansion
19 will continue forever breaks the underlying math of the model and inherently inflates the
20 expected cost of equity.

21 Additionally, she applies a second estimate based on the long-run historical
22 arithmetic average market return of 12.23% between 1926 and 2025, as reported by Kroll.¹²

¹¹ Direct Testimony of Jennifer E. Nelson at Exhibit (JEN-4) at 1.

¹² Direct Testimony of Jennifer E. Nelson at 31:15-17.

1 However, she ignores Kroll's own forward-looking guidance published in that very same
2 resource. Kroll explicitly points out that raw historical returns are upwardly biased by an
3 unsustainable expansion in price-to-earnings (P/E) multiples. To correct this, Kroll
4 provides a "Supply-Side Model" that strips out this historical multiple expansion, resulting
5 in a true forward-looking expected market return of just 9.45%.¹³ By relying on the raw
6 historical average instead of Kroll's adjusted model, Ms. Nelson inflates this market return
7 estimate by an additional 278 basis points.

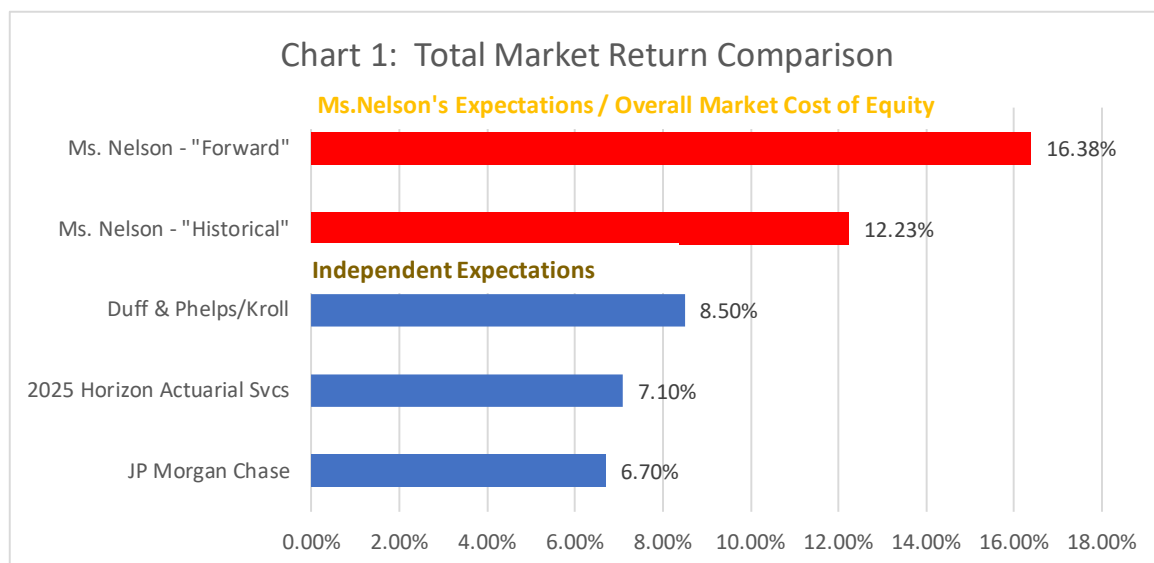
8 Grounding the analysis in broader, observable market data ensures that my
9 recommendation more accurately reflects the actual economic environment. Specifically,
10 my CAPM analysis utilizes an overall market return component of 8.22% to 8.72%, which
11 is derived directly from capital market data, including publicly traded stock and stock
12 option prices.

13 As shown in Chart 1 on page 15, Ms. Nelson's singular reliance on analyst EPS
14 growth rates suggests a market return of between 16.38% and 19.08%. While she
15 ultimately selects the 16.38% figure for use in her CAPM analysis, broader perspectives
16 and benchmarks from J.P. Morgan¹⁴ (6.7%) and Horizon Actuarial Services¹⁵ (7.1%) point
17 to a reality that is less than half of what Ms. Nelson proposes.

¹³ Kroll 2023 SBBI Yearbook, Page 197-202.

¹⁴ J.P. Morgan Asset Management is a global asset management business that annually publishes its Long-Term Capital Market Assumptions to help institutional investors and advisors inform strategic asset allocation. Now in its 30th edition for 2026, this research provides projections that establish reasonable risk and return expectations over a 10- to 15-year time frame across more than 200 asset classes.

¹⁵ Horizon Actuarial Services is an independent consulting firm that provides actuarial services to multiemployer defined benefit pension plans. In its annual Survey of Capital Market Assumptions, now in its 2025 edition, Horizon aggregates future risk and return expectations from 41 different investment advisory firms. This research provides composite forecasts over both 10-year and 20-year horizons to help evaluate the reasonableness of long-term investment return assumptions across various asset classes.



Q. WHY SHOULD THE COMMISSION REJECT MS. NELSON'S RECOMMENDED ROE?

A. The Commission should reject Ms. Nelson's 10.80% recommendation because it is significantly higher than Piedmont's market-based cost of equity (COE) and lacks a foundation in economic reality. If adopted, her recommendation would overcharge consumers by approximately \$15.1 million annually. Her models provide an inherently inflated result due to several critical defects:

- Inflated Growth Rates:** Ms. Nelson's models rely on short-term, optimistic sell-side EPS forecasts that are inappropriately forced into a perpetual Discounted Cash Flow (DCF) model. This "horizon mismatch" creates a mathematical domino effect, as she then uses these upwardly biased DCF results to calculate an excessive Market Risk Premium of up to 11.70%¹⁶, which fundamentally distorts her CAPM and ECAPM outputs.

¹⁶ Direct Testimony of Jennifer Nelson at 34:5.

- 1 • **Stale and Distorted Inputs:** Her CAPM and ECAPM results are further
2 distorted by her reliance on 10-year historical betas, which artificially lock
3 in the extreme market turmoil of the 2020 pandemic. This choice adds
4 between 30 and 63 basis points to her model results, ignoring current,
5 forward-looking market conditions.
- 6 • **Non-Market-Based Bond Yield Method:** Her Bond Yield Plus Risk
7 Premium method relies on past administrative accounting figures rather
8 than actual, current, and observable market prices, failing to reflect the cost
9 of equity that investors currently demand in the open market.

10 These methodological defects and instances of biased judgment are discussed in
11 further detail in Section VII.

12 IV. REVENUE IMPACT ANALYSIS

13 **Q. PLEASE COMPARE PIEDMONT'S REVENUE REQUIREMENT IF YOUR**
14 **RECOMMENDATIONS ARE ADOPTED INSTEAD OF MS. NELSON'S.**

15 **A.** If my 8.44% COE and capital structure recommendations are adopted, the rate of return
16 portion of the revenue requirement for Piedmont will be approximately \$63.2 million. In
17 contrast, adopting Ms. Nelson's 10.80% recommendation would increase that requirement
18 to \$81.0 million, a difference of \$15.1 million charged to consumers annually. With my
19 9.00% ROE recommendation, the difference is \$15.1 million annually.

TABLE 5: ANNUAL REVENUE IMPACT VS. ROTHSCILD RECOMMENDATION - PIEDMONT NATURAL GAS COMPANY, INC (\$ million)		
	Rate of Return Portion of Revenue Requirement	Difference versus Rothschild Recommendation
Rothschild ROE & Cap Structure	\$65.9	
Rothschild ROE with Nelson Cap Structure	\$70.1	\$4.3
Nelson ROE & Cap Structure	\$81.0	\$15.1
Source/Inputs:		
Requested Rate Base [1]		\$822.0
Federal income tax rate		21.00%
State income tax rate		5.00%
Uncollectable Expense		0.00%
[1] Exhibit No. __ (JDT-2), Page 11 of 48		

These drastic differences show that the cost of capital is a pivotal decision. It is understandable to feel a sense of caution when setting rates for services as essential as those provided by Piedmont. There is often a temptation to “err on the side of caution” by authorizing a higher ROE to ensure system stability. However, as Alfred Kahn¹⁷ reminds us, the essence of regulation is the replacement of competition.¹⁸ If the authorized return is disconnected from the actual COE, the result is an involuntary subsidy from ratepayers to shareholders—an outcome that undermines the very purpose of regulation.

To put the scale of this subsidy into perspective: the “cost” of moving the ROE by just ten basis points (one-tenth of a percent) is approximately \$500,000. This means that a relatively small increase above the market-based rate results in about a half of a million dollars in additional costs for ratepayers across all customer classes.

¹⁷ Alfred E. Kahn (1917–2010), author of the seminal two-volume *The Economics of Regulation: Principles and Institutions* (1970–71), was a leading economist and regulator often regarded as the “father of airline deregulation” whose work continues to shape utility regulation policy.

¹⁸ Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions* at 20 (MIT Press 1988).

V. COE METHODOLOGY

A. Overview

Q. PLEASE PROVIDE AN OVERVIEW OF YOUR COE METHODOLOGY.

A. As discussed above, the governing principle for establishing a fair rate of return (ROR) is rooted in Supreme Court precedent, which mandates that an authorized Return on Equity (ROE) should be commensurate with returns on investments of comparable risk¹⁹ and that it should be sufficient to support the Company's credit and its ability to raise the money necessary for the proper discharge of its public duties.²⁰ Traditionally, this is achieved by analyzing a proxy group of utility companies with risk profiles similar to the utility in question.

In this proceeding, I provide two distinct ROE recommendations to offer the Commission both a conservative safety benchmark and a utility-specific market analysis. These recommendations are supported by the various financial models summarized in Table 3 on page 10.

Primary Recommendation (9.00% authorized ROE): My primary recommendation is based on an analysis of the overall market. By focusing on the broader market benchmark, the Commission can bypass granular disputes and move directly to a conclusion that is both practical and analytically supported: the overall market is riskier than a regulated utility company like Piedmont and thus has a higher COE. I have used this benchmark to provide an ROE with a conservative cushion that is fully justified and

¹⁹ *Fed. Power Comm'n v. Hope Nat. Gas Co.*, 320 U.S. 591, 603 (1944).

²⁰ *Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm'n of the State of W. Va.* 262 U.S. 679, 692-693 (1923).

1 quantified. My rationale is straightforward: if the authorized ROE is sufficient to attract
2 capital in the broader, higher-risk market, it is indisputably sufficient for a lower-risk
3 regulated utility. This approach provides the Commission with the highest level of
4 assurance that the *Bluefield* requirement of ensuring financial integrity and capital
5 attraction is not only met but exceeded.

6 This recommendation rests on a fundamental economic boundary condition: if a
7 recommended ROE exceeds the expected return of the S&P 500, it is economically
8 unsound. Ms. Nelson's ROE recommendation of 10.80% violates this risk boundary.

9 To translate this economic reality into a specific, market-based figure, I rely on the
10 following analytical framework:

- 11 • **Model and Methodology:** I use the Constant Growth Discounted Cash
12 Flow (DCF) model with option-implied growth to derive expectations
13 directly from the prices of stock options traded on the S&P 500 Index. By
14 focusing on the S&P 500 directly, I have captured a baseline that is
15 indisputably sufficient for a utility.
- 16 • **Data Highlights:** As shown in Chart 2 on page 25, this model reflects
17 investor expectations across various horizons:
 - 18 ▪ 8.72% to 9.34% over a 1-year horizon.
 - 19 ▪ 8.78% to 8.90% over a 3-year horizon.
 - 20 ▪ 7.46% to 7.96% over a 5-year horizon.
- 21 • **Note on Capital Asset Pricing Model (CAPM):** I do not implement the
22 CAPM for this benchmark, as applying it to the overall market would be
23 redundant, essentially comparing the market against itself.

1
2 **Traditional Recommendation (8.44% ROE):** This analysis follows the standard
3 regulatory practice of evaluating the same proxy group of 7 publicly traded utility
4 companies used by Ms. Nelson.²¹ These companies provide a reliable benchmark because
5 they possess risk profiles comparable to Piedmont. To ensure a robust result that is not
6 skewed by any single methodology, I employ a suite of models yielding results ranging
7 from 7.70% to 8.50%.

8 To determine the specific cost of equity for this group, I have synthesized results
9 from the following multi-model analysis, as detailed in Table 3 on page 10:

- 10 • **Three DCF Variants:** I implement the Sustainable Growth DCF (9.57%–
11 9.61%)²², the Non-Constant Growth DCF (8.47%–8.53%), and the Option-
12 Implied Growth DCF (7.78%–8.44%).
- 13 • **Horizon Limitation:** Unlike the Primary recommendation, the Option-
14 Implied Growth DCF for the proxy group is based strictly on a 6-month
15 investment horizon. This is a deliberate choice driven by market reality:
16 individual utility companies do not have a consistent, liquid market for
17 options traded beyond roughly 8 months, making the 6-month horizon the
18 most reliable forward-looking snapshot available.
- 19 • **CAPM Analysis:** I utilize eight variations of the CAPM, incorporating both
20 historical and forward-looking (option-implied) betas and risk premiums.

²¹ Direct Testimony of Jennifer E. Nelson at 21, Figure 4.

²² The reason my sustainable growth DCF model shows a COE Result higher than my other method is because of growth from the sale of new common stock of 3.82%. It is likely that investors do not expect this growth from the sale of new common stock to be sustainable in the long run.

1 As reflected in Table 3 on page 10, these results indicate a range of 5.35%
2 to 7.38%.

3 If the Commission seeks to authorize a true market-based ROE reflecting the lower-
4 risk profile of a regulated utility, it should adopt this 8.44% recommendation. By utilizing
5 these two distinct paths, the Commission can see both the specific market cost for a
6 regulated utility (Traditional) and the broader economic boundary that ensures Piedmont
7 can attract capital without overcharging ratepayers (Primary).

8 It is worth noting that standard COE modeling often leads to protracted debates
9 over fluctuating betas, risk-free rate projections, and individual growth estimates. These
10 technical disputes, while common and often necessary in utility rate cases, can sometimes
11 make it harder to see what capital markets are revealing regarding the COE. Therefore, by
12 focusing on the COE for the overall market, the basis of my Primary Recommendation, I
13 have simplified the analysis and narrowed the scope of debate. Reducing the number of
14 parameters in this way removes unnecessary complexity, allowing the Commission to base
15 its decision on a clear and robust economic boundary that is less susceptible to the technical
16 disagreements inherent in proxy-group modeling.

17 **B. How Capital Markets Inform the Cost of Equity**

18 **Q. PLEASE PROVIDE AN OVERVIEW OF YOUR PERSPECTIVE REGARDING**
19 **HOW CAPITAL MARKETS RELATE TO THE COE AND THE OVERALL COST**
20 **OF CAPITAL.**

21 **A.** The cost of capital is the return investors require to provide capital to Piedmont based on
22 current capital markets. To measure the Cost of Equity (COE) accurately, it is critical to

1 use current market data because it increases the likelihood that the authorized ROE will
2 match Piedmont's market-based COE when it needs to raise equity capital.

3 My recommendation prioritizes current market prices (e.g., stocks, bonds, and
4 options). These prices serve as a direct measure of contemporaneous investor expectations,
5 rather than relying on the lagging indicators or subjective projections inherent in historical
6 data and analyst forecasts. This market-based approach is superior for two primary reasons:

- 7 1. **Direct Reflection of Macro-Conditions:** The COE that Piedmont pays
8 investors is dictated by the markets. Recent inflation and interest rate shifts
9 are not a secret; therefore, market-based models reflect these changing
10 expectations in real-time.
- 11 2. **Market Unpredictability:** As Warren Buffett famously noted, investors
12 should not listen to "jabbering" about what the market will do tomorrow
13 because "nobody knows". Current market prices of stocks and bonds are our
14 best source of investors' actual expectations because they reflect what
15 people are doing with their money *now*, not what they say they might do
16 later.

17 **Q. HOW DOES THIS PERSPECTIVE INFORM YOUR CRITIQUE OF MS.**
18 **NELSON'S TESTIMONY?**

19 **A.** While Ms. Nelson incorporates market-derived inputs, her methodology frequently relies
20 on historical averages and third-party analyst forecasts. By prioritizing these "expert"
21 projections over current market prices, her analysis becomes untethered from the
22 fundamental economic boundary I described in my summary: an ROE for a regulated utility
23 cannot logically exceed the expected return of the riskier overall market.

1 **C. Primary ROE Recommendation - Overall Market**

2 **Q. HOW DID YOU CALCULATE THE SPECIFIC COE FOR THE OVERALL**
3 **MARKET USED IN YOUR PRIMARY RECOMMENDATION?**

4 **A.** To arrive at my 9.00% ROE recommendation, I calculated the COE for the S&P 500
5 directly using the DCF method. I used the prices of stock options traded on the S&P 500
6 to derive an option-implied growth rate. This methodology captures actual investor
7 expectations and indicates a market COE of 7.46% to 9.34%. Since Piedmont, as a
8 regulated utility, is inherently less risky than the S&P 500—a competitive market—its
9 ROE cannot reasonably exceed this range.

10 **Q. PLEASE DESCRIBE THE PRINCIPLES BEHIND THE DCF METHOD.**

11 **A.** The DCF method is a standard valuation approach used to estimate the COE by providing
12 a direct measure of investors' actual expectations and required returns. It is based on the
13 principle that investors purchase common stock to receive future cash payments from two
14 sources: (a) current and future dividends, and (b) proceeds from eventually selling the
15 stock.

16 The value of the stock is the discounted value of all these future cash flows. To
17 estimate the COE based on this principle, the model sums two components:

- 18 1. **Dividend Yield:** The cash percentage an investor expects to receive today via
19 dividends.
- 20 2. **Growth Rate:** The percentage increase in value the investor expects to see in the
21 future through capital appreciation.

22 In simple terms, the formula is:

1 **COE = Dividend Yield + Growth Rate.**

2 Because the dividend yield is easily observable in the market, accurately estimating
3 the growth rate is the primary challenge and the source of most disagreement among
4 experts.

5 **Q. HOW DID YOU CALCULATE THE GROWTH COMPONENT FOR YOUR S&P**
6 **500 ANALYSIS?**

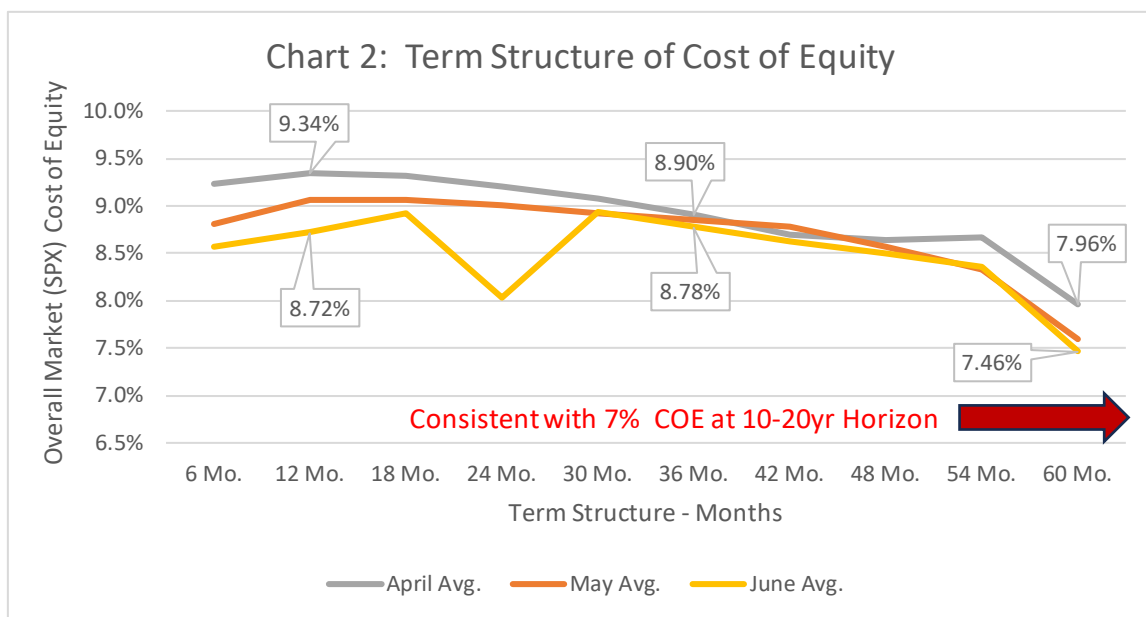
7 **A.** I calculated the growth component by analyzing the prices of stock options traded on the
8 S&P 500 Index to derive an "option-implied" growth rate. I calculated these growth
9 expectations over three different investment time horizons—1-year, 3-year, and 5-year—
10 to capture the full "term structure" of investor expectations.

11 To calculate the term structure of the COE, I added the dividend yield of the S&P
12 500 Index (approximately 1.1%) to these growth rates.

13 **Q. WHAT CONCLUSION DO YOU DRAW FROM THE RESULTS OF YOUR DCF**
14 **ANALYSIS?**

15 **A.** My analysis reveals a dynamic, downward-sloping term structure for the COE of the
16 overall market. While short-term market expectations have risen in recent months, long-
17 term expectations remain anchored at lower levels:

- 18 • **1-Year Horizon:** 8.72% to 9.34%.
- 19 • **3-Year Horizon:** 8.78% to 8.90%.
- 20 • **5-Year Horizon:** 7.46% to 7.96%.



This is significant for utility ratemaking because the longer horizons are arguably the most relevant. As the timeline extends toward five years, the COE indicated by my analysis (7.96%) trends directly toward the long-term (10-to-20 year) forecasts from major financial institutions like J.P. Morgan (6.7%) and the Horizon Actuarial Survey (around 7.1%). See Table 4 on page 12.

Q. WHY DIDN'T YOU CALCULATE THE COE BEYOND THE 5-YEAR TIME FRAME?

A. I did not calculate an option-implied COE beyond the 5-year horizon simply because a consistent market for such options does not exist. Publicly traded index options occasionally trade out to six years for a brief period but are only available consistently out to about five years.

However, the trend is instructive. The term structure I calculated clearly slopes downward, moving from 9.34% in Year 1 to 7.96% in Year 5. If we were to extrapolate this trend out to the 10- or 20-year horizon, the data suggests the COE would continue to

moderate, converging with the long-term forecasts of major financial institutions (which range from 5.9% to 8.5%).

Q. WHY IS YOUR 9.00% RECOMMENDATION APPROPRIATE GIVEN THESE MARKET-BASED RESULTS?

A. My recommendation of 9.00% is highly conservative. It sits comfortably above the midpoint of my June 2026 calculations (8.40%) and well above the long-term consensus of the institutional investment community.

While my analysis indicates that the true market-based COE for a low-risk regulated utility is significantly lower—close to the 7.96% end of my range—I am recommending 9.00% for practical reasons: to provide a conservative cushion that ensures Piedmont maintains its credit quality while moving the Commission incrementally toward alignment with true market costs.

D. Traditional ROE Recommendation

Utility Proxy Group

Q. PLEASE SUMMARIZE HOW YOU DETERMINED YOUR 8.44% COE RECOMMENDATION FOR PIEDMONT.

A. To arrive at my recommendation, I applied the Constant Growth²³ and Non-Constant Growth versions of the DCF and 8 variations of the CAPM methodologies to a proxy group

²³ The constant growth DCF model is a variant, or version, of the single-stage DCF model that uses a consistent, never-changing growth rate component in perpetuity.

1 of 7 publicly traded natural gas utilities companies (“RFC Gas Proxy Group”)²⁴ using data
2 available from December 2025 through June 30, 2026.

3 The RFC Proxy Group consists of the same 7 companies included in Ms. Nelson’s
4 proxy group for her COE analysis.²⁵ I use a proxy group because Piedmont does not have
5 its own publicly traded stock data; using a group of comparable companies provides a
6 stable benchmark less likely to be skewed by individual corporate anomalies.

7 As shown in Table 3 on page 10, Cost of Equity Model Results, the results of my
8 cost of equity models, including eight variations of the CAPM and three variations of the
9 DCF, range between 5.35% and 9.61%. Reducing the overall range of my results,²⁶ leads
10 me to a reduced Recommended Cost of Equity range of 7.70% to 8.50% (with a
11 recommendation of 8.44%).²⁷

12 **Q. WHAT COMPANIES ARE IN YOUR PROXY GROUP?**

13 **A.** My comparable proxy group, shown on Table 6 on page 28, and referred to as the RFC
14 Gas Proxy Group, consists of the following 7 publicly traded natural gas utilities covered
15 by Value Line. Ms. Nelson’s proxy group contains the same 7 companies.

²⁴ Rothschild Financial Consulting (“RFC”).

²⁵ Direct Testimony of Jennifer E. Nelson at 21, Figure 4.

²⁶ While my standard practice often involves the use of an Inner 50 Percentile Range to mitigate the impact of outliers, the specific data set in this proceeding exhibited a high degree of dispersion. Consequently, I have narrowed the focus to a more concentrated range, specifically between the 75th and 85th percentiles. This adjustment ensures that the recommended range is supported by the most statistically robust cluster of results, thereby providing a more stable basis for the rate of return than a wider, more volatile interval would allow.

²⁷ I apply a statistical filtering approach by eliminating the top and bottom 80% of COE model results to reduce the impact of short-term unsustainable market distortions that could overly impact any one of my models.

TABLE 6: RFC GAS PROXY GROUP COMPOSITION

	Company Name	Ticker
1	ATMOS ENERGY CORP.	ATO
2	NI SOURCE INC.	NI
3	NEW JERSEY RES.	NJR
4	N.W. NATURAL	NWN
5	ONE GAS, INC.	OGS
6	SPIRE INC.	SR
7	SOUTHWEST GAS	SWX

Discounted Cash Flow Model

Q. HOW DID YOU IMPLEMENT THE DCF METHOD FOR YOUR TRADITIONAL ANALYSIS?

A. While the general principles of the DCF remain consistent, I employ three distinct variants for the Traditional Recommendation to capture different facets of investor expectations:

- **Sustainable Growth DCF (9.57%–9.61%):** This uses the "retention growth" (bxr) method, which determines growth based on the earnings a company keeps and reinvests. This avoids the "optimism bias" often found in raw analyst forecasts.
- **Non-Constant Growth DCF (8.47%–8.53%):** This model discounts each separate annual cash flow based on specific, multi-year forecasts from Value Line.
- **Option-Implied Growth DCF (7.78%–8.44%):** This uses the same market-based logic as my Primary Recommendation but is applied to the individual companies in the proxy group.

1 **Q. WHY IS THE OPTION-IMPLIED DCF FOR THE PROXY GROUP LIMITED TO**
2 **A 6-MONTH HORIZON?**

3 **A.** Unlike the S&P 500, which has a deep and liquid market for long-term options, individual
4 utility companies rarely have a consistent market for options traded beyond eight months.
5 Therefore, for the RFC Proxy Group, I use a 6-month investment horizon as the most
6 reliable forward-looking snapshot currently available.

7 **Capital Asset Pricing Model (CAPM)**

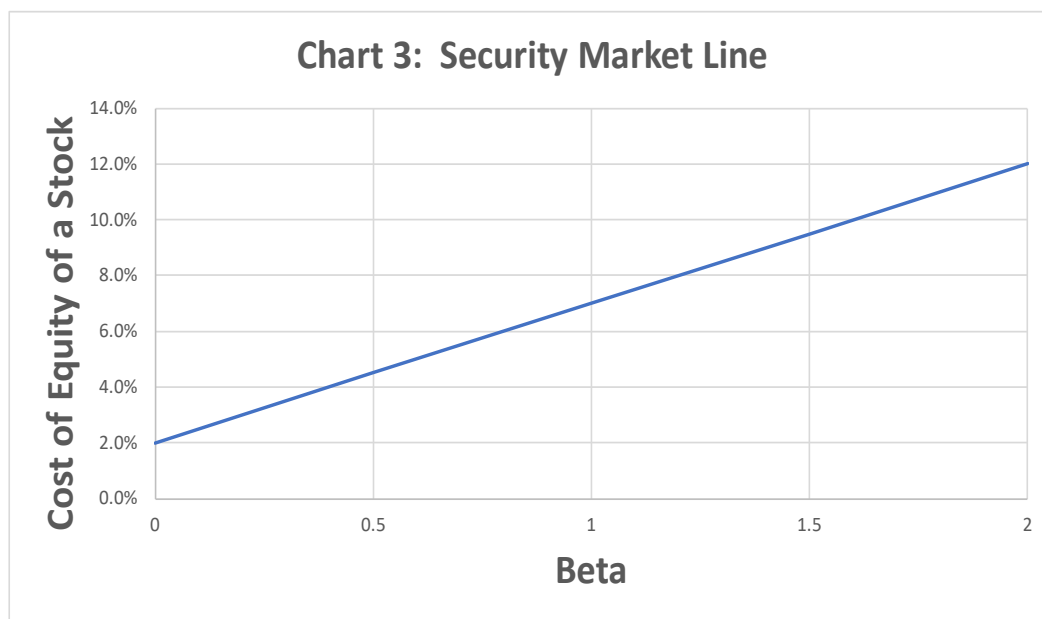
8 **Q. PLEASE DESCRIBE THE CAPM.**

9 **A.** The CAPM relates return to risk; specifically, it relates the expected return on an
10 investment in a security to the risk of investing in that security. The riskier the investment,
11 the greater the expected return (i.e., the COE) investors require to make that investment.

12 Investors in a firm's equity face two types of risks: (1) firm-specific risk and (2)
13 market risk (financial analysts refer to this market risk as systematic risk). Firm-specific
14 risk refers to risks unique to the firm, such as management performance and losing market
15 share to a new competitor. Investors can reduce firm-specific risk by purchasing stocks as
16 part of a diverse portfolio of companies if they construct the portfolio to cause the firm-
17 specific risk of individual companies to balance out. Market-related risk refers to potential
18 impacts from the overall market, such as a recession or interest rate changes.
19 Diversification cannot remove market-related risks, so the investor must bear it no matter
20 what. Because the investor has no option but to bear market risk, the investor's COE will
21 reflect that risk.

The CAPM predicts that for a given equity security, the COE has a linear relationship to how sensitive the stock's returns are to movements in the overall market (e.g., S&P 500). A security's market sensitivity is measured by its beta. The price of a stock with a beta of 1 tends to move with the market. If the market increases by 1%, the stock is also expected to increase by about 1%, and vice versa. The price of a stock with a beta greater than 1 tends to be more volatile than the market. For example, a stock with a beta of 1.5 will on average be 50% more volatile than the market. If the market rises by 1%, the price of a stock with a beta of 1.5 is expected to rise by 1.5%, and if the market falls by 1%, the stock price is expected to decrease by 1.5%. The price of a stock with a beta of less than 1 tends to be less volatile than the market.

As shown in Chart 3 below, the higher the beta of a stock, the higher the company's COE—the return required by the investor to invest in the stock.



Here is the standard CAPM formula:

$$K = R_f + \beta_i * (R_m - R_f)$$

Where:

K is the COE;
 R_f is the risk-free interest rate;
 R_m is the expected return on the overall market (e.g., S&P 500);

[R_m – R_f] is the premium investors expect to earn above the risk-free rate for investing in the overall market (“equity risk premium” or “market risk premium”); and β_i (Beta) is a specific asset’s share of non-diversifiable, or systematic, risk.

Q. PLEASE EXPLAIN HOW YOU IMPLEMENTED THE CAPM.

First, I determined appropriate values or ranges for each of the three model inputs: (a) Risk-Free Rate, (b) Beta, and (c) Market risk premium. Second, I used the equation above to calculate the COE implied by the model. Below I will explain how I calculated the three model inputs and summarize the CAPM COE numbers resulting from those inputs. Table 7 and Table 8 on page 38 show the results of my CAPM.

Risk-Free Rate

Q. WHAT RISK-FREE RATE DID YOU USE IN YOUR CAPM?

A. It is generally preferable to use the market yield on short-term U.S. Treasury securities as the risk-free rate because these assets have a beta close to zero. *Principles of Corporate Finance* states “The CAPM... calls for a short-term interest rate.”²⁸ I chose to use a risk-free rate based on both long- and short-term Treasury yields. However, as indicated by the recent inverted yield curve,²⁹ investors with a longer investment horizon would likely use a lower risk-free rate as an opportunity cost for their investment decisions.

²⁸ Richard Brealey, Stewart Myers, & Franklin Allen, *Principles of Corporate Finance*, p. 228, (McGraw-Hill Irwin, New York, 12th ed. 2017).

²⁹ The yield curve on U.S. Treasury bonds relates the yield to its time to maturity. We say the current yield curve is steep because the difference in yield between short-term (near 0%) and long-term (over 1%) bonds is large in percentage terms.

Beta

Q. WHAT BETA DID YOU USE IN YOUR CAPM?

A. Since the COE should be based on investor expectations, I chose to use two betas. My “forward beta” is based on forward-looking investor expectations of non-diversifiable risk. My “historical blended” beta is based on historical return data over 6-month, 2-year, and 5-year periods.

Most published betas are based exclusively on historical return data. For example, Value Line publishes a 5-year historical beta for each of the companies it covers. However, it is also possible to calculate betas based on investors’ expectations of the probability distribution of future returns. This probability distribution of future returns expected by investors can be calculated based on the market prices of stock options.

Q. WHAT IS A STOCK OPTION?

A. A stock option is the right to buy or sell a stock at a specific price for a specified amount of time. A call option is the right to buy a stock at a specified exercise or strike price on or before a maturity date. A put option is the right to sell a stock at a specified exercise or strike price on or before a maturity date. For example, a call option to purchase 100 shares of Apple Inc. stock for \$230 on January 17, 2020, allows the owner the option (not the obligation) to buy Apple stock for \$230 on that date. At the end of July 2019, Apple stock was trading at about \$215 per share. Why would anyone pay for the right to buy a stock higher than the current price? Investors who purchased those call options thought there was a chance Apple stock would be trading higher than \$230 on January 17, 2020, giving those investors the right to buy Apple stock for \$230 and profit by selling it at the market price on that date, if it was higher. The price of Apple’s stock was \$317.98 at the close of

1 trading on January 17, 2020. Therefore, the investor who purchased this call option for
2 \$635 on July 31, 2019, earned a profit of \$8,163.³⁰ at expiry on January 17, 2020. On the
3 other hand, the investor who purchased an Apple put option with the same expiration date
4 and strike price on July 31, 2019, would have lost the price of the option (\$2,248) and
5 gained nothing on the expiration date because the right to sell Apple stock for \$230 when
6 the price is over \$300 is worthless.

7 The market prices of put options and call options provide information regarding the
8 probability distribution of future stock prices expected by investors. Using established
9 techniques, I am able to use price data for stock options of my RFC Gas Proxy Group
10 companies and the S&P 500 Index to determine investors' return expectations, including
11 the relationship (covariance) between the return expectations for individual RFC Gas Proxy
12 Group companies and those for the overall market (S&P 500).³¹ This covariance between
13 the expected returns for my RFC Gas Proxy Group and for the S&P 500 indicates what
14 investors expect betas will be in the future. I refer to betas based on option price
15 calculations as "option-implied betas."

16 **Q. PLEASE EXPLAIN HOW YOU CALCULATED THE BETAS USED IN YOUR**
17 **CAPM.**

18 **A.** Traditionally, the betas used in CAPM calculations are calculated from historical returns.
19 While this approach is common, it is fundamentally backward-looking. A superior way to
20 calculate forward betas is to base them directly on investors' current expectations using

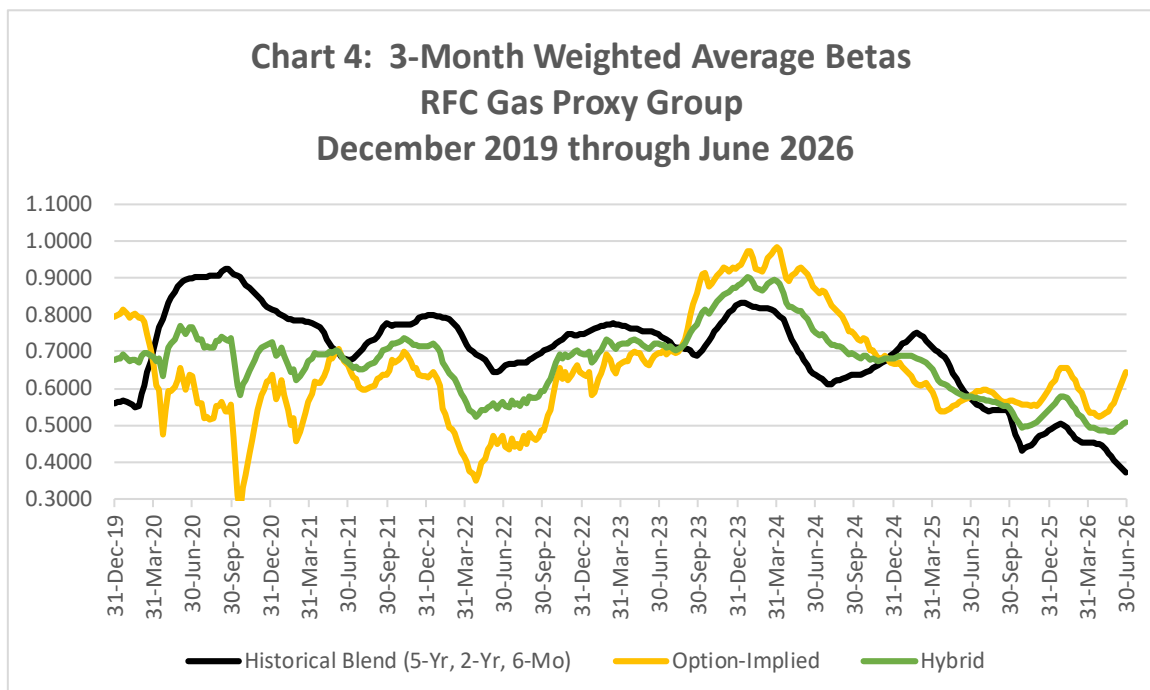
³⁰ \$8,163 profit from exercising call option (\$31,798 from selling at \$317.98 market price - \$23,000 cost to purchase at \$230) - \$635 (\$6.35 X 100) option purchase price. Note: Each call option is the right to purchase 100 shares.

³¹ My primary recommendation is based solely on S&P 500 index options. The S&P 500 is also an input in my CAPM model used in my traditional recommendation.

observable option prices. Because the cost of equity is inherently a forward-looking metric based on investor expectations, incorporating these option-implied betas provides critical, real-time information regarding future perceived risks.

As shown in Chart 4 below, my historical blended betas have been trending downward in recent months, while the option-implied betas have been increasing. This divergence is highly valuable because it demonstrates that the forward-looking cost of equity for utility companies is likely higher than if we were to rely on historical betas alone.

For these reasons, I have chosen to use both historical and option-implied betas in my CAPM analysis. By using a mix of current historical data and option-implied expectations, my analysis ensures that Piedmont's risk profile reflects today's market reality rather than yesterday's chaos. As discussed in Section VII (see Chart 5 on page 55), Ms. Nelson's decision to introduce a 10-year historical beta serves the opposite purpose—it effectively locks in the pandemic-era turmoil, creating a permanent distortion that artificially inflates her results.



1 Exhibit ALR-4, page 3 contains the last three months of data used in creating Chart
2 5 on page 55, which is what I use in my CAPM analysis. Specifically, I use the following
3 two betas in my CAPM analysis:

- 4 1. **Historical Blend:** 50% (6 months) + 30% (2 years) + 20% (5 years).
- 5 2. **Forward Beta:** 100% Option-Implied Beta (6 months).

6 **Q. PLEASE EXPLAIN HOW YOU CALCULATED OPTION-IMPLIED BETAS.**

7 **A.** Calculating option-implied betas of a company requires (1) obtaining stock option data for
8 that company and a market index, (2) filtering the stock option data, (3) calculating the
9 option-implied volatility for the company and for the index, (4) calculating the option-
10 implied skewness for the company and for the index, and (5) calculating option-implied
11 betas for the company based on implied volatility and skewness for the company and for
12 the index. There are various ways one could choose to perform the steps above. I chose to
13 filter stock option data and calculate option-implied volatility³² and skewness³³ following
14 exactly the same methodology used by the Chicago Board of Options Exchange (CBOE)
15 in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index,
16 respectively.

³² CBOE Volatility Index White Paper (2018) available at <https://cdn.cboe.com/resources/indices/srvix-white-paper.pdf>. Please note that the cover page says, “proprietary information.” However, this document has been in the public domain for over 3 years.

³³ *Id.*

Market Risk Premium

Q. PLEASE EXPLAIN HOW YOU CALCULATED THE MARKET RISK PREMIUM USED IN YOUR CAPM.

A. Traditionally, the risk premium used in CAPM calculations is derived from historical returns and/or equity analyst projections. The former approach is historically accurate but does not take into account investors' expectations for future market risks and returns. The latter approach is based on analyst projections, which are not appropriate since they do not reflect current investor expectations. A superior market-based way to calculate the market risk premium is to use option-implied return expectations, which is the approach I have used.

My market risk premium is the expected return on the S&P 500 minus the risk-free rate. I calculate an expected return on the S&P 500 by using stock options traded on this index. To begin with, I use exactly the same methodology used by the Chicago Board of Options Exchange to filter stock option data and calculate option-implied volatility and skewness,³⁴ as described in detail in the Beta section on page 35. The volatility and skewness calculated in this way describe a probability distribution representing the possible trajectories for the S&P 500 implied by the options market. The resulting skewed probability distribution can be closely approximated by a log-normal distribution using established statistical formulas, which then make it straightforward to calculate the expected growth for the S&P 500 for any given cumulative probability. A cumulative probability of 50% represents the median of the probability distribution, or the option-

³⁴ As used in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index, respectively.

1 implied market consensus, which is how I arrive at my calculation of expected market
2 growth.

3 Once the option-implied growth rate of the S&P 500 has been estimated as
4 described above, I add the dividend yield and subtract the risk-free rate to arrive at the
5 market risk premium, as laid out in Exhibit ALR-4, page 4 and Exhibit ALR-4, page 6. In
6 line with my Spot and Weighted Average CAPM approaches, I use both spot values as of
7 June 30, 2026 and weighted averages over the 3 months ending on that date for option-
8 implied growth, dividend yields, and short- and long-term risk-free rates in these
9 calculations to arrive at a total of 4 estimated values for the market risk premium. The
10 market risk premia I use in my Weighted Average CAPM analysis with short- and long-
11 term risk-free rates are 4.95% and 3.76%, respectively. The market risk premia I use in
12 my Spot CAPM analysis with short- and long-term risk-free rates are 4.35% and 3.31%,
13 respectively.

14 For additional explanation regarding risk-free rate, betas, and market risk premium
15 see Appendix E below.

16 **CAPM Results**

17 **Q. PLEASE SUMMARIZE THE RESULTS OF YOUR CAPM.**

18 **A.** Table 7 and Table 8 on page 38 show the results of my Weighted Average CAPM and Spot
19 CAPM Analyses, respectively.

Weighted Average CAPM

TABLE 7: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY WEIGHTED - All Inputs Weighted From April to June 2026				
	<u>3-Month Treasury Bill</u>		<u>30-Year Treasury Bond</u>	
	Historical Blended Beta	Forward Beta	Historical Blended Beta	Forward Beta
Risk-Free Rate	3.76%	3.76%	4.95%	4.95%
Beta	0.37	0.65	0.37	0.65
Risk Premium	4.95%	4.95%	3.76%	3.76%
CAPM	5.61%	6.96%	6.36%	7.38%

Source: Exhibit ALR-4, page 1

Spot CAPM

TABLE 8: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY (SPOT) SPOT - All Inputs Based on Last Available Data as of June 30, 2026				
	<u>3-Month Treasury Bill</u>		<u>30-Year Treasury Bond</u>	
	Historical Blended Beta	Forward Beta	Historical Blended Beta	Forward Beta
Risk-Free Rate	3.87%	3.87%	4.91%	4.91%
Beta	0.34	0.72	0.34	0.72
Risk Premium	4.35%	4.35%	3.31%	3.31%
CAPM	5.35%	6.99%	6.04%	7.28%

Source: Exhibit ALR-4, page 5

The results of my CAPM analysis applied to the RFC Gas Proxy Group are consistent with recent declining trends. As shown in Appendix E, the CAPM COE has evolved since the onset of the COVID-19 pandemic. The COE briefly spiked in early 2020 but then declined as markets stabilized. Most importantly, since peaking at about 9.25% in November 2022, the CAPM-implied COE for the proxy group has been on a clear downward trend, falling to under 7% by August 2025.

Q. PLEASE PROVIDE A COMPARISON OF THE BASIS OF YOUR PRIMARY AND TRADITIONAL RECOMMENDATIONS.

A. Table 9 below provides a final comparison of the two analytical paths used to determine the COE for Piedmont, highlighting the relationship between the broader economic "ceiling" and the utility-specific market cost.

Table 9: Summary: Overall Market Analysis vs. Utility Proxy Group		
Feature	Primary Recommendation (Overall Market)	Traditional Recommendation (RFC Gas Proxy Group)
ROE Recommendation	9.00%	8.44% (7.70% to 8.50%)
Analytical Basis	S&P 500 Index	7 natural gas utility companies
Economic Role	Acts as a conservative "ceiling" or economic boundary	Represents the specific market cost for the utility sector
Primary Logic	A regulated utility is less risky than the competitive market	A multi-model synthesis ensures a robust, utility-specific result
Models Used	DCF (Option-Implied Growth)	DCF (3 variations, 6 scenarios) and CAPM (8 scenarios)
Investment Horizon	1, 3, & 5-Year (Option-Implied DCF)	6-Month (Option-Implied Betas); 5-Year (MRP); Perpetual (Sustainable Growth DCF)

Key Points

As the Commission evaluates these figures, three core principles should remain in focus:

- The Risk Boundary:** Because a regulated monopoly utility is inherently less risky than the competitive overall market, the COE for the S&P 500 serves as a strict upper bound for Piedmont's return. Any recommendation exceeding this boundary, such as Ms. Nelson's 10.80%, is economically unsound.
- Alignment with Major Financial Institutions:** Both recommendations are validated by the long-term expectations of major financial institutions (e.g., J.P. Morgan, Charles Schwab), which currently range between 5.9% and 8.5%. My 9.00% recommendation sits comfortably above these institutional benchmarks, providing a significant margin of safety.

- **Gradualism and Stability:** While my traditional analysis supports a market-based COE as low as 8.44%, the 9.00% Primary Recommendation provides a practical "anchor in reality." This allows the Commission to move incrementally toward market-aligned rates while ensuring the utility maintains total financial integrity.

VI. CAPITAL STRUCTURE AND COST OF DEBT

Q. IS PIEDMONT'S REQUESTED CAPITAL STRUCTURE OF 55.09% COMMON EQUITY AND 44.91% DEBT APPROPRIATE?

A. No. Piedmont's requested capital structure is not appropriate for setting rates in this proceeding since it has a significantly higher common equity ratio (55.09%) than the consolidated capital structure used at the holding company level for Duke Energy Corporation (38.0% as of September 30, 2025)³⁵. This requested equity component also exceeds the average common equity ratios observed for the same 7 natural gas utilities analyzed by both Ms. Nelson and myself (mean of 48.4% and median of 46.6%).³⁶

Q. WHAT CAPITAL STRUCTURE DO YOU RECOMMEND BE USED FOR PIEDMONT'S OVERALL COST OF CAPITAL?

A. I recommend using a capital structure consisting of 48.39% equity and 51.61% debt. This recommendation is conservative and arguably on the high end of what can be justified based on the common equity ratios (38.0%) at the holding company level and the 7 natural gas utility companies analyzed by both Ms. Nelson and myself (mean of 48.4% and median

³⁵ Duke Energy Corporation Value Line Company Report, February 6, 2026.

³⁶ Exhibit ALR-5, at 5.

1 of 46.6%). Absent evidence from Piedmont supporting a specific need for an atypically
2 expensive capital structure, utilizing a ratio that aligns more closely with market
3 benchmarks is consistent with the Commission's duty to set just and reasonable rates that
4 balance the needs of the utility and its investors with those of the ratepayers.

5 Authorizing a regulatory capital structure for Piedmont with a common equity ratio
6 higher than other comparable utility companies without justification is not reasonable
7 because it will result in excessive rates. A regulated utility company is obligated to use
8 capital that results in the lowest possible cost of capital, and Piedmont's requested structure
9 does not fulfill this obligation.

10 **Q. WHAT IS THE IMPACT OF ADOPTING MS. NELSON'S AND MS. GLENN'S**
11 **RECOMMENDED CAPITAL STRUCTURE?**

12 **A.** It can be overlooked that the authorized capital structure can have a large impact on the
13 utility company's revenue requirement.

14 My primary recommendation, including my capital structure recommendation,
15 result in an overall rate of return of 6.56% as shown in Table 1 on page 9. My traditional
16 recommendation, including my capital structure recommendation, result in an overall rate
17 of return of 6.29% as shown in Table 2 on page 10. Ms. Nelson's recommendations result
18 in an overall rate of return of 7.87%.³⁷ If the Commission adopts an equity component of
19 the capital structure ratio that is higher than I have recommended, there should be a
20 corresponding reduction to ROE.

21 If the Company witnesses' capital structure recommendations is adopted it is
22 important to make an adjustment to the overall ROR to account for the financial risk

³⁷ Direct Testimony of Erica N. Glenn at 17:20-22

1 difference between her capital structure recommendation and that of the companies in the
2 RFC Gas Proxy Group, which have a significantly lower average common equity ratio
3 (average of 48.4%)³⁸ than the common equity ratios recommended by Ms. Nelson. A
4 higher common equity ratio means less debt, a lower chance of financial stress (financial
5 risk), and therefore a lower COE.

6 If my COE recommendation is applied to Ms. Nelson's recommended capital
7 structure Piedmont will require a larger revenue requirement of approximately \$4.0
8 million. The difference is even larger when compared to the average common equity ratio
9 of the same 7 natural gas utility companies analyzed by both Ms. Nelson and myself (mean
10 48.4% of and median of 46.6%)

11 **Q. IS IT REASONABLE FOR MS. NELSON TO BASE HER RECOMMENDATIONS**
12 **ON THE AVERAGE COMMON EQUITY AND LONG-TERM DEBT RATIOS**
13 **FOR EACH OF THE PROXY GROUP GAS OPERATING COMPANIES?**

14 **A.** No. Ms. Nelson observes that the mean and median common equity ratio for her proxy
15 group of gas operating companies is 54.26% and 54.83%, respectively.³⁹ While Ms. Nelson
16 relies on these average ratios of operating subsidiaries, this approach ignores a basic tenet
17 of finance: riskier entities require more equity, while less risky entities can support more
18 debt. A regulated utility like Piedmont is inherently less risky than its consolidated holding
19 company because the holding company level includes competitive, unregulated operations
20 with far more volatile earnings.

³⁸ Exhibit ALR-5, page 5.

³⁹ Direct Testimony of Jennifer E. Nelson at 71:23-24 and 72:1-3.

1 In a sound financial structure, we should expect the holding company level—which
2 bears these substantial unregulated risks and multi-billion dollar uncertainties—to maintain
3 a higher common equity ratio. However, the Company is proposing the opposite. Piedmont,
4 the lower-risk regulated subsidiary, is asking for a 55.09% equity ratio, while its higher-
5 risk holding company operates with a consolidated equity ratio of only 38.0%.

6 The Company's witnesses provide no justification for why the lower-risk subsidiary
7 requires significantly more expensive equity financing than the holding company that owns
8 and finances it. It is fundamentally unfair to charge Piedmont's customers rates based on a
9 capital structure that ignores the increased debt capacity provided by the utility's stable,
10 regulated risk profile. Basing a recommendation solely on operating subsidiary books
11 ignores the structural reality where a holding company can raise debt and report it as an
12 equity investment on the books of its regulated subsidiary.

13 **Q. WHAT COST OF DEBT DO YOU RECOMMEND?**

14 **A.** I recommend adopting Piedmont's requested cost of debt of 4.28%.

15 **VII. EVALUATION OF PIEDMONT'S RATE OF RETURN TESTIMONY**

16 **Q. PLEASE SUMMARIZE THE TESTIMONY OF MS. NELSON.**

17 **A.** Ms. Nelson concluded that Piedmont's COE is between 9.80% and 11.80% based on her
18 financial model results, Piedmont's risk profile, and current capital market conditions.
19 Within that range, she recommends a 10.80% ROE for Piedmont.⁴⁰ She applies her own
20 modified versions of the following financial models (COE models) to a proxy group of 7

⁴⁰ Direct Testimony of Jennifer E. Nelson at 4:10-14.

1 natural gas utility companies⁴¹: 1) Constant Growth and Quarterly Growth DCF models,
 2 2) CAPM and ECAPM, and 3 Bond Yield Plus Risk Premium approach.⁴² As outlined in
 3 Table 10 below, these approaches provide equity cost rate estimates between 9.24% and
 4 14.16%.

TABLE 10: MS. NELSON'S COST OF EQUITY RESULTS	
METHOD	Model Results
Constant Growth DCF	9.24% - 11.99%
Quarterly Growth DCF	9.30% - 12.24%
CAPM	9.89% - 13.42%
ECAPM	10.47% - 14.16%
Bond Yield Risk Premium	10.21% - 10.28%
Ms. Nelson' Recommend Range	9.80% - 11.80%

[1] Ms. Nelson's Direct Testimony, Page 6

6 Additionally, Ms. Nelson concluded that Piedmont's requested capital structure
 7 consisting of 55.09% common equity and 44.91% long-term debt is reasonable because it
 8 is consistent with the capital structure ratios that finance the regulated gas operations of the
 9 companies in her proxy group.⁴³

10 Ms. Nelson's ROE recommendation combined with Piedmont's requested capital
 11 structure and cost of long-term debt (4.28%)⁴⁴ result in a weighted cost of capital/rate of
 12 return of 7.87%.

⁴¹ Direct Testimony of Jennifer Nelson at 21, Figure 4.

⁴² Direct Testimony of Jennifer E. Nelson at 5:1-8.

⁴³ Direct Testimony of Jennifer E. Nelson at 4:15-19.

⁴⁴ Direct Testimony of Erica N. Glenn at 17:19-20.

1 **Q. WHAT DID MS. NELSON CONCLUDE REGARDING PIEDMONT'S RELATIVE**
2 **RISK COMPARED TO THE COMPANIES IN HER PROXY GROUP?**

3 **A.** Ms. Nelson considered various factors that she claims impact Piedmont's risk profile,
4 including the Company's capital expenditure plan, the regulatory environment in which
5 the Company operates, and the small size of Piedmont relative to the proxy group.⁴⁵
6 However, she did not specifically adjust her ROE recommendation to account for risks
7 faced by Piedmont.⁴⁶

8 **Q. DO THE RESULTS OF MS. NELSON'S COE MODELS PROVIDE A RELIABLE**
9 **INDICATION OF PIEDMONT'S COE?**

10 **A.** No. Ms. Nelson's 10.80% ROE recommendation is significantly higher than Piedmont's
11 market-based COE. If her recommendation is used to set rates, consumers will be
12 overcharged by approximately \$18.6 million per year. Her recommendation is excessive
13 largely because her calculations are based on a flawed analytical approach that fails to
14 ground itself in economic reality.

15 Her models provide an inherently inflated result due to several critical defects:

- 16 • **Inflated Growth Rates:** Ms. Nelson's models rely heavily on structurally
17 optimistic, short-term, sell-side EPS forecasts. Plugging these short-term
18 cyclical estimates into a perpetual Discounted Cash Flow (DCF) model
19 creates a severe "horizon mismatch" that breaks the underlying math and
20 inflates the output. This fundamental error cascades directly into her Capital
21 Asset Pricing Model (CAPM) and Empirical CAPM (ECAPM), as she uses

⁴⁵Direct Testimony of Jennifer E. Nelson at 45:1-9.

⁴⁶Direct Testimony of Jennifer E. Nelson at 45:58.

these upwardly biased DCF results to calculate an overall market return of up to 19.08%—driving a severely excessive Market Risk Premium of up to 11.70%.

- **Stale and Distorted Inputs:** In addition to the excessive market risk premium, she chooses 10-year historical betas that artificially lock in the extreme market turmoil of the 2020 pandemic. This single decision to use 10-year betas adds between 39 and 63 basis points to her CAPM results and between 30 and 47 basis points to her ECAPM results.
- **Non-Market-Based Bond Yield Method:** Her Bond Yield Plus Risk Premium method is based on past administrative accounting figures rather than actual, current, and observable market prices.

Ms. Nelson's 10.80% ROE recommendation is excessive because she uses biased growth rates, stale data and non market-based analyses.

DCF Method Analysis

Q. IS MS. NELSON'S DCF RESULT REASONABLE?

A. No. The primary reason both of Ms. Nelson's DCF models produce unreasonable results is because of the growth rate component. Ms. Nelson's constant growth DCF analysis using analysts' 3- to 5-year EPS⁴⁷ growth rate projections produces COE results between 9.24% and 11.99%,⁴⁸ and her Quarterly Growth DCF Model produces COE results between 9.30% and 12.24%.⁴⁹ My sustainable growth DCF and option-implied growth

⁴⁷ Ms. Nelson does not disclose the length of these forecasts in her testimony, but from my experience these forecasts are generally between 3 and 5 years. I have never seen an analyst EPS growth rate longer than 5 years.

⁴⁸ Direct Testimony of Jennifer E. Nelson at 25-26, Figure 5.

⁴⁹ Direct Testimony of Jennifer E. Nelson at 28, Figure 6.

1 DCF methods produce COE results of 9.57% - 9.61% and 7.78% - 8.44% respectively.⁵⁰

2 The differences between our sustainable/constant growth DCF results shown above range

3 between negative 81 basis points (9.24% - 9.57%) and 266 basis points (11.99% – 9.61%).

4 Ms. Nelson uses an average growth rate component of 7.57% a, with underlying individual

5 analyst estimates as high as 10.50% (Southwest Gas and Spire).⁵¹ I use growth rate

6 components of 6.23% to 6.34%.⁵² Even the low end of Ms. Nelson’s DCF results is higher

7 than the highest of my results because she mechanically uses unsustainable growth rates as

8 high as 10.80%.⁵³ Her observation that the Constant Growth DCF model “likely

9 understates the cost of equity”⁵⁴ because it does not fully capture that compounding does

10 not address (and cannot offset) the far larger overstatement introduced by the growth rate

11 itself.

12 **Q. DOES MS. NELSON USE AN APPROPRIATE METHODOLOGY TO**
13 **DETERMINE THE GROWTH RATE IN HER DCF MODEL?**

14 **A.** No. Ms. Nelson uses analysts’ 3 to 5-year EPS growth rates without attempting to

15 investigate what percentage of the earnings of the companies in her Proxy Group are being

16 retained in the business (i.e., the retention rate). This is analogous to failing to reconcile

17 the money you are taking out of your checking account with your future balance, i.e., the

18 basic balancing of a checkbook.

⁵⁰ Exhibit ALR-2.

⁵¹ Direct Testimony of Jennifer E. Nelson, Exhibit_(JEN-3).

⁵² Exhibit ALR-3, at 1 and 2, Row 5 plus Row 6.

⁵³ Direct Testimony of Jennifer E. Nelson, Exhibit_(JEN-3)

⁵⁴ Direct Testimony of Jennifer E. Nelson at 26:9-10.

1 J.P. Morgan explained that its equity assumptions methodology considers five
2 return drivers (including earnings growth and dividends).⁵⁵ Pertinently, J.P. Morgan
3 explained that its equity return assumptions methodology:

4 ties together complex interrelationships among these factors to
5 ensure that retained earnings and gross dilution imply a future book
6 value that is consistent with projected return on equity and future
7 earnings. This framework – analogous to Robert Higgins’
8 sustainable growth rate (SGR) concept – ensures that higher
9 shareholder payouts, for instance, would come at the expense of
10 slower earnings growth, all else the same. Our methodology uses
11 trailing, not forward, earnings, which tend to be more stable.⁵⁶
12

13 Thus, exclusively relying on analysts’ EPS growth rates, as Ms. Nelson has done,
14 without considering multiple factors that ensure sustainable growth, is inappropriate. As
15 reflected in my exhibit ALR-3, page 1, consistent with the multi-factor approach relied
16 upon by J.P. Morgan in its 2019 Long-Term Capital Market report, I have also used a
17 sustainable growth rate method to compute my DCF results.

18 **Q. ARE YOU SAYING THAT ANALYSTS’ CONSENSUS EARNINGS PER SHARE**
19 **(“EPS”) GROWTH RATES ARE USELESS AS AN AID TO PROJECTING THE**
20 **FUTURE?**

21 **A.** No. Analysts’ EPS growth rates are, however, very dangerous if used in a simplified DCF
22 without proper interpretation. That is, use of EPS growth rates without considering factors
23 such as dividend-per-share growth and book value-per-share growth, could lead to
24 unsustainable growth rates. For example, if a company has a slow earnings year followed
25 by a strong recovery, this potentially high earnings growth rate is unlikely to be maintained

⁵⁵ J.P. Morgan Asset Management, 2019 23rd Annual Edition Long-Term Capital Market Assumptions, accessible at: <https://am.jpmorgan.com/content/dam/jpm-am-aem/global/en/insights/portfolio-insights/lcma/archive/LTCMA-2019.pdf>, pages 62-63.

⁵⁶ *Id.*

1 in the long-term and therefore results in an unrealistic and/or unsustainable projection.
2 Analysts' 3 to 5-year earnings-per-share growth rates forecasts are not useful if used
3 without considering other sensitivities. However, if used as part of a holistic analysis that
4 considers other factors, the analysts' earnings-per-share growth rates forecasts can be
5 useful in computing estimates of what earned ROE investors expect will be sustained in
6 the future, and as such, are useful in developing long-term sustainable growth rates.

7 **Q. WHAT COE IS INDICATED BY THE SUSTAINABLE GROWTH FORM OF THE**
8 **DCF METHOD THAT YOU RELY ON FOR YOUR RECOMMENDATION?**

9 **A.** As mentioned above, the result of my sustainable growth DCF analysis using the Constant
10 Growth form of the DCF indicates a COE range of between 9.57% and 9.61% for the Utility
11 Proxy Group (i.e., the same proxy group that Ms. Nelson relied upon).⁵⁷ Since these DCF
12 findings use analysts' forecasts to derive sustainable growth (in part), the results should be
13 considered as conservatively high. This is because analysts' forecasts of such growth have
14 been notoriously overstated.⁵⁸

15 My DCF results are more reliable than Ms. Nelson's because they are not as
16 influenced by overly-optimistic analysts' forecasts as would have been the case had I
17 merely used analysts' earnings growth rate forecasts as a proxy for long-term growth. The

⁵⁷ Exhibit ALR-3, at 1.

⁵⁸ McKinsey & Company, Equity Analysts Still too Bullish, April 1, 2010, accessible at: <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/equity-analysts-still-too-bullish> (this article discusses a study conducted by McKinsey & Company to determine the accuracy of analysts' earnings forecasts. This study found that the analysts were overly optimistic, slow to revise their forecast, and prone to making increasingly inaccurate forecasts during economic downturns. Moreover, the study explained that as indicated by price/earnings (P/E) ratios, investors' expectations were more conservative). A May 16, 2022, McKinsey & Company article reiterated that "analysts' near-term forecasts are often overly optimistic and don't always correctly reflect operating performance.") (citations omitted). See McKinsey & Company, Do Consensus Estimates Accurately Reflect Operating Performance, May 16, 2022, accessible at: <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/prime-numbers/do-consensus-estimates-accurately-reflect-operating-performance>.

DCF methods I use compute sustainable growth rates, rather than exaggerating the growth rate by assuming that a relatively short-term forecast (5 years) will remain indefinitely.

CAPM Analysis

Q. PLEASE DESCRIBE MS. NELSON’S CAPM METHOD.

A. Ms. Nelson uses the same standard CAPM formula that I use. In her testimony, she explains that the CAPM method “is a risk premium method that estimates the COE for a given security as a function of a risk-free return plus a risk premium to compensate investors for the non-diversifiable or ‘systematic’ risk of that security.”⁵⁹ She says that this method is defined by the following four components:

$$K_e = r_f + \beta (r_m - r_f)$$

Where:

K_e	=	the required ROE for a given security;
r_f	=	the risk-free rate of return;
β	=	the Beta of an individual security; and
r_m	=	the required return on the market. ⁶⁰

Q. WHAT RISK-FREE RATE DOES MS. NELSON USE IN HER CAPM?

A. She uses the following two risk-free rates: (1) Current 30-day average of 30-year Treasury bond yields (4.83%), and (2) Projected 30-year U.S. Treasury Bond Yields (4.68%).⁶¹

Q. WHAT BETA COEFFICIENT DOES MS. NELSON USE IN HER CAPM?

A. She uses the following two historical beta coefficient estimates: (1) the average of Bloomberg 5-year weekly return relative to the S&P 500 index and Value Line’s 5-year

⁵⁹Direct Testimony of Jennifer E. Nelson at 28:5-7.

⁶⁰Direct Testimony of Jennifer E. Nelson at 28:10-15.

⁶¹Direct Testimony of Jennifer E. Nelson at 30:11-13.

historical weekly return relative to the New York stock exchange composite index, and 2) 10-year Bloomberg Beta coefficients.⁶²

Q. WHAT RISK PREMIUM DOES MS. NELSON USE IN HER CAPM?

A. Ms. Nelson claims that she uses the average of a historical market risk premium and a “forward-looking” market risk premium in her CAPM analysis.⁶³ Her historical risk premium is the difference between the return on large company stocks from 1926-2025 less the income-only return on government bonds.⁶⁴ Ms. Nelson calculates her forward-looking market risk premium by mechanically using published earnings growth rate forecast and dividend yields from three sources (S&P’s Earnings and Estimates report, Bloomberg Professional and Value Line) in her Constant Growth DCF model.⁶⁵ Her historical market risk premium is 7.40% (based on the current 30-year Treasury bond yield) and 7.56% (based on the projected Treasury bond yield).⁶⁶ Her forward-looking market risk premium is 11.55% (based on the current 30-year Treasury bond yield) and 11.70% (based on the projected Treasury bond yield).⁶⁷

Q. DOES MS. NELSON USE AN APPROPRIATE RISK-FREE RATE IN HER CAPM?

A. In principle, no. The risk-free rate component of Ms. Nelson’s CAPM is not appropriate because it is based considerably on economist published projections and not investors’ expectations as indicated by current market yields. The forecasted yields she used in her

⁶²Direct Testimony of Jennifer E. Nelson at 31:1-10.

⁶³ Direct Testimony of Jennifer Nelson at 34:1-8.

⁶⁴ Direct Testimony of Jennifer E. Nelson at 31:15-17.

⁶⁵ Direct Testimony of Jennifer E. Nelson at 32:1-5.

⁶⁶ Direct Testimony of Jennifer E. Nelson at 34, Figure 10.

⁶⁷ *Id.*

1 CAPM are now lower than the market-based risk-free rates that I used in my CAPM
2 analysis. As outlined in Exhibit ALR-4, page 2, my spot and weighted average short-term
3 risk-free rates are 3.87% and 3.76%⁶⁸, respectively. My spot and weighted average long-
4 term risk-free rates are 4.91% and 4.95%, respectively. These four rates average 4.33%.
5 The risk-free rate component of Ms. Nelson's CAPM analysis is between 4.68% for
6 projected yield on 30-year U.S. Treasury bonds and 4.83% for the current 30-day average
7 market yield on the 30-year Treasury bond.⁶⁹

8 Ms. Nelson's use of interest rate forecasts is wrong in principle because current
9 market yields on U.S. Treasury bonds indicate market expectations. As discussed above,
10 Piedmont's authorized ROE should be market-based because investors provide the
11 capital.⁷⁰

12 **Q. DO MS. NELSON'S BETA COEFFICIENTS OVERSTATE THE COE?**

13 **A.** Yes. The historical beta coefficients used by Ms. Nelson are higher than a broader measure
14 of recent historical and forward-looking beta coefficients indicate and therefore overstate
15 the COE. Ms. Nelson's CAPM results likely overstate the COE because Ms. Nelson uses
16 an average 5-year historical betas for her proxy group for 0.70 (Value Line) and 0.74
17 (Bloomberg) instead of betas based on current investor expectations.⁷¹

18 Unlike the historical betas Ms. Nelson relies on, option-implied betas are based on
19 current investor expectations as reflected in actual, observable capital market prices.

⁶⁸ The spot and weighted average are the same by chance.

⁶⁹ Direct Testimony of Jennifer E. Nelson at 30:11-13.

⁷⁰ While Ms. Nelson's use of interest rate forecasts to determine the risk-free rate component does not inflate her CAPM result, her CAPM method should not be used to set rates in future South Carolina proceedings because it could produce inaccurate COE results (too high or too low) in different capital market conditions.

⁷¹ Direct Testimony of Jennifer E. Nelson, Exhibit ____ (JEN-5) at 1 – 2.

Option-implied betas over the past three months average 0.65⁷², indicating that investors expect natural gas utility companies' stock price movements to be less correlated with the overall market than they were prior to the War in Ukraine and the 2020 pandemic.

Q. PLEASE EXPLAIN MORE ABOUT WHY MS. NELSON'S USE OF HISTORICAL BETA COEFFICIENTS OVER 5- AND 10-YEAR TIME HORIZONS OVERSTATES HER CAPM COE RESULTS.

A. Relying on 5- and 10-year historical betas at any time is risky because they may not represent current capital market conditions. However, at this time we know that beta coefficients for gas companies based on the time frame are particularly problematic because they include the market turmoil of the onset of the COVID-19 pandemic in March 2020. Beta coefficients are a critical component of the CAPM approach to estimating the COE. Finding beta coefficients that accurately reflect the current and future expected risk profile of the utilities in the proxy group is essential to arriving at an accurate estimate of the COE.

Generally speaking, beta coefficients with longer horizons (much like averages of larger sets of data) will be more stable than those with shorter time horizons but will take longer to reflect even permanent changes in the risk profile of a utility. For this reason, I stand strongly behind my use of historical beta coefficients with shorter time horizons (six months and 2 years), in conjunction with the traditional 5-year betas. Using historical betas is already only a rough proxy for estimating investors' future expectations; the longer one looks back, the staler the historical data becomes and the larger the potential difference with the true goal of estimating a forward-looking beta coefficient.

⁷² Exhibit ALR-4, at 3.

1 The problem with using long-term time horizons for historical betas is made
2 considerably worse when the time-horizon includes a uniquely tumultuous period, such as
3 the capital market upheaval caused by the onset of the COVID-19 pandemic in March
4 2020. The market turmoil during that period caused historical beta coefficients for utility
5 companies based on any time horizon to increase sharply. Financial data indicates that the
6 capital market upheaval of March 2020, including its impact on gas utilities' COE was
7 relatively short-lived, yet any historical beta coefficient with a time horizon that includes
8 March 2020 will remain at abnormally elevated levels, even four years later.

9 **Q. DO MS. NELSON'S BETAS USED IN HER CAPM ANALYSIS DISPLAY BIASED**
10 **JUDGMENT?**

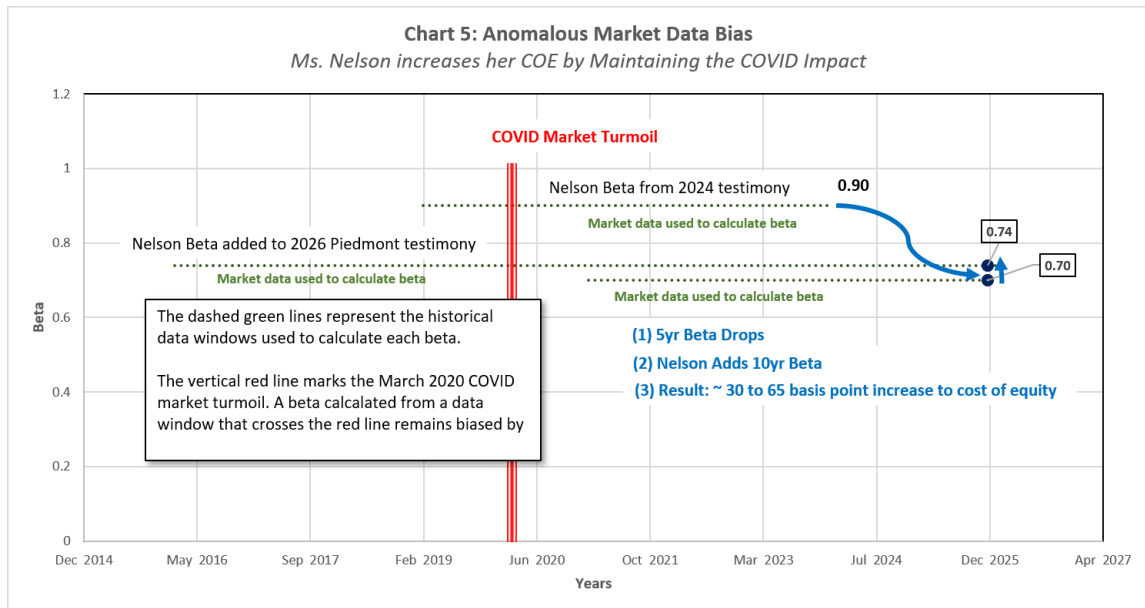
11 **A.** Yes. Ms. Nelson added 10-year Bloomberg beta coefficients to her analysis, a move she
12 did not make in Dominion's 2024 rate case.⁷³ By extending the window to ten years, she
13 is effectively "locking in" the effects of one of the most significant short-term market
14 anomalies in history: the extreme market turmoil caused by the initial COVID-19 pandemic
15 in March 2020.

16 In Dominion's 2025 rate case, Ms. Nelson explained that she added 10-year
17 Bloomberg beta coefficients to her analysis to "attenuate any perceived distortion in the
18 five-year Beta coefficients" associated with short-term market events.⁷⁴ While this is a
19 reasonable goal in principle, her decision to introduce the 10-year historical beta achieves
20 the exact opposite of her stated objective.

⁷³ Direct Testimony of Jennifer E. Nelson, Docket No. 2024-34-E at 31:8-14.

⁷⁴ Direct Testimony of Jennifer E. Nelson, Docket 2025-325-E at 37:16-18.

As shown in Chart 5 below, the dashed green lines in the chart represent the periods of market data Ms. Nelson used to calculate each beta, while the vertical red line marks the March 2020 COVID market turmoil. Any calculation window that crosses that red line remains impacted, and biased, by that anomalous event.



The impact of this choice is significant:

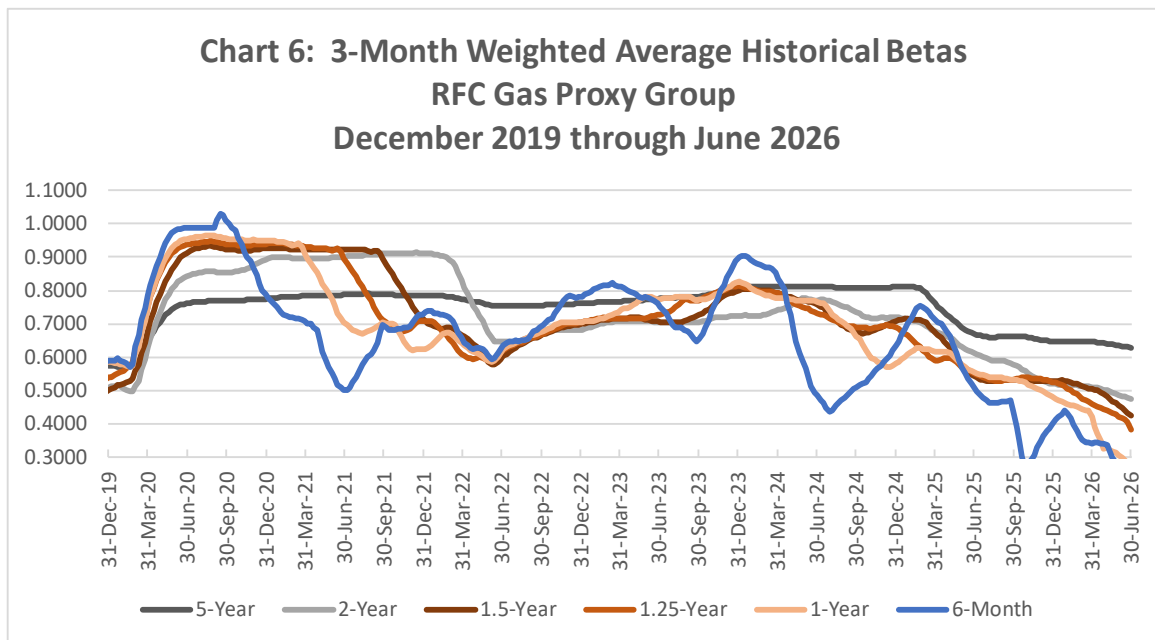
- **Selective Methodology:** Once the standard five-year beta window moved past the COVID turmoil, the Bloomberg 5-year beta dropped sharply from 0.90 in the 2024 Dominion Electric case to 0.62 in the current proceeding. Chart 5 above shows 0.70 because she uses the average of Bloomberg and Value Line betas.
- **Artificial Inflation:** Rather than accepting this more representative measure of current conditions, Ms. Nelson introduced a 10-year beta (0.74) that still captures the 2020 volatility.

- Inflated Results: This methodological shift adds between 30 and 65 basis points to her Capital Asset Pricing Model (CAPM) compared to using the more current 5-year average of Bloomberg and Value Line betas.

By maintaining a "hurricane warning" years after the storm has passed, Ms. Nelson produces a COE that reflects historical chaos rather than current utility risk.

Q. CAN YOU PROVIDE FURTHER SUPPORT FOR YOUR CLAIM THAT LONG-TERM BETA COEFFICIENTS WHOSE TIME HORIZON INCLUDES THE MARKET UPHEAVAL OF MARCH 2020 REMAIN ABNORMALLY ELEVATED?

A. Yes. As shown in Chart 6 on page 34, historical beta coefficients calculated based on shorter time horizons that no longer include the market upheaval of March 2020 reverted back to lower levels (consistent with the earlier drop in option-implied betas) as soon as the period of turmoil was left behind.



1 As can be seen on Chart 6 on page 34, historical beta coefficients calculated based
2 on a 6-month time horizon came down significantly starting roughly 6 months after March
3 2020. 1-year historical betas started to come down roughly 1-year later. And so on.

4 **Q. IS IT NECESSARY TO PERFORM THE MANUAL REMOVAL OF DATA FROM**
5 **THE REGRESSION USED TO CALCULATE BETA COEFFICIENTS, AS YOU**
6 **DESCRIBE IN YOUR ANALYSIS ABOVE?**

7 **A.** No. I used the analysis above to definitively prove the disproportional effect of the market
8 turmoil in March 2020 on any historical beta coefficient that includes such data, even four
9 years afterwards. Making such a manual adjustment to 5-year betas is not a bad approach.
10 Additionally, another acceptable approach, as I do in my comprehensive COE analysis, is
11 considering historical beta coefficients with shorter time horizons, such as 2 years and six
12 months, as well as forward-looking option-implied beta coefficients.

13 However, exclusively using 5- and 10-year historical beta coefficients, both of
14 which remain at abnormally elevated levels, definitively leads to incorrect high COE
15 estimates which are not proportional to current or expected risk levels. Ms. Nelson relies
16 on 5- and 10-year beta coefficients that are based on capital market data that is no longer
17 relevant. This approach does not produce credible results upon which the Commission
18 should base a decision. Using these inflated coefficients to estimate the COE would be
19 like maintaining a hurricane warning after the storm has passed.

20 Using a superior approach to calculating betas that relies upon relevant historical
21 and forward-looking option data shows that even though beta coefficients did rise across
22 the board during the onset of the COVID-19 pandemic back in March 2020, the increase

1 in beta values—and thus the relative risk—of the gas utility industry was relatively short-
2 lived.

3 **Q. DOES THE MARKET RISK PREMIUM COMPONENT OF MS. NELSON’S**
4 **CAPM ANALYSIS CONTRIBUTE TO AN EXCESSIVE COE RESULT?**

5 **A.** Yes. I believe Ms. Nelson’s market risk premium components of between 7.40%
6 (historical) and 11.70% (forward-looking) are excessive and lead to unreasonably high
7 CAPM results of between 9.89% and 13.42%.⁷⁵ Using a reasonable market risk premium
8 component in the CAPM produces a COE of hundreds of basis points lower. Stock option
9 data indicates that the market risk premium is 3.76% to 4.35%.⁷⁶ Closer examination
10 shows that one of Ms. Nelson’s own sources (Kroll) and other prominent sources arrive at
11 substantially lower market risk premium than Ms. Nelson.

12 **Q. MS. NELSON’S FORWARD-LOOKING MARKET RISK PREMIUM RESTS ON**
13 **AN ASSUMED MARKET RETURN OF 16.38%. IS THAT ASSUMPTION**
14 **SUPPORTED?**

15 **A.** No, and it is contradicted within her own testimony. Ms. Nelson selects a 16.38% expected
16 market return to build her forward-looking premium,⁷⁷ the premium that drives the high
17 end of her CAPM. Yet in the same discussion, she concedes that this figure “is above the
18 long-term arithmetic annual average market return” and that “it may be reasonable to
19 expect that, over the long-term, the market return will revert to its long-run historical
20 arithmetic average” of 12.23%.⁷⁸ Her forward return is thus 415 basis points above the very

⁷⁵ Direct Testimony of Jennifer E. Nelson, Exhibit_ (JEN-5), at 1 – 4.

⁷⁶ Exhibit ALR-4, at 1 and Exhibit ALR-4, at 5.

⁷⁷ Direct Testimony of Jennifer E. Nelson at 32:2-7.

⁷⁸ Direct Testimony of Jennifer E. Nelson at 33:8-14.

1 (already inflated) benchmark she concedes is the reasonable long-term. Her response that
2 16.38% is “conservative” does not rescue it: it is merely the lowest of three estimates
3 (16.38%, 18.56%, and 19.08%), all produced by the same method—a DCF on the S&P 500
4 using the same upward-biased analyst earnings-growth forecasts I discuss above. Nor is
5 the 16.38% assumption supported by her observation that an annual market return of
6 16.38% or higher “occurred in 48 of the last 100 years” and in nine of the last 17.⁷⁹
7 Individual annual returns are the wrong yardstick for a long-horizon cost of equity — by
8 that logic, the market’s many negative years would equally “support” a negative cost of
9 equity — and measuring a perpetual return assumption against one-year outcomes is
10 internally inconsistent with the 30-year Treasury horizon she adopts for her risk-free rate.
11 Even that lowest figure is incompatible with contemporaneous professional benchmarks
12 for the total return on the overall market—J.P. Morgan (6.7%), Charles Schwab (5.9%),
13 and the Horizon Actuarial Services survey ($\approx 7.1\%$)—none of which is even half of 16.38%.

14 **Kroll**

15 As discussed above, Ms. Nelson calculated the historical market risk premium
16 component of her CAPM of 7.40% and 7.56% based on the difference between the return
17 on large company stocks from 1926-2025 less the current and project 30-year Treasury
18 yields.⁸⁰ The source of her historical data, Kroll Cost of Capital Navigator, calculates a
19 supply-side market risk premium⁸¹ to account for evidence that equity returns may be lower
20 in the future than they were since 1926.⁸² Kroll calculated a geometric supply-side market

⁷⁹ Direct Testimony of Jennifer E. Nelson at 32:8-14.

⁸⁰ Direct Testimony of Jennifer E. Nelson at Exhibit___ (JEN-5) at 1-2.

⁸¹ Kroll refers to market risk premium as equity risk premium.

⁸² Kroll 2023 SBBI Yearbook, at 197 – 202.

1 risk premium of 4.39%.⁸³ Ms. Nelson’s market risk premium is inflated because she does
2 not consider whether historical equity returns are representative of investors’ current
3 expectations or not, as Kroll has done. This is important because if investors expect future
4 equity returns to be lower than historical equity returns, Ms. Nelson’s CAPM will indicate
5 a COE that is higher than investors currently expect. In other words, Ms. Nelson’s COE
6 results will overstate Piedmont’s current market-based COE.

7 Other Prominent Sources

8 This discrepancy is evident even when consulting other respected sources, like
9 Professor Aswath Damodaran from NYU (who finds a market risk premium⁸⁴ of 4.37% as
10 of March 1, 2026),⁸⁵ and further supports the argument that Ms. Nelson’s equity risk
11 premium estimation is excessively high.

12 Additionally, based on calculations by P. Brett Hammond and Martin L. Leibowitz,
13 which were based on a literature survey and estimates from participants in the 2001 Equity
14 Risk Premium Forum, they found the most frequent estimate of the 10-year equity risk
15 premium to be 4%.⁸⁶

16 The authors of *Revisiting the Equity Risk Premium* noted, “Despite radically
17 different market environments, it is striking that the estimates in all three forums were so
18 similar. They tended to be in the 3%–5% range, and notably, in comparison to historical

⁸³ *Id.*

⁸⁴ Professor Aswath Damodaran uses the term equity risk premium.

⁸⁵ Aswath Damodaran, *Implied ERP by month for previous months (September 2008-Current)*, March 6, 2026 <https://pages.stern.nyu.edu/~adamodar/pc/implprem/ERPbymonth.xlsx>.

⁸⁶ P. Brett Hammond & Martin L. Leibowitz, CFA Institute Research Foundation, *Revisiting the Equity Risk Premium, Introduction: Three Decades of Equity Risk Premium Forums*, p. vi, (2023) available at <https://www.cfainstitute.org/-/media/documents/article/rf-brief/Revisiting-the-Equity-Risk-Premium.pdf>.

returns, none of them included estimates above 7% or below zero.” The three forums were in 2001, 2011, and 2021.⁸⁷

In summary, one of the reasons Ms. Nelson’s CAPM results are unreasonably high, is because her equity risk premium component is above current market-based indicators (my own analysis based on stock option prices, the sources she uses, which are Kroll and Bloomberg, and the conclusions of other prominent research).

Q. DO YOU AGREE WITH THE RESULTS OF MS. NELSON’S CAPM ANALYSIS?

A. No, I do not agree with the results of Ms. Nelson’s CAPM analysis of 9.89% to 13.42% because it is based on (1) an astonishingly high market risk premium component predicated on cherry-picked data from prominent sources and (2) inflated beta coefficients that are not representative of current capital market conditions and investor expectations and

Empirical CAPM Analysis

Q. PLEASE SUMMARIZE MS. NELSON’S USE OF THE EMPIRICAL CAPITAL ASSET PRICING MODEL (ECAPM) AND HER JUSTIFICATION FOR ITS INCLUSION.

A. Ms. Nelson utilizes the ECAPM as a specific variant of the CAPM designed to address what she describes as the traditional model's tendency to underestimate the Cost of Equity (COE) for low-beta companies like regulated utilities.⁸⁸ She implements the formula $K_e = R_f + 0.75\beta_i (R_m - R_f) + 0.25(R_m - R_f)$, which assigns a 25% weight to the market risk premium without any effect from the security's beta⁸⁹. Her justification is rooted in

⁸⁷ *Id.*

⁸⁸ Direct Testimony of Jennifer E. Nelson at 36:3-5.

⁸⁹ Direct Testimony of Jennifer E. Nelson at 35:5-10.

1 empirical research, citing Dr. Roger Morin and the work of Fama and French, which
2 suggests that the actual "Security Market Line" is flatter than the one predicted by standard
3 CAPM theory.⁹⁰ She argues that this adjustment, used alongside her 5-year and 10-year
4 Bloomberg beta estimates, is a necessary and standard feature of asset pricing in a
5 regulatory context.⁹¹

6 **Q. PLEASE RESPOND TO MS. NELSON'S USE OF THE ECAPM.**

7 **A.** The Commission should view Ms. Nelson's use of the ECAPM with significant skepticism.
8 While it is presented as a necessary technical correction, the model is far from universally
9 accepted; in fact, many highly respected financial scholars are deeply critical of such
10 empirical "fudge factors." Under the standard CAPM, a company with a Beta coefficient
11 below 1.00 (one less risky than the overall market) receives a proportionally smaller risk
12 premium. The ECAPM overrides part of that proportionality as it awards 25% of the full
13 market risk premium to every company regardless of its risk, and scales only the remaining
14 75% by each proxy company's beta. In effect, one quarter of the premium is granted as
15 though Piedmont were as risky as the market as a whole. Because regulated utilities
16 essentially always have betas below 1.00, this adjustment can only raise the indicated COE
17 relative to the standard CAPM. The effect is visible in her own results: every ECAPM
18 figure exceeds its CAPM counterpart, reaching as high as 14.16%.⁹²

- 19 • **Critique of "Data Mining":** Leading authorities like Professor Aswath
20 Damodaran and the standard textbook *Principles of Corporate Finance*
21 (Brealey, Myers, and Allen) have warned that these types of empirical

⁹⁰ Direct Testimony of Jennifer E. Nelson at 36-38.

⁹¹ Direct Testimony of Jennifer E. Nelson at 37:22-24.

⁹² Direct Testimony of Jennifer E. Nelson, Exhibit_ (JEN-5).

1 adjustments are often the product of data mining. They argue that while
2 certain "anomalies" (like the low-beta bias) may appear in historical data,
3 they often "fade away" or disappear entirely once they are widely
4 recognized by the market.

- 5 • **Highly Biased Academic Source:** It is instructive that Ms. Nelson relies
6 extensively on Dr. Roger Morin to justify this model. Dr. Morin has served
7 as an expert for utility companies for decades; it is therefore unsurprising
8 that the model he champions consistently produces a "plot" that results in
9 higher authorized returns for utilities.
- 10 • **Part of a Pattern of Selective Inflation:** The ECAPM should not be
11 viewed in isolation. It is part of a broader pattern of methodological shifts
12 designed to find a way to increase model results. This is strikingly similar
13 to Ms. Nelson's decision to introduce 10-year historical betas only after her
14 standard 5-year betas dropped—a move intended to "lock in" the non-
15 recurring market turmoil of the 2020 pandemic.
- 16 • **Violation of the Economic Risk Boundary:** Regardless of the
17 mathematical complexity Ms. Nelson adds, her ECAPM results (ranging as
18 high as 14.16%) fundamentally violate the economic boundary I established
19 in my Primary Recommendation. There is no credible evidence to support
20 the idea that a low-risk regulated monopoly requires a return that is
21 hundreds of basis points higher than the expected return of the competitive
22 S&P 500.

1 In summary, the ECAPM is an analytically unsound methodology rooted in
2 historical data mining rather than current market reality; as such, it should be disregarded
3 in favor of a principled, market-based approach.

4 **Bond Yield Plus Risk Premium Analysis**

5 **Q. PLEASE DESCRIBE MS. NELSON’S BOND YIELD PLUS RISK PREMIUM**
6 **ANALYSIS.⁹³**

7 **A.** Ms. Nelson’s Risk Premium Analysis is based on the risk premiums implied by authorized
8 ROEs relative to long-term Treasury bond yields.⁹⁴ She determined that the average
9 difference between authorized ROEs and Long-Term Treasury bonds between January 1,
10 1980 and January 30, 2026 was 5.45% based on the current 30-day average of the 30-year
11 Treasury bond yield and 5.53% based on projected interest rates.⁹⁵

12 **Q. SHOULD MS. NELSON’S BOND YIELD PLUS RISK PREMIUM ANALYSIS BE**
13 **CONSIDERED?**

14 **A.** No. The foundation of Ms. Nelson’s analytical methodology is flawed because it is not
15 market-based. Ms. Nelson, herself, says that “the ROE is a market-based concept.”⁹⁶ In
16 her DCF and CAPM methods she at least includes some market data (e.g., stock prices).
17 In the case of her Bond Yield Plus Risk Premium analysis, she relies on limited market
18 data. The overriding problem with Ms. Nelson’s Bond Yield Plus Risk Premium analysis
19 is that it does not address the COE at all. She simply calculates the historical relationship

⁹³ Ms. Nelson discusses both a Bond Yield Plus Risk Premium Analysis and the Bond Yield Plus Risk Premium Approach. As far as I can tell, both of these names refer to the same method.

⁹⁴ Direct Testimony of Jennifer E. Nelson at 40-44.

⁹⁵ Direct Testimony of Jennifer E. Nelson at 43, Figure 14.

⁹⁶ Direct Testimony of Jennifer E. Nelson at 17:15.

1 between authorized ROEs and interest rates. Authorized ROEs are applied to book equity
2 and, therefore, in order to determine investors' return expectations, it is required to consider
3 the market price investors are willing to pay for the companies with these authorized ROEs.

4 **Business Risk and Other Considerations**

5 **Q. DO THE COMPANY-SPECIFIC FACTORS MS. NELSON IDENTIFIES—**
6 **PIEDMONT'S CAPITAL-EXPENDITURE PROGRAM, THE REGULATORY**
7 **ENVIRONMENT, AND ITS SMALL SIZE RELATIVE TO THE PROXY**
8 **GROUP—SUPPORT AN ROE AT OR ABOVE THE MIDPOINT OF HER**
9 **RANGE?**

10 **A.** No. As noted above, Ms. Nelson did not make an explicit upward adjustment to her ROE
11 for any of these factors, yet she relies on them to characterize her 10.80% midpoint
12 recommendation as reasonable, and, in the case of size, as "conservative." None of the
13 three withstands scrutiny. I address each below, together with the current market conditions
14 Ms. Nelson also invokes in support of her recommendation.

15 **Q. DOES PIEDMONT'S CAPITAL-EXPENDITURE PROGRAM WARRANT A**
16 **HIGHER ROE?**

17 **A.** No. A capital-spending program is an opportunity for Piedmont to increase its rate base,
18 and therefore its earnings; it is not a risk that warrants a higher return. Because the market-
19 to-book ratios of gas utility companies are significantly greater than one, every dollar
20 invested in rate base creates market value significantly greater than the dollar invested.
21 Using the proxy-group median market-to-book ratio of 1.56 that Ms. Nelson herself

1 reports, each dollar Piedmont adds to rate base creates roughly \$1.56 of market value.⁹⁷
2 Piedmont projects approximately \$634 million of capital expenditures in South Carolina—
3 part of an approximately \$4.38 billion program across its service territories—over the 2026
4 to 2030 period.⁹⁸ That is a value-creating opportunity for investors, not a basis for
5 increasing the authorized ROE. Piedmont also recovers capital investment on a timely basis
6 through the Natural Gas Rate Stabilization Act, which reduces pressure on cash flow and
7 the risk associated with regulatory lag.

8 **Q. DOES THE SOUTH CAROLINA REGULATORY ENVIRONMENT JUSTIFY A**
9 **HIGHER ROE FOR PIEDMONT?**

10 **A.** No. Ms. Nelson makes no adjustment for it. In fact, she acknowledges that Regulatory
11 Research Associates recently upgraded its ranking of this Commission from “Average/3”
12 to “Average/2”—an upgrade RRA attributed to recent legislation extending the RSA
13 framework to electric utilities—and views South Carolina’s regulatory climate as
14 “relatively balanced from an investor perspective.”⁹⁹ She further concedes that Piedmont’s
15 regulatory mechanisms “serve to reduce the Company’s absolute level of risk” and are
16 “credit supportive, but not necessarily credit enhancing relative to its peers,” and concludes
17 that Piedmont’s “risk relative to the proxy group is not reduced as a result of its ratemaking
18 structures.”¹⁰⁰

⁹⁷ Direct Testimony of Jennifer E. Nelson at 57:14-21

⁹⁸ Direct Testimony of Jennifer E. Nelson at 46:9-17.

⁹⁹ Direct Testimony of Jennifer E. Nelson at 51:14-17.

¹⁰⁰ Direct Testimony of Jennifer E. Nelson at 52:5-6.

1 **Q. DOES PIEDMONT'S SMALL SIZE RELATIVE TO THE PROXY GROUP**
2 **WARRANT A HIGHER ROE?**

3 **A.** No. I do not believe Piedmont's authorized ROE should be any higher because of the size
4 of its gas distribution operations, for two reasons. First, Piedmont is not a small company.
5 It is a wholly owned subsidiary of Duke Energy Corporation. A subsidiary of a large
6 company has access to resources financial and management expertise. Further, Piedmont
7 issues its own debt and carries its own investment-grade Moody's rating of A3, a notch
8 above its parent's Baa2,¹⁰¹ and is undertaking a \$4.38 billion five-year capital program.¹⁰²
9 Those are not the "limited financial resources" her sources ascribe to small utilities.¹⁰³

10 Second, even if we assume Piedmont is a small company, the evidence indicates
11 that investors do not demand a higher expected return on equity to invest in small
12 companies as compared to larger ones. The 2021 SBBI Yearbook states that the size effect
13 "is not without controversy, nor is this controversy something new," and that it is "not clear
14 ... whether this is due to size itself, or to other factors closely related to or correlated with
15 size."¹⁰⁴ Professor Damodaran has written that a small-cap premium "is an extremely
16 sloppy and lazy way of dealing with that risk, since risk ultimately has to come from
17 something fundamental (and size is not a fundamental factor)."¹⁰⁵ And a 2018 study by
18 scholars at AQR Capital Management and Yale University found that "the size effect
19 diminished shortly after its discovery and publication," and that the early studies were

¹⁰¹ Direct Testimony of Jennifer E. Nelson at 18, Figure 3.

¹⁰² Direct Testimony of Jennifer E. Nelson at 46:10-17.

¹⁰³ Direct Testimony of Jennifer E. Nelson at 54:8-11.

¹⁰⁴ Ibbotson SBBI® 2021 Classic Yearbook at 99.

¹⁰⁵ Aswath Damodaran, *Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2014 Edition* (paper updated March 2015), at 42.

1 distorted by a "delisting bias" that made smaller stocks' returns look higher than reality¹⁰⁶—
 2 findings that postdate the 1981 study Ms. Nelson relies upon.¹⁰⁷

3 In light of this, Ms. Nelson's claim that Piedmont's smaller size demonstrates that
 4 her midpoint recommendation is "conservative" is unjustified and should be disregarded.¹⁰⁸
 5 She computes a 103-basis-point differential and does not add it—and in any event,
 6 "conservative" is measured against her own range of model results.¹⁰⁹ As discussed above,
 7 each of the models producing that range overstates the cost of equity: her DCF relies on
 8 analysts' growth rates that cannot be sustained in perpetuity; her CAPM and ECAPM rely
 9 on Beta coefficients that lock in the 2020 market turmoil and on a market risk premium far
 10 above the estimates published by her own source; and her Bond Yield Plus Risk Premium
 11 is not based on market data at all. The midpoint of an overstated range is not conservative.

12 Capital Market Environment

13 **Q. DO CURRENT MARKET CONDITIONS—ELEVATED LONG-TERM YIELDS,**
 14 **INFLATION, AND GEOPOLITICAL UNCERTAINTY—SUPPORT AN ROE AT**
 15 **THE TOP OF MS. NELSON'S RANGE?**

16 **A.** No. Capital markets are unpredictable, and it is investors' expectations that matter,
 17 because they are the ones providing the capital. Investors' expectations regarding
 18 inflation, interest rates, and the geopolitical developments Ms. Nelson catalogs¹¹⁰ are
 19 already embedded in the current market prices of stocks, bonds, and stock options.

¹⁰⁶ Ron Alquist, Ronen Israel & Tobias Moskowitz, "Fact, Fiction, and the Size Effect," *The Journal of Portfolio Management*, Vol. 45, No. 1 (Fall 2018), pp. 34–61. DOI: 10.3905/jpm.2018.1.082.

¹⁰⁷ Direct Testimony of Jennifer E. Nelson at 55:4-13.

¹⁰⁸ Direct Testimony of Jennifer E. Nelson at 58:20.

¹⁰⁹ Direct Testimony of Jennifer E. Nelson at 58:10-20.

¹¹⁰ Direct Testimony of Jennifer E. Nelson at 59-68.

1 Interpreting those current prices, rather than layering economist forecasts on top of them,
2 is how a market-based cost of equity is measured. Uncertainty is not a reason to abandon
3 market data in favor of the high end of inflated models; markets are always uncertain,
4 which is precisely why real-time, market-based methods that already price in current
5 expectations are the appropriate tool. The controlling market fact remains the boundary
6 condition: with major financial institutions expecting only about 6% to 9% from the far
7 riskier overall market, a 10.80% cost of equity for a low-risk, regulated gas monopoly is
8 untethered from current capital-market reality.

9 **Summary of Concerns with Ms. Nelson's Recommendations**

10 **Q. PLEASE SUMMARIZE YOUR CONCERNS WITH MS. NELSON'S**
11 **TESTIMONY?**

12 **A.** Ms. Nelson's 10.80% ROE recommendation is significantly higher than Piedmont's
13 market-based COE. If her recommendations are used to set rates, consumers will be
14 significantly overcharged. Ms. Nelson's 10.80% ROE recommendation is excessive
15 largely because: (1) her DCF analysis relies on an inflated growth component, (2) her
16 CAPM analysis relies on inflated beta coefficients and an outrageously high market risk
17 market risk premium component, and (3) her Bond Yield Plus Risk Premium method is not
18 designed to measure the market-based COE.

1 **Q. THERE IS A LARGE GAP BETWEEN YOUR RECOMMENDATIONS AND**
2 **THOSE OF MS. NELSON. WHAT IS THE PRIMARY DRIVER OF THIS**
3 **DISCREPANCY?**

4 **A.** While this proceeding involves a mountain of technical data, the discrepancy boils down
5 to a single, fundamental issue: The reliance on short-term analyst growth forecasts to
6 predict long-term investor expectations.

7 In the world of storytelling, it is said that “character drives plot.” The same is true
8 in financial modeling. The primary “characters” in Ms. Nelson’s testimony are sell-side
9 equity analysts. By their very nature, these “characters” are driven by an optimistic bias—
10 their professional role is to facilitate transactions and generate interest in the stocks they
11 cover.

12 When you cast these optimistic characters as the lead in a COE model, the “plot”
13 (the resulting ROE) inevitably veers into a fictional universe.

14 **Q. HOW DOES MS. NELSON’S RELIANCE ON ANALYST FORECASTS**
15 **MANIFEST IN THE RESULTS?**

16 **A.** It creates a domino effect across her entire analysis. By using inflated analyst EPS growth
17 rates in her DCF and CAPM, she produces a "COE for the Overall Market" that is
18 untethered from economic reality.

19 To see this clearly, we must look outside the "regulatory bubble" and compare Ms.
20 Nelson’s results to the expectations of the broader financial world. As previously noted,
21 major financial institutions have published return expectations for the overall market that
22 currently range between 5.9% and 8.5%. If Ms. Nelson’s projections are correct, then the

1 world's most sophisticated institutional investors, academics, and pension funds—who
2 manage trillions of dollars—are fundamentally wrong.

3 **VIII. CONCLUSION**

4 **Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS IN THIS CASE.**

5 **A.** I present two recommendations:

- 6 • Primary (overall market): ROE 9.00% 9.00% - with my recommended
7 48.39% equity / 51.61% debt capital structure and 4.28% long-term debt
8 cost, this produces an overall cost of capital of 6.56%.
- 9 • Traditional (utility proxy group): ROE 8.44% - with my recommended
10 48.39% equity / 51.61% debt capital structure and 4.28% long-term debt
11 cost, this produces an overall cost of capital of 6.29%.

12 If the Commission instead adopts Piedmont's requested 55.09% equity / 44.91%
13 debt, I recommend reducing the authorized ROE to 8.17% (range 7.43%–8.23%) if
14 adopting my Traditional ROE recommendation or 9.00% if adopting my Primary ROE
15 recommendation, to reflect the lower financial risk of a more equity-heavy structure.

16 These recommendations satisfy *Hope* and *Bluefield*: they are grounded in current
17 market data, provide Piedmont a reasonable opportunity to attract capital on fair terms, and
18 protect customers from paying too far above the market-based COE.

1 **Q. WHY DO YOU OFFER PRIMARY 9.00% ROE RECOMMENDATION IF YOUR**
2 **MARKET-BASED ANALYSIS SUPPORTS 7.70% TO 8.50%?**

3 **A.** My Traditional Recommendation of 8.44% is fully supported by capital market data and
4 satisfies the standards of *Hope* and *Bluefield*. However, I also recognize the practical reality
5 that commissions are often hesitant to move too far from recent or contemporaneous
6 authorizations in this or other states. Regulators are understandably cautious about
7 unintended consequences, and it is difficult to break from precedent even when the
8 evidence supports it. For this reason, I propose a Primary Recommendation of
9 9.00%9.00%. This should not be seen as a different conclusion about Piedmont's market-
10 based COE, but rather as a practical step in a gradual, step-by-step process that allows the
11 Commission to move incrementally toward alignment with true market costs.

12 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

13 **A.** Yes.

APPENDIX A. DEFINITIONS

1 **Cost of Equity (COE):** Our COE recommendation is our opinion of the return investors
2 require to provide equity capital to Piedmont based on current capital markets. Since investors
3 must pay the market price of a stock to make an investment, investors' required returns are based
4 on the return they expect to receive on the market price of stocks. In other words, Piedmont's COE
5 is forward-looking and "market-based." Our recommendation is consistent with the following
6 legal standards set by the United States Supreme Court for a fair rate of return:

7 The return to the equity owner should be commensurate with returns on
8 investments in other enterprises having corresponding risks.¹¹¹

9 And:

10 [S]ufficient to . . . support its credit and . . . raise the money necessary for
11 the proper discharge of its public duties.¹¹²

12 **Cost of Debt:** Our cost of debt recommendation is based on the actual cost of debt
13 paid by the utility to its sources of credit. For example, if a utility has issued a bond with a
14 3% interest rate three years ago, its authorized cost of debt should be 3%, even if interest
15 rates are currently higher or lower than 3%.

16 **Capital Structure:** Capital structure is the percentage of equity and debt that
17 makes up the finances of a utility. For example, if a utility raises \$1 million of equity capital
18 and \$1 million of debt capital, we say it has a capital structure containing 50% equity and
19 50% debt. Our capital structure recommendation is based on our review of Piedmont's
20 justification for its requested regulatory capital structure, the capital structure ratios of other
21 gas utility companies, and the capital structure of Piedmont's parent, Duke Energy

¹¹¹ *Fed. Power Comm'n v. Hope Nat. Gas Co.*, 320 U.S. 591, 603 (1944).

¹¹² *Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm'n of the State of W. Va.* 262 U.S. 679, 692-693 (1923).

1 Corporation As discussed below, the reported capital structure of a regulated subsidiary is
2 often not representative of how the regulated utility was financed. For example, the parent
3 of a regulated utility can report funds raised through debt financing at the holding company
4 level as equity financing on the books of its regulated utility subsidiary. Therefore, it is
5 important to make sure Piedmont's requested capital structure would not overcharge
6 consumers by including a higher common equity ratio than is appropriate.¹¹³

7 **Cost of Equity vs. Authorized ROE:** The COE is the market-based return
8 investors expect to earn on the market value of any given stock. In other words, the COE
9 is the return investors expect to earn on the market price of equity. As it applies to this
10 proceeding, it is the return on proxies for what investors would require to provide equity
11 capital to Piedmont. The appropriate authorized ROE is based on the Commission's
12 determination of the COE at the time of the proceeding, after reviewing the evidentiary
13 record, which incorporates investor expectations. Once the Commission issues an
14 authorized ROE, the market-based COE will continue to fluctuate as capital markets
15 inevitably continue to change. The authorized ROE is based on a snapshot of the COE,
16 which is constantly changing.

17 Piedmont's authorized ROE should not be set based on authorized ROEs in other
18 proceedings. Authorized ROEs set in past proceedings are not the right benchmark for
19 Piedmont's COE. They are accounting returns applied to book value, not measures of the
20 return investors currently require on the market value of equity. A real estate analogy
21 makes the point: if an investor buys a property for \$100,000 and earns \$6,000 per year in
22 rent, that's a 6% return on book. If the property's market value later rises to \$200,000 with

¹¹³ A higher common equity ratio, all else equal, results in higher rates for consumers because equity is more expensive than debt.

1 rent unchanged, the return on market value falls to about 3.0%. Rent does not automatically
2 rise to preserve a 6% book return; it is set by the market. The same is true for utility stocks.
3 With market-to-book ratios well above 1.0 today, the market-based COE is necessarily
4 lower than authorized book returns.

5 In his 1970 book *The Economics of Regulation: Principles and Institutions*,
6 regulatory economist Alfred Kahn wrote on why the COE is lower than authorized returns
7 when market-to-book ratios are significantly above one, saying:

8 [T]he sharp appreciation in the prices of public utility stocks, to one and
9 half and then two times their book value during this period, reflected ... a
10 growing recognition that the companies in question were in fact being
11 permitted to earn considerably more than their cost of capital. ... The source
12 of the discrepancy between market and book value has been that
13 commissions have been allowing r 's [returns on equity] in excess of k
14 [market cost of equity]; if instead they had set r equal to k , or proceeded at
15 some point to do so ... the discrepancy between market and book value ...
16 would have disappeared, or would never have arisen.¹¹⁴

17 **Consistency with Regulatory Principles:** The flaw is equating our
18 recommendations with regulatory precedent rather than investor requirements. *Hope* and
19 *Bluefield* require that the return be “commensurate with returns on investments in other
20 enterprises having corresponding risks”—that is, consistent with market-based investor
21 expectations today. They do not require regulators to match or exceed prior authorizations
22 in other states.

23 Authorized ROEs are backward-looking and become embedded in rates until the
24 next case; they do not adjust dynamically with market conditions. Basing current decisions
25 on averages of past authorizations creates a circular process that can drift out of alignment
26 with actual investor expectations. By contrast, our recommendations are grounded in

¹¹⁴ Alfred Kahn, *The Economics of Regulation: Principles and Institutions*, Mass. Inst. Tech. at 48 (fn. 69), 50 (1970).

1 current capital market data—interest rates, inflation expectations, equity risk premiums,
2 and forward-looking betas. That is the proper way to satisfy *Hope* and *Bluefield*.

3 **Appropriate Rate of Return:** The appropriate Rate of Return (ROR) is based upon
4 the weighted average cost of capital (WACC) of the current costs of debt and equity at the
5 time of this proceeding. The weighted cost rate is calculated by multiplying the capital
6 structure ratios of the sources of capital (debt, preferred equity, and common equity) by
7 their respective cost rates.¹¹⁵
8

¹¹⁵ WACC = Cost of Debt X Debt Ratio + COE X Common Equity Ratio + Cost of Preferred Equity X Preferred Equity Ratio.

APPENDIX B. MARKET-TO-BOOK RATIOS AND THE MARKET-BASED COE

The Relationship Between Market Returns and Book Returns: A market-to-book ratio significantly above one indicates that the COE for gas utility companies is lower than the expected return on book equity. Calculating the COE (investors' equity return expectations) is more complicated than calculating the return on a rental property, but the same concept applies regarding the relationship between market returns and book returns.

If an investor purchases an apartment for \$100,000 and expects to receive \$500 per month ($\$500 \times 12 = \$6,000$ per year) in rent, they will expect an annual return of 6% ($\$6,000 / \$100,000$) on their investment. When the investor purchases the apartment, they would record the book value as \$100,000 and the market value as \$100,000, unless they determined that the purchase price was higher or lower than the market value. If the value of the apartment increases to \$200,000, for example, the market-to-book ratio would increase to 2.0, and therefore, their return on book value would remain at about 6% while their return on the market value of the apartment would decrease to about 3.0%.

In this rental property example, an increasing market value results in a lower expected return on market (3.0%) compared to the expected return on book (6%) if the rent price remains constant. Rent prices do not increase to maintain an expected 6% return on book value; they are set by what the rental market reasonably can bear.

The same is true of utility stocks. An ROE is not established based on constant return on book (accounting) returns; it is set based on what investors in the market expect that market to return. In the case of a utility stock, an increasing market value results in a lower return on market for the same expected return on book. As this rental property

1 example demonstrates, there is nothing inconsistent about investors expecting a lower
2 return on the market price of an investment than on the book value of an investment. In
3 fact, with market-to-book ratios of gas utility companies significantly above one, it would
4 be surprising if investors expected a return on market equal, or anywhere close, to the return
5 on book.
6

APPENDIX C. CONSTANT GROWTH DCF AND FUTURE-ORIENTED “B X R” METHOD

The constant growth model is described by the equation $k = D/P + g$, where:¹¹⁶

k = cost of equity (COE);

D =dividend; and

P =market price of stock at time of the analysis

and where:

g =the growth rate, where $g = br + sv$;

b =the earnings retention rate;

r =return on common equity investment (referred to below as “book equity”);

v =the fraction of funds raised by the sale of stock that increases the book value of the existing shareholders’ common equity; and

s =the rate of continuous new stock financing

The constant growth model is therefore correctly recognized to be:

$$k = D/P + (br + sv)$$

The COE demanded by investors is the sum of two factors. The first factor is the dividend yield. The second factor is growth (dividends and stock price). The logical relationship among these factors is as follows: the dividend yield is calculated based on current dividend payments, while growth indicates what dividends and stock prices will be in the future.

The “br” Approach to the Constant Growth DCF Model: There are claims alleging that the “br” approach to the constant growth discounted cash flow (DCF) model is flawed because it relies on the value of the future expected return on book equity “r” to estimate what the earned return on equity should be. One common criticism is that it is not reasonable for the DCF to indicate a COE (market return) that is different (lower or higher)

¹¹⁶ Myron J. Gordon, *Cost of Capital to a Public Utility*, p. 32-33 (MSU Public Utility Studies 1974).

1 than the expected return on book equity (accounting). There are multiple reasons why this
2 concern is unfounded:

- 3 1. The constant growth form of the equation using “br” is:

4
$$k = D/P + (br + sv)$$

5 In this equation, “k” is the variable for the COE, and “r” is the future
6 expected ROE. The COE, “k,” is not the same variable as the future
7 expected earned ROE, “r.” In fact, there often is a large difference between
8 the two.

- 9 2. The correct value to use for “r” is the return on book equity expected by
10 investors as of the time the stock price and dividend data are used to
11 quantify the D/P term in the equation. Therefore, even if future events occur
12 that may change what investors expect for “r,” the computation of the COE
13 “k” remains correct as of the time the computation was made.

- 14 3. The ability of a commission’s ROE decision to influence future cash flow
15 expectations is not unique to the retention growth DCF approach. The five-
16 year analysts’ earnings per share growth rate is a computation that is directly
17 influenced by what earnings per share will be in 5 years. Allowed ROEs
18 impact earning – higher allowed returns lead to higher earnings growth
19 because with higher allowed returns, more earnings are available for
20 reinvestment.

21 **Sustainable Growth vs. Short-Term Earnings Changes:** While changes in the
22 actual earned returns can impact growth above and beyond whatever growth results from
23 earnings retention, large short-term changes in earnings per share caused by a perceived

1 change in the future expected earned returns are unsustainable. The new perceived earned
2 return on book equity should be part of the computation, but the one-time growth spurt to
3 get there is no more indicative of the sustainable growth required in the constant growth
4 DCF formula than the temporary negative growth that occurs when a company has a bad
5 year.

6 A future-oriented “b x r” method is superior to a five-year earnings per share growth
7 rate forecast in providing a long-term sustainable growth rate. The primary cause of
8 sustainable earnings growth is the retention of earnings. A company is able to create higher
9 future earnings by retaining a portion of the prior year’s earnings in the business and
10 purchasing new business assets with those retained earnings. There are many factors that
11 can cause short-term swings in earnings growth rates, but the long-term sustainable growth
12 is caused by retaining earnings and reinvesting those earnings. Factors that cause short-
13 term swings include anything that causes a company to earn a return on book equity at a
14 rate different from the long-term sustainable rate. Assume, for example, that a particular
15 utility company is regulated so that it is provided with a reasonable opportunity to earn 9%
16 on its equity. Should the company experience an event such as the loss of several key
17 customers, or unfavorable weather conditions, which cause it to earn only 6% on equity in
18 a given year, the drop from a 9% earned return on equity to a 6% earned return on equity
19 would be concurrent with a very large drop in earnings per share. In fact, if a company did
20 not issue any new shares of stock during the year, a drop from a 9% earned return on book
21 equity to a 6% earned return on book equity would result in a 33.3% decline in earnings

1 per share over the period.¹¹⁷ However, such a drop in earnings would not be an indication
2 of what is a long-term sustainable earnings per share growth rate. If the drop were caused
3 by weather conditions, the drop in earnings would be immediately offset once normal
4 weather conditions return. If the drop were from the loss of some key customers, the
5 company would replace the lost earnings by filing for a rate increase to bring revenues up
6 to the level required for the company to be given a reasonable opportunity to recover its
7 COE.

8 For the reasons above, changes in earnings per share growth rates that are caused
9 by non-recurring changes in the earned return on book equity are inconsistent with long-
10 term sustainable growth, but changes in earnings per share because of the reinvestment of
11 additional assets are a cause of sustainable earnings growth. The “ $b \times r$ ” term in the DCF
12 equation computes sustainable growth because it measures only the growth which a
13 company can expect to achieve when its earned return on book equity “ r ” remains in
14 equilibrium. If analysts have sufficient data to be able to forecast varying values of “ r ” in
15 future years, then a complex, or multi-stage DCF method must be used to accurately
16 quantify the effect. Averaging growth rates over sub-periods, such as averaging growth
17 over the first five years with a growth rate expected over the subsequent period, will not
18 provide an appropriate representation of the cash flows expected by investors in the future
19 and, therefore, will not provide an acceptable method of quantifying the COE using the
20 DCF method. The choices are either a constant growth DCF, in which one growth rate
21 derived using “ $b \times r$ ” should be used, or a complex DCF method in which the cash flow

¹¹⁷ By definition, earned return on equity is earnings divided by book value. Therefore, whatever level of earnings is required to produce earnings of 6% of book would have to be 33.3% lower than the level of earnings required to produce a return on book equity of 9%.

1 anticipated in each future year is separately estimated. Ms. Nelson has done neither.
2 Instead, she mechanically adds analysts' five-year earnings per share growth rate to the
3 dividend yield.

4 **Flaws in Using Analysts' Five-Year EPS Growth Rates:** Analysts' five-year
5 earnings per share growth rates are earnings per share growth rates that measure earnings
6 growth from the most currently completed fiscal year to projected earnings five years into
7 the future. These growth rates are not indicative of future sustainable growth rates in part
8 because the sources of cash flow to an investor are dividends and stock price appreciation.
9 While both stock price and dividends are impacted in the long run by the level of earnings
10 a company is capable of achieving, earnings growth over a period as short as five years is
11 rarely in synchronization with the cash flow growth from increases in dividends and stock
12 prices. For example, if a company experiences a year in which investors perceive that
13 earnings temporarily dipped below normal trend levels, stock prices generally do not
14 decline at the same percentage that earnings decline, and dividends are usually not cut just
15 because of a temporary decline in a company's earnings. Unless both the stock price and
16 dividends mirror every downswing in earnings, they cannot be expected to recover at the
17 same growth rate that earnings recover. Therefore, growth rates such as five-year projected
18 growth in earnings per share are not indicative of long-term sustainable growth rates in
19 cash flow. As a result, they are not applicable for direct use in the simplified DCF method.

20 The use of five-year earnings per share growth rates directly in the DCF model is
21 also improper. A raw, unadjusted, five-year earnings per share growth rate is usually a poor
22 proxy for either short-term or long-term cash flow growth that an investor expects to
23 receive. When implementing the DCF method, the time value of money is considered by

1 equating the current stock price of a company to the present value of the future cash flows
2 that an investor expects to receive over the entire time that they own the stock. The
3 discount rate required to make the future cash flow stream, on a net present value basis,
4 equal to the current stock price is the COE. The only two sources of cash flow to an
5 investor are dividends and the net proceeds from the sale of stock at whatever time in the
6 future the investor finally sells. Therefore, the DCF method is discounting future cash
7 flows that investors expect to receive from dividends and from the eventual sale of the
8 stock. Five-year earnings growth rate forecasts are especially poor indicators of cash flow
9 growth, even over the five years being measured by the five-year earnings per share growth
10 rate number.

11 Furthermore, a five-year earnings per share growth rate is a poor indicator of five-
12 year cash dividend growth expectations. The board of directors of a company changes
13 dividend rates based upon long-term earnings expectations combined with the capital needs
14 of a company. Most companies do not decrease dividends simply because a company has
15 a year in which earnings were below sustainable trends, and similarly they do not increase
16 dividends simply because earnings for one year happened to be above long-term
17 sustainable trends. Therefore, over any given five-year period, earnings growth is
18 frequently very different from dividend growth. In order for earnings growth to equal
19 dividend growth, at a minimum, earnings per share in the first year of the five-year earnings
20 growth rate period would have to be exactly on the long-term earnings trend line expected
21 by investors. Since earnings in most years are above or below the trend line, the earnings
22 per share growth rate over most five-year periods is different from what is expected for
23 dividend growth.

1 A five-year earnings per share growth rate is also a poor indication of future stock
2 price growth. If a company happens to experience a year in which earnings decline below
3 what investors believe is consistent with the long-term trend, then the stock price does not
4 drop anywhere near as much as earnings drop. Similarly, if a company happens to
5 experience a year in which earnings are higher than the investor-perceived long-term
6 sustainable trend, the stock price will not increase as much as the earnings. In other words,
7 the P/E ratio of a company will increase after a year in which investors believe earnings
8 are below sustainable levels, and the P/E ratio will decline in a year in which investors
9 believe earnings are higher than expected. Since stock price is one of the important cash
10 flow sources to an investor, a five-year earnings growth rate is a poor indicator of cash
11 flow, both because it is a poor indicator of stock price growth over the five years being
12 examined, and because it is equally a poor predictor of dividend growth over the period.

13 **Appropriate Use of Analysts' Consensus Growth Rates:** This does not mean that
14 analysts' consensus earnings per share growth rates are useless as an aid to projecting the
15 future. Analysts' EPS growth rates are, however, very dangerous if used in a simplified
16 DCF without proper interpretation. While they are not useful if used in their "raw" form,
17 they can be very useful in computing estimates of what earned return on equity investors
18 expect will be sustained in the future, and as such, are useful in developing long-term
19 sustainable growth rates. This is exactly what I do in the application of our Constant
20 Growth DCF Analysis.

21 **Constant Growth DC Form of the DCF Model:** Sufficient care must be taken to
22 be sure that the growth rate "g" is representative of the constant sustainable growth. To

1 obtain an accurate, constant growth DCF result, the mathematical relationship between
2 earnings, dividends, book value and stock price must be respected.

3 The basic difference between the use of an analyst's earnings per share growth rate
4 in the constant growth DCF formula and using the "br" (b (the earnings retention rate) X r
5 (rate of return on common equity investment)) approach is that the "br" form, if properly
6 applied, eliminates the mathematical error caused by an inconsistency between the
7 expectations for earnings per share growth and dividends per share growth. Because it
8 eliminates that error, the results of a properly applied "br" approach will be superior to the
9 answer obtained from other approaches to the constant growth form of the DCF model.
10 This is not to say that even a properly applied "br" approach will be perfect. The self-
11 correcting nature of a properly applied "br" to forecasted differences in earnings per share
12 and dividends per share growth rates helps to mitigate the resultant error, but should not be
13 viewed as the perfect way to quantify the impact of expected non-constant growth rates.

14 **Implementation of the Model:** I have applied the constant growth form of the
15 DCF model by staying true to the mathematically derived " $k=D/P + (br + sv)$ " form of the
16 DCF model. I have also taken care to fully allocate all future expected earnings to either
17 future cash flow in the form of dividends ("D") or to retained earnings (the retention rate,
18 "b"). This extra accuracy is obtained only when the retention rate "b" is derived from the
19 values used for "D" and "r," rather than independently.

20 **Deriving the Values Used in the DCF Method:** The DCF model generally calls
21 for the use of the dividend expected over the next year. A reasonable way to estimate next
22 year's dividend rate is to increase the quarterly dividend rate by half of the current actual

1 quarterly dividend rate. This is a good approximation of the rate that would be obtained if
2 the full prior year's dividend were escalated by the entire growth rate.¹¹⁸

3 I obtained the stock price—"P"—used in my DCF analysis from the closing prices
4 of the stocks on June 30, 2026. I also obtained an average stock price for the 12 months
5 ending June 30, 2026 by averaging the high and low stock prices for the year.

6 I based the value of the future expected return on equity—"r"—on the average
7 return on book equity expected by Value Line, adjusted in consideration of recent returns.
8 I also made a computation that was based on a review of both the earned return on equity
9 consistent with analysts' consensus earnings growth rate expectations and on the actual
10 earned returns on equity. For a stable industry such as utility companies, investors will
11 typically look at actual earned returns on equity as one meaningful input into what can be
12 expected for future earned returns on book equity.¹¹⁹

13 This return on book equity expectation used in the DCF method to compute growth
14 must *not* be confused with the COE. Since the stock prices for the comparative companies
15 are substantially higher than their book value, the return investors expect to receive on their
16 market price investment is considerably less than the anticipated return on book value. If
17 the market price is low relative to book value, the COE will be higher than the future

¹¹⁸ For example, assume a company paid a dividend of \$0.50 in the first quarter a year ago, and has a dividend growth rate of 4 % per year. This dividend growth rate equals $(1.04)^4 - 1 = 0.00985$ % per quarter. Thus, the dividend is \$0.5049 in the second quarter, \$0.5099 in the third quarter, and \$0.5149 in the fourth quarter. If that 4 % per annum growth continues into the following year, then the dividend would be \$0.5199 in the first quarter, \$0.5251 in the second quarter, \$0.5303 in the third quarter, and \$0.5355 in the fourth quarter. Thus, the total dividends for the following year equal \$2.111 ($0.5199 + 0.5251 + 0.5303 + 0.5355$). I computed the dividend yield by taking the current quarter (the \$0.5149 in the fourth quarter in this example) and multiplying it by 4 to get an annual rate of \$2.06. I then escalated this \$2.06 by half the 4 % growth rate, which means it is increased by 2 %. $\$2.06 \times 1.02 = \2.101 , which is within one cent of the \$2.111 obtained in the example.

¹¹⁹ Exhibit ALR-3, page 1.

1 expected return on book equity, and if the market price is high, then the return on book
2 equity will be greater than the COE.

3 In addition to growing through the retention of earnings, utility companies also
4 grow by selling new common stock. Selling new common stock increases a company's
5 growth. I quantified this growth, caused by the sale of new common stock, by multiplying
6 the amount that the actual market-to-book ratio exceeds 1.0 (representing the point where
7 market price equals book value), by the compound annual growth rate of stock that Value
8 Line forecasts. The results of that computation are shown on line 4 of Exhibit ALR-3, page
9 1.

10 Pure financial theory prefers concentrating on the results from the most current
11 price because investors cannot purchase stock at historical prices. There is legitimate
12 concern, however, about the potential distortion of using just a single price. I present DCF
13 results based on the most recent stock pricing data (June 30, 2026) as well as the average
14 of the high and low stock price over the past 12 months to obtain a range of reasonable
15 values. The DCF result based on the average of the high and low stock price for the year
16 ending June 30, 2026 is 9.57%. As shown in Exhibit ALR-3, page 1, the DCF result based
17 on the stock price as of June 30, 2026 is 9.61%. Exhibit ALR-3, page 1, shows more of
18 the specifics of how I implemented the constant growth form of the DCF model for the
19 RFC Gas Proxy Group.

1 **Q. PLEASE EXPLAIN HOW YOU DETERMINED WHAT VALUE TO USE FOR “r”**
2 **WHEN COMPUTING GROWTH IN YOUR CONSTANT GROWTH FORM OF**
3 **THE DCF MODEL.**

4 **A. Determining the Value of "r" for Computing Growth:** The value of “r” that is
5 appropriate to use in the DCF formula is the value anticipated by investors to be maintained
6 on average in the future. The inputs I considered are shown in Footnote [C] of Exhibit
7 ALR-3, page 1. The value of “r” that is appropriate to use in the DCF formula is the value
8 anticipated by investors to be maintained on average in the future. This Exhibit shows that
9 the average future return on equity, forecasted by Value Line for the RFC Gas Proxy Group
10 between 2026 and 2029-31, is 10.07%. The same footnote also shows that the future
11 expected return on equity derived from the Zacks consensus forecast is 8.28%, and that the
12 actual returns on equity earned by the RFC Gas Proxy Group on average were 8.75% in
13 2023, 8.60% in 2024, and 9.37% in 2025. Based on the combination of the forecasted
14 return on equity derived from the Zacks consensus, the recent historical actual earned
15 returns, and Value Line’s forecast, I made the DCF growth computation using a 9.10%.¹²⁰
16 value of “r”.

¹²⁰ I used 9.10% in consideration of historical returns, Zacks’s projections, and Value Line projected returns for the RFC Gas Proxy Group.

APPENDIX D. NON-CONSTANT GROWTH FORM OF THE DCF MODEL

1 **Annual vs. Quarterly Cash Flow Modeling:** My non-constant growth DCF model
2 uses annual expected cash flows. Although dividends are paid quarterly, I used the annual
3 model because it is easier for observers to visualize what is happening. Modeling cash
4 flows to be annual rather than when they are actually expected to occur causes a small
5 overstatement of the COE.

6 The process of changing from an annual model to a quarterly model would require
7 two changes. A quarterly model would show dividends being paid sooner and would also
8 show earnings being available sooner. A company that receives its earnings sooner, rather
9 than at the end of the year, has the opportunity to compound them. Since revenues, and
10 therefore earnings, are essentially received every day, a company that is supposed to earn
11 an annual rate of 9.00% on equity would have to earn only 8.62% if the return were
12 compounded daily.¹²¹ This reduction from 9.00% to 8.62% would then be partially offset
13 by the impact of the quarterly dividend payment to bring the result of switching from the
14 simplifying annual model closer to, but still a bit below, 9.00%.

15 **The Role of Earnings and Retention Rates:** By using cash flow expectations as
16 the valuation parameter, the non-constant DCF model still relies on earnings. It relies on
17 an expectation of future cash flows. Future cash flows come from dividends during the
18 time the stock is owned and capital gains from the sale of the stock once it is sold. Since
19 earnings impact both dividends and stock price, the non-constant DCF model still relies on
20 earnings.

¹²¹ $(1+.0862/365)^{365}=1.09=9.00\%$.

1 Every dollar of earnings is used for the benefit of stockholders, either in the form
2 of a dividend payment, or earnings reinvested for future growth in earnings and/or
3 dividends. Earnings paid out as a dividend have a different value to investors than earnings
4 retained in the business. Recognizing this difference and properly considering it in the
5 quantification process is a major strength of the DCF model and is why the non-constant
6 DCF model I have set forth is an improvement over either the price-to-earnings ratio (P/E
7 ratio) or dividend/price (D/P) methods. Comparing the P/E ratios and the dividend yield
8 (D/P) are helpful as a rule of thumb, but they must be used with caution because, among
9 other reasons, two companies with the same dividend yield can have a different COE if
10 they have different retention rates. A DCF model is more reliable than these rules of thumb
11 because it can account for different retention rates, among other factors.

12 **Valuation of Retained Earnings vs. Dividends:** There is a difference to investors
13 in the value of earnings paid out as a dividend compared to the value of earnings retained
14 in the business because the return on earnings retained in the business depends upon the
15 opportunities available to that company. If a regulated utility reinvests earnings in needed
16 “used and useful” utility assets, then those reinvested earnings have the potential to earn at
17 whatever rate of return is consistent with ratemaking procedures allowed and the skill of
18 management in prudently operating the system.

19 When an investor receives a dividend, she can either reinvest it in the same or
20 another company or use it for other things, such as paying down debt or paying living
21 expenses. Although an investor could theoretically use the proceeds from any dividend
22 payments to simply buy more stock in the same company, when an investor increases her
23 investment in a company by purchasing more stock, the transaction occurs at market price.

1 However, when the same investor sees her investment in a company increase because
2 earnings are retained rather than paid as a dividend, the reinvestment occurs at book value.
3 Stated within the context of the DCF terminology: earnings retained in the business earn at
4 the future expected return on book equity “r,” and dividends used to purchase new stock
5 earn at the rate “k.” When the market price exceeds book value (that is, the market-to-
6 book ratio exceeds 1.0), retained earnings are worth more than earnings paid out as a
7 dividend because “r” will be higher than “k.” Conversely, when the market price is below
8 book value, “k” will be higher than “r,” meaning that earnings paid out as a dividend earn
9 a higher rate than retained earnings.

10 Even if retained earnings are more valuable when the market-to-book ratio is above
11 1.0, a company might still choose to pay a dividend. Retained earnings are more valuable
12 than dividends only if there are sufficient opportunities to profitably reinvest those
13 earnings. Regulated utility companies are allowed to earn the cost of capital only on assets
14 that are used and useful in providing utility service. Investing in assets that are not needed
15 may not produce any return at all. For unregulated companies, opportunities to reinvest
16 funds are limited by the demands of the business. For example, how many new computer
17 chips can Intel profitably develop at the same time?

18 **Flexibility of the Non-Constant DCF Model:** Under the non-constant DCF
19 model, it is not necessary for earnings and dividends to grow at a constant rate for the
20 model to be able to accurately determine the COE. Because the non-constant form of the
21 DCF model separately discounts each and every future expected cash flow, it does *not* rely
22 on any assumptions of constant growth. The dividend yield can be different from period
23 to period, and growth can bounce around in any imaginable pattern without harming the

1 accuracy of the answer obtained from quantifying those expectations. When the non-
2 constant DCF model is correctly used, the answer obtained is as accurate as the estimates
3 of future cash flow.

4 Because the non-constant DCF treats every future cash flow as an independent
5 event, it provides a granular and mathematically robust estimate of the COE.
6
7

APPENDIX E. CAPITAL ASSET PRICING MODEL

1 **Risk Free Rate:** When looking for a security to calculate an estimate of the risk-
2 free rate, it could be argued that it is appropriate to find one with a term or maturity that
3 best matches the life of the asset being financed. In that sense, the 30-year Treasury bond
4 yield can be argued to be ideal for this specific application. However, it is equally
5 important to find a security that has a beta coefficient with the overall market as close to
6 zero as possible, because by the very definition of the risk-free rate in the CAPM model,
7 its movements should have no correlation to the movements of the market. And this is
8 where the problem with the 30-year Treasury bond yield arises, as it has an established
9 non-zero beta. The 3-month Treasury bill yield has a considerably lower beta, and
10 therefore is superior in that respect to the 30-year Treasury bond yield. Neither one is a
11 perfect fit on both fronts, which is why we have chosen to consider both as proxies for the
12 risk-free rate to establish a range for our CAPM results.

13 It is important to recognize that current long-term Treasury bond yields represent a
14 direct observation of investor expectations and there is no need to use “expert” forecasts
15 such as Blue Chip to determine the appropriate risk-free rate to use in a CAPM analysis or
16 any other COE calculations.

17 Many economists and forecasters will continue to be quoted in the press
18 prognosticating on possible developments that are truly unpredictable. The Nobel Laureate
19 Economist Daniel Kahneman stated the following regarding forecasting:

1 It is wise to take admissions of uncertainty seriously, but declarations of
 2 high confidence mainly tell you that an individual has constructed a
 3 coherent story in his mind, not necessarily that the story is true.¹²²

4 **Historical Beta:** We calculate historical betas following the methodology used by
 5 Value Line, with some modifications. Specifically, Value Line adheres to the following
 6 guidelines:

- 7 1. Returns for each security are regressed against returns for the overall market
 8 in the following form:

$$9 \ln(p^I_t / p^I_{t-1}) = a_I + B_I * \ln(p^m_t / p^m_{t-1})$$

10 Where:

- 11 • p^I_t is the price of the security I at time t
- 12 • p^I_{t-1} is the price of the security I one week before time t
- 13 • p^m_t and p^m_{t-1} are the corresponding values of the market index
- 14 • B_I is the regression estimate of Beta for the security against the
 15 market index

- 16 2. The natural log of the price ratio is used as an approximation of each return,
 17 and no adjustment is made for dividends paid during the week.
- 18 3. Weekly returns are calculated on one day of the week, with a stated
 19 preference for Tuesdays to minimize the effect of holidays as much as
 20 possible.

¹²² DANIEL KAHNEMAN, *Thinking Fast and Slow*, p. 212(New York: Farrar, Straus, and Giroux, 2011).

4. Betas calculated using the regression method above are adjusted as per Blume (1971)¹²³ using the following formula:¹²⁴

$$\text{Adjusted } B_I = 0.35 + 0.67 * \text{Calculated } B_I$$

There are four differences between our historical beta calculations and Value Line's calculations:

1. The first significant difference is that whereas Value Line uses the New York Stock Exchange Composite Index as the market index, we use the S&P 500 Index.
2. Another important difference is that whereas Value Line calculates weekly returns on one day of the week, with a stated preference for Tuesdays, we calculate weekly returns on all days of the week.
3. Value Line only calculates betas every 3 months in their quarterly company reports, whereas we use the same consistent methodology to calculate betas every week during the most recent 3 complete months (April through June 2026).
4. Value Line always uses a 5-year period for the return regression,¹²⁵ whereas we calculate historical betas for periods of 6 months, 2 years, and 5 years.

¹²³ M. Blume, On the Assessment of Risk, *The Journal of Finance*, Vol. XXVI (March 1971) at www.stat.ucla.edu/~nchristo/Fiatlux/blume2.pdf.

¹²⁴ Michelfelder and Theodossiou (2013) have discredited the Blume adjustment for regulated public utility stocks, but Gombola and Kahl (1990) found that, while their betas do not approach unity, they are nonstationary. Our use of the Blume adjustment, then, is “conservative”, from the perspective of the DCA.

Michelfelder, R.A. & Theodossiou, P. (2013). Public utility beta adjustment and biased costs of capital in public utility rate proceedings, *Electricity Journal* 26(9), 60-68. <https://doi.org/10.1016/j.tej.2013.09.017>

Gombola, M. & Kahl, D. (1990). Time-series processes for utility betas: implications for forecasting systematic risk, *Financial Management* 19(3), 84-93. <https://www.jstor.org/stable/3665827>

¹²⁵ They offer betas calculated over different time periods on their website, including 3 years and 10 years.

1 In the following pages, we explain our rationale for making the four modifications
2 above to Value Line's beta calculation methodology.

3 **Choice of Market Index (S&P 500 vs. NYSE):** A critical factor in the calculation
4 of a beta coefficient is the choice of index to represent the overall market. Using exactly
5 the same beta calculation methodology with a different market index will result in different
6 values of beta for a given company or portfolio — sometimes drastically different values.
7 It is easy to jump to the conclusion that this points to a flaw in CAPM theory, as different
8 values of beta would result in a different implied COE. However, another key component
9 of the CAPM, the market risk premium, also depends on the choice of the market index,
10 which in theory would have an offsetting effect on the COE calculation. This points to the
11 most important aspect of selecting a market index for a CAPM analysis, which is to be
12 consistent and use the same index for the calculation of beta as for the calculation of the
13 market risk premium. This is a fundamental concept of the CAPM, and using betas based
14 on one index with a market risk premium based on a different index yields invalid results.

15 As stated above, Value Line calculates its published betas based on the NYSE
16 Composite Index. Most methodologies used to calculate the market risk premium,
17 including those we rely on, are based on the S&P 500 Index, so using them in the CAPM
18 together with Value Line betas exactly as published would yield invalid results.

19 For this reason, we calculate our historical betas versus the S&P 500 Index, making
20 our CAPM approach entirely consistent.

21 As an aside related to our option-implied betas, using the S&P 500 Index
22 consistently throughout our CAPM has the added benefit that this index has a much larger

1 number of options traded, which makes the calculation of option-implied betas more
2 reliable.

3 **Daily vs. Single-Day Weekly Return Calculations:** Using one day of the week to
4 calculate weekly returns for use in the regression analysis used to calculate historical betas
5 has the unintended effect of generating different values of betas depending on the day of
6 the week that is used. To clarify, if one were to use Value Line's precise methodology for
7 calculating a 5-year historical beta for a given company using weekly returns calculated on
8 Tuesdays, the resulting beta value would be different than the resulting value if one were
9 to use the same exact methodology, but using weekly returns calculated on Wednesdays,
10 or any other day of the week. Even though 5-year historical betas should in theory be quite
11 stable and should not change very much from one day to the next, calculating returns on
12 only one day of the week results in differences that can be significant and make no sense
13 conceptually.

14 It is easy to understand why it happens. Even though there is some correlation due
15 to some overlap, the set of weekly returns calculated on Mondays is a completely different
16 set of numbers than the set of weekly returns calculated on Tuesdays. As a result, there
17 are five 5-year betas that can result from Value Line's methodology, and even though the
18 Monday beta for a given company will change slowly from week to week, the change
19 between the Monday beta and the Tuesday beta, calculated just one trading day apart, can
20 be quite significant.

21 Since we became aware of this undesirable effect, we began calculating our
22 historical betas based on an all-encompassing set of weekly returns calculated on every
23 trading day in the beta calculation period. This methodology has the effect of averaging

1 out the five possible betas that could result from using only one day of the week for the
2 return calculations,¹²⁶ as Value Line does. In this way, a 5-year beta calculated on any two
3 consecutive trading days would only change minimally, as it should.

4 Using a daily calculation of weekly returns could be criticized for the resulting
5 overlap in a weekly return from Monday to Monday with that from Tuesday to Tuesday.
6 However, given that the overlap is consistent and equal for the net effect of every trading
7 day, no trading day is given undue weight in the regression. Even though the effect of each
8 trading day appears 5 times in the weekly return data, there are also 5 times the total number
9 of weekly returns in the overall set used in the regression, so any individual trading day
10 has the same relative weight than in Value Line's methodology. The fact that the resulting
11 beta value of this aggregate approach turns out to be a sort of average of the five possible
12 values that would result from Value Line's methodology on different days of the week is
13 the final confirmation that this is the superior approach for calculating a historical beta
14 based on weekly returns.

15 Using a daily calculation of weekly returns has the added benefit of providing more
16 data pairs to be used in historical beta calculations for shorter periods, such as for 6-month
17 historical betas, where instead of 25 return pairs, the regression is performed on 117 return
18 pairs.

19 **Benefits of Independent Calculations & Statistical Significance:** Doing our own
20 historical beta calculations using Value Line's established methodology allows me to see
21 how beta values change from week to week and to use the most up-to-date beta calculations

¹²⁶ The resulting beta is not a direct arithmetic or geometric average of the other five betas, but rather a regression based on the union of all five possible sets of weekly returns.

1 instead of relying on stale beta values that can be more than 3 months old, inappropriate
2 for the up-to-date snapshot of the market that we are taking.

3 Regarding the number of data point pairs necessary to estimate the relationship
4 between two variables in a regression analysis, establishing a minimum number is
5 somewhat subjective, though various authorities on statistics argue the number is between
6 3 and 8 data pairs. While one can broadly correctly generalize that the more data point
7 pairs one uses, the more certain one can be about the significance of the results of any
8 correlation analysis, this is very different from stating that one cannot achieve statistical
9 significance with a relatively low number of data pairs. In fact, it is important to realize
10 that one can achieve statistical significance with fewer than 10 data pairs, and that even
11 hundreds of data pairs do not guarantee statistical significance. For precisely this reason,
12 statisticians have developed a tool that helps determine statistical significance based on the
13 number of data pairs in a regression analysis.

14 A “table of critical values” of Pearson’s correlation, which can be readily found
15 online¹²⁷ or in most statistics books, tells a statistician that for 25 data point pairs (implying
16 $N-2=23$ “degrees of freedom”), a correlation, or beta, coefficient of 0.505 or higher will
17 occur *by chance* with a probability of only 0.01.¹²⁸ As explained in more detail in the text
18 regarding how to use the table of critical values,¹²⁹ any beta coefficient above this level,
19 and certainly above the 0.209 3-month average for the recent 6-month betas for our RFC
20 Gas Proxy Group, by definition are considered statistically significant. The threshold for

¹²⁷ University of Connecticut, *r Critical Value Table*, available at:
https://researchbasics.education.uconn.edu/r_critical_value_table/#

¹²⁸ In fact, many researchers use a more lenient “alpha level” of 0.05 for determinations of statistical significance.

¹²⁹ University of Connecticut, *Statistical Significance: Is there a relationship (difference) or isn’t there a relationship (difference)?* at https://researchbasics.education.uconn.edu/statistical_significance

1 statistical significance for 117 data point pairs (implying 115 “degrees of freedom”), is so
 2 low that it is not even included in the table of critical values. The maximum “degrees of
 3 freedom” listed is 100, with an already very low threshold of 0.254.

4 **Historical Blended Beta:** I am not aware of any academic study specifically
 5 focused on the optimal relative weight of historical betas to predict future betas. However,
 6 the authors of the paper I relied upon for guidance on the calculation of our option-implied
 7 betas did attempt to quantify the predictive power of 6-month option-implied (“forward-
 8 looking”) betas as well as that of 6-month (“180-day”), 1-year, and 5-year historical betas
 9 by back-testing historical predictions with actual *expost* results, or “realized” betas, for the
 10 30 companies in the Dow Jones Index. In addition to using each of the betas above
 11 independently, they also measured the predictive power of a “mixed” beta consisting of a
 12 simple average of the six-month option-implied beta and the 6-month historical beta.

13 Their conclusions for predicting 6-month future betas are as follows:

14 The forward-looking beta outperforms the other methods ten times, and the
 15 same is true for the 180-day historical beta. The mixed beta is the best
 16 performer in seven cases, and the 1-year historical beta in three cases. The
 17 5-year historical beta is always outperformed by at least one other method,
 18 and it often ranks last. The 180-day historical beta clearly dominates the
 19 two other historical methods.¹³⁰

20 Their conclusions for predicting 1-year and 2-year future betas are as follows:

21 Somewhat unexpectedly, the performance of the forward-looking beta
 22 compared to that of the 180-day historical beta is much better [for the one-
 23 year prediction] than [for the six-month prediction], and this conclusion
 24 carries over to [the two-year prediction]. The mixed beta also perform [sic]
 25 well. It is perhaps not surprising that the performance of the 180-day
 26 historical beta [for the one- and two-year predictions] is poorer than [for the
 27 six-month prediction], because the horizons used in the construction of
 28 realized betas are no longer equal to 180 days. What is harder to explain is
 29 why the correlation between realized beta and forward-looking beta is in

¹³⁰ Peter Christoffersen, Kris Jacobs, & Gregory Vainberg, *Forward-Looking Betas*, p. 16 (April 25, 2008) at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=891467.

1 many cases higher [for the one- and two-year predictions] than [for the six-
2 month prediction]. Finally, it is also interesting that the 1-year and 5-year
3 historical betas do not perform well [for the one-and two-year predictions].
4 In summary, [for the one-year prediction] either the forward-looking beta
5 or the mixed beta is the best performer in nineteen out of thirty cases. [For
6 the two-year prediction], this the case twenty-two times out of thirty.¹³¹

7 Their conclusions strongly support the use of 6-month historical betas, 6-month
8 option-implied betas, and/or an average of the two as predictors of future betas 6 months,
9 1 year, or 2 years into the future. Therefore, considering a historical blended beta in
10 conjunction with option-implied betas to calculate the COE is consistent with research
11 findings that coming historical and option-implied betas is the best predictor of future
12 betas.

13 I decided on the composition of the historical blended betas primarily based on the
14 conclusions of the authors above. Though the predictive power of longer-term historical
15 betas seems to be quite reduced, it is not zero, so in an effort to preserve the effect of longer-
16 term market trends in our historical blended betas, we chose to incorporate 5-year historical
17 betas.

18 **Option-Implied Betas:** I start my process with publicly available trading information for
19 all the options for a given security (company or index) for a complete trading day. I then
20 filter the option data as described by the CBOE using the following guidelines:

- 21 1. Use the mid-quote or mark (average of bid and ask) as the option price.
- 22 2. Use only out-of-the-money call and put options.
- 23 • Determine the “moneyness” threshold where absolute difference
24 between call and put prices is smallest (using CBOE “Forward Index
25 Price” formula).

¹³¹ *Id. at 17.*

- Include “at-the-money” call and put options and use average of call and put prices as price for “blended” option.

3. Exclude all zero bids.

4. Exclude remaining (more out-of-the-money) options when two sequential zero bids are found.

I then apply the series of formulas clearly described in both of the CBOE’s white papers to the remaining options to calculate Option-Implied Volatility and Option-Implied Skewness. In the words of the CBOE, each of its two indices is “an amalgam of the information reflected in the prices betas using the following formula developed by Christoffersen, Chang, Jacobs and Vainberg (2011):¹³²

$$\beta_i = \left(\frac{SKEW_i}{SKEW_m} \right)^{1/3} \left(\frac{VAR_i}{VAR_m} \right)^{1/2}$$

Where:

β_i : option – implied beta of security (e.g. stock, fund);
 $SKEW_i$: skewness of security;
 $SKEW_m$: skewness of overall market (S&P 500);
 VAR_i : variance of security;
 VAR_m : variance of overall market (S&P 500).

Market Risk Premium: I used a cumulative probability of 50.0% in the calculation of our option-implied growth for the S&P 500, which results in a value of 7.82% as of February 28, 2026, and a value of 7.65% for the weighted average of the 3 months ending on that date. As stated above, a cumulative probability of 50% represents the median of

¹³² Bo-Young Chang, Peter Christoffersen, Kris Jacobs & Gregory Vainberg, Option-Implied Measures of Equity Risk, *Review of Finance* Volume 16, Issue 2, pp. 385-428 (April 2012) at <https://academic.oup.com/rof/article/16/2/385/1584560>

1 the probability distribution, or in this case the option-implied market consensus, which is
2 why we have chosen to use this level.

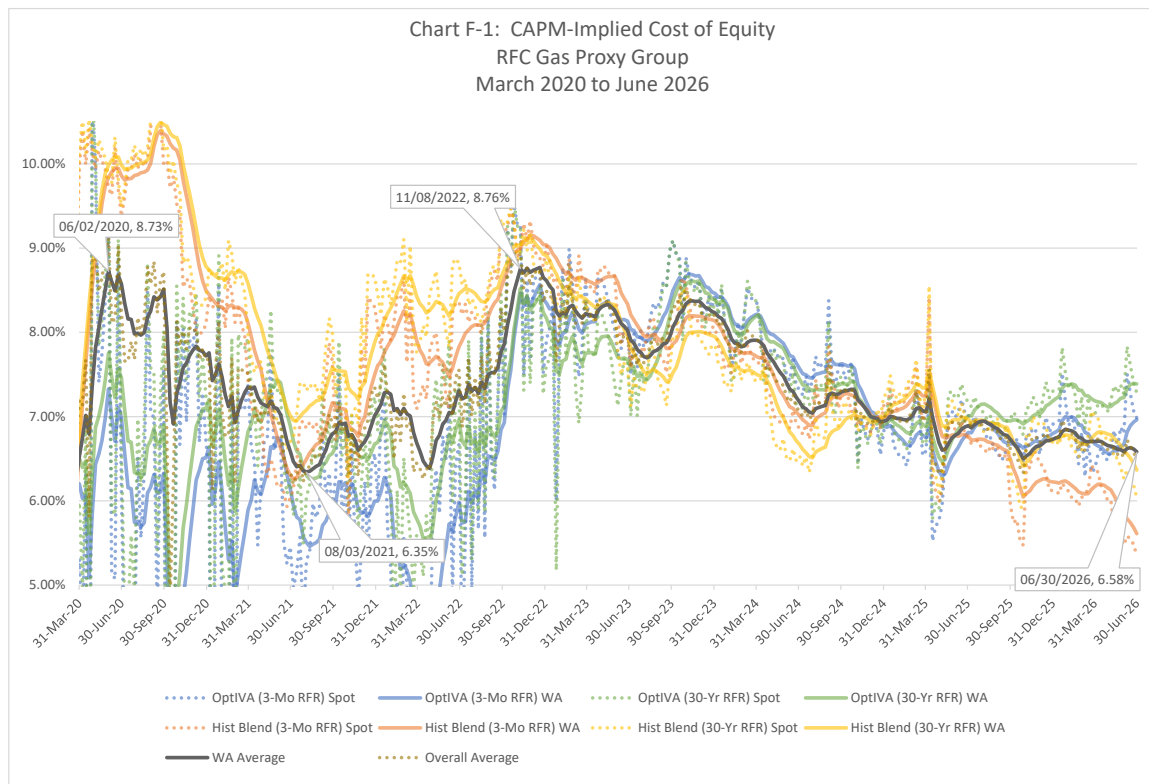
3 The cumulative probabilities referred to in this case are directly comparable to the
4 cumulative probabilities I have used or referred to in prior filed testimonies. In late 2020,
5 after significant efforts related to the complexities in processing extremely large volumes
6 of option data, I was finally able to use option-implied volatility and option-implied
7 skewness to come up with a log-normal distribution that approximates the probability
8 distribution of the possible trajectories for the S&P 500 implied by the options market as
9 of any given day, as explained above. All of the testimonies I have filed since then, starting
10 in 2021, have used this complete and superior approach along with a cumulative probability
11 of 50%, representing the median of the probability distribution, or the option-implied
12 market consensus, to estimate expected market growth. Any references to cumulative
13 probability in these testimonies are directly comparable.

14 Prior to incorporating skewness into the approximation, I used a normal function to
15 estimate the same probability distribution referred to above. Using a normal distribution as
16 an approximation is a simplification used commonly in economics, including in the Black-
17 Scholes formula for a single option. However, unlike a skewed log-normal distribution, a
18 normal distribution has the same median and mean, meaning that when applied in this case,
19 the option-implied market consensus of this simplified approximation implies market
20 growth of 0%. As a result, before using log-normal distributions, I had to resort to finding
21 an adequate level of cumulative probability above 50% to estimate market growth, which
22 is admittedly somewhat subjective. To be conservative, I often used a cumulative
23 probability of 68.3%, which is the probability found within one standard deviation of the

1 mean of a normal distribution, which I understood would lead to a conservatively high
2 estimate for market growth.

3 It is important to point out that the cumulative probabilities of the simplified normal
4 distribution approximation I used in cases before 2021 cannot be directly compared to the
5 cumulative probabilities of the superior log-normal distribution approximation, which
6 takes skewness into account. The considerably improved approximation based on a log-
7 normal distribution eliminates all subjectivity in arriving at the implied market consensus
8 and allows a much better measure of implied cumulative probabilities of deviations from
9 that market consensus.

APPENDIX F. CAPM-IMPLIED COST OF EQUITY FOR RFC GAS PROXY GROUP OVER TIME SINCE ONSET OF COVID PANDEMIC



Notes regarding the content of this chart:

- The information in this chart is the property of Rothschild Financial Consulting (“RFC”) and may not be used for any purpose without the express written consent of RFC. Even when the underlying data are publicly available from another source, the results of analyses performed by RFC and the way of presenting the data are and remain the property of RFC.
- The data presented herein may not agree 100% with past recommendations by RFC for numerous reasons, including differences in the underlying proxy group and the fact that this chart represents only results based on the CAPM, whereas RFC usually bases recommendations on the CAPM and other models, such as various forms of the DCF.

APPENDIX G. OPTION-IMPLIED GROWTH METHODOLOGY

1 **The "Inverse Problem" Approach (Market-Implied Expectations):** My
2 methodology solves what economists call the "inverse problem." Historically, academics
3 used theoretical assumptions to guess what a stock's price should be. My approach reverses
4 this logic: instead of guessing, I look at what the price is in the options market, and I work
5 backward to mathematically determine the exact growth and return expectations that justify
6 that price.

7 **Extracting Expectations from Stock Options:** It is a fundamental economic
8 reality that the price investors pay for an option today is directly determined by their
9 expectations of the stock's future value. To extract this information, my analysis is based
10 on an extremely large set of market data, making it highly robust. To avoid short-lived
11 changes in the market, I gathered data weekly over the course of the last quarter on 13
12 sequential Tuesdays between April 2026 and June 2026.

13 The depth of this data is substantial. On any given date, the option contracts
14 analyzed cover between 4,277 and 5,197 different strike prices. Even after applying strict
15 filtering criteria to remove illiquid quotes, the dataset remains massive: the average number
16 of share equivalents covered across the 13 dates is 1,051 million (over 1 billion shares) per
17 week, providing an undeniable, real-time market signal.

18 **An Established, Institutional Methodology:** This is not a novel or experimental
19 method. It is the foundation of the exact same mathematical framework utilized by the
20 Federal Reserve Bank of Minneapolis to estimate market probabilities, and by the Chicago
21 Board Options Exchange (CBOE) to calculate global benchmarks like the VIX and SKEW
22 indices.

1 **The 5-Step Calculation Process:** To calculate the option-implied growth of the
2 S&P 500, I rely on the exact same proven mathematical frameworks utilized by the CBOE.

3 I perform the following steps:

- 4 1. Gather and Filter Data: I obtain S&P 500 option data and apply the CBOE's strict
5 filtering rules (e.g., utilizing mid-quotes, removing zero bids, and cleaning out inactive
6 options) to ensure only valid, high-quality pricing signals are used.
- 7 2. Calculate Option-Implied Volatility: Using the CBOE methodology, I calculate the
8 expected magnitude of future stock price movements (risk).
- 9 3. Calculate Option-Implied Skewness: I then calculate the market's expectation
10 regarding the shape of that risk—specifically, the fear of a sudden market crash (tail
11 risk).
- 12 4. Extract the Probability Distribution: Using a standard mathematical framework
13 originating with the Breeden-Litzenberger theorem, I measure how these option prices
14 change across different strike prices to reveal the exact probability distribution the
15 market assigns to the stock's future trajectory.
- 16 5. Determine Expected Growth: Finally, I convert this distribution into the specific
17 growth investors expect. Financial theory dictates that investors require a higher return
18 (a "risk premium") for assets that are volatile or prone to sudden crashes. This step
19 mathematically converts the "fear" measured by volatility and skewness into the
20 specific "return" investors demand to compensate them for that fear.

21 The median of this distribution represents the true market consensus of expected
22 growth. This forward-looking, market-derived Option-Implied Growth Rate is what I then

1 use in my DCF analysis, providing a vastly superior reflection of current economic reality
2 than a reliance on short-term analyst forecasts.
3

APPENDIX H. RESUME OF AARON L. ROTHSCCHILD

SUMMARY

Financial professional providing U.S. public utility commissions financial tools and expert testimony to assist in rate setting for regulated utility companies (e.g., regulated electric distribution providers, natural gas pipelines). Relevant experience includes developing and applying methodologies that directly measure investors' equity return expectations based on stock option prices, applied mathematics research for utility industry as an affiliate of the New England Complex Systems Institute, and serving as Head of Business Analysis for a major U.S. telecom firm in Asia Pacific.

EXPERIENCE

Rothschild Financial Consulting, Ridgefield, CT

November 2001- present

Independent consulting firm specializing in utility sector

President

- Provide financial expert testimony (e.g., rate of return and M&A) to regulators, policy makers, foundations, and consumer groups in utility rate case proceedings, including representing the California Public Advocates Office and the Wild Tree Foundation in the ongoing California water and energy cost of capital proceedings
- Developed cost of equity models that have been adopted by the Public Service Commission of South Carolina in 2020 (decision upheld by the South Carolina Supreme Court in September 2021) and the Connecticut Public Utilities Regulatory Authority in September 2021
- Developing market-based cost of equity methodology in ongoing regulated natural gas pipeline case before the Federal Energy Regulatory Commission (FERC), including proposing replacing equity analyst earnings per-share forecasts (IBES, Value Line) with options-implied growth expectations to determine authorized return on equity (ROE)
- Present at utility regulation conferences (NARUC/NASUCA and MARC) regarding rate of return, power purchase agreements, complex systems science, and subsidy auctions

360 Networks, Hong Kong

January 2001 - October 2001

Pioneer of the fiber optic telecommunications industry

Senior Manager

- Business development and investment evaluation
- Negotiated landing rights and formed local partnerships in Korea, Japan, Singapore, and Hong Kong for \$1 billion undersea cable project
- Structured fiber optic bandwidth swapping agreement with Enron and Global Crossing
- Established relationships with Hong Kong based Investment Bankers to communicate Asia Pacific objectives and accomplishments to Wall Street

Dantis, Chicago, IL

July 2000- December 2000

Start-up managed data-hosting services provider

Director

- Built capital raise valuation models and negotiated with potential investors
- Team raised \$100M from venture capital firm through valuation negotiations and internal strategic analysis

MFS, MCI-WorldCom, Chicago, Hong Kong, Tokyo September 1996- July 2000
 American Telecommunications Company

Head of Business Analysis for Japan operations

- Managed staff of 5 business development analysts
- Raised \$80M internally for Japanese national fiber network expansion plan by conducting an investment evaluation and presenting findings to CEO of international operations in London, UK
- Built financial model for local fiber optic investment evaluation that was used by business development offices in Oak Brook, IL and Sydney, Australia

EDUCATION

Vanderbilt University, Nashville, TN 1994-1996
MBA, Finance

- Completed business plan for Nextlink Communications in support of their national fiber optic network expansion, including identifying opportunities from passage of Telecom Act of 1996
- Developed analytical framework to evaluate predictability of rare events
- Provided financial and accounting analysis to Chicago's consumer advocate, the Citizens Utility Board (CUB) as a summer intern

Clark University, Worcester, MA 1990 - 1994
BA, Mathematics

APPENDIX I. TESTIFYING EXPERIENCE OF AARON L. ROTHSCILD**Filed Rate of Return Testimonies:****California**

- Pacific Gas and Electric Company, Application 25-03-010, Rate of Return, July 2025
- Southern California Edison, Application 25-03-011, Rate of Return, July 2025
- San Diego Gas & Electric Company, Application 25-03-012, Rate of Return, July 2025
- Southern California Gas Company Application 25-03-013, Rate of Return, July 2025
- Pacific Gas and Electric, Application 22-04-008 et al, Rate of Return/Cost of Capital Mechanism, January 2024
- Liberty Utilities, Application A.23-05-004, Rate of Return, August 2023
- San Gabriel Water Company, Application 23-05-001, Rate of Return, August 2023
- Suburban Water Company, Application 23-05-003, Rate of Return, August 2023
- Great Oaks Water Company, Application 23-05-002, Rate of Return, August 2023
- Incumbent Local Exchange Carriers (ILECs), Application 22-09-003, Rate of Return, May 2023
- Pacific Gas and Electric Company, Application 22-04-008, Rate of Return, August 2022
- Southern California Edison, Application 22-04-009, Rate of Return, August 2022
- San Diego Gas & Electric Company, Application 22-04-012, Rate of Return, August 2022
- California American Water Company, Application 21-05-001, Rate of Return, January 2022
- California Water Service Company, Application 21-05-002, Rate of Return, January 2022
- Golden State Water Company, Application 21-05-003, Rate of Return, January 2022
- San Jose Water Company, Application 21-05-004, Rate of Return, January 2022
- Southern California Edison, Application 21-08-013, Rate of Return/Cost of Capital Mechanism, January 2022
- San Diego Gas & Electric Company, Application 21-08-014, Rate of Return/Cost of Capital Mechanism, January 2022
- Pacific Gas and Electric Company, Application 21-08-015, Rate of Return/Cost of Capital Mechanism, January 2022
- Pacific Gas and Electric Company, Application 21-01-004, Securitization, February 2021
- Pacific Gas and Electric Company, Application 20-04-023, Securitization, October 2020
- Southern California Edison, Application 20-07-008, Securitization, September 2020
- San Diego Gas & Electric Company, Application 19-04-017, Rate of Return, August 2019
- Southern California Gas Company, Application 19-04-016, Rate of Return, August 2019
- Pacific Gas and Electric Company, Application 19-04-015, Rate of Return, August 2019
- Southern California Edison, Application 19-04-014, Rate of Return, August 2019
- Liberty Utilities, Application A.18-05-006, Rate of Return, August 2018
- San Gabriel Water Company, Application 18-05-005, Rate of Return, August 2018
- Suburban Water Company, Application 18-05-004, Rate of Return, August 2018
- Great Oaks Water Company, Application 18-05-001, Rate of Return, August 2018
- California Water Service Company, Application 17-04-006, Rate of Return, August 2017
- California American Water Company, Application 17-04-003, Rate of Return, August 2017

- Golden State Water Company, Application 17-04-002, Rate of Return, August 2017
- San Jose Water Company, Application 17-04-001, Rate of Return, August 2017

Colorado

- Public Service Company of Colorado, Docket No. 11AL-947E, Rate of Return, March 2012

Connecticut

- Aquarion Water Company of Connecticut, Docket No. 25-12-12, Rate of Return, June 2026
- Yankee Gas Service Company, Docket No. 24-14-01, Rate of Return, March 2025
- United Illuminating Company, Docket No. 24-10-04, Rate of Return, February 2025
- Connecticut Natural Gas Corporation, Docket No. 23-11-02, Rate of Return, February 2024
- The Southern Connecticut Gas Company, Docket No. 23-11-02, Rate of Return, February 2024
- The Connecticut Water Company, Docket No. 23-08-32, Rate of Return, December 2023
- United Illuminating Company, Docket No. 22-08-08, Rate of Return, December 2022
- Aquarion Water Company of Connecticut, Docket No. 22-07-01, Rate of Return, October 2022
- Eversource and United Illuminating, Docket No. 17-12-03RE11, Rate of Return / Interim Rate Reduction, April 2021
- United Water Connecticut, Docket No. 07-05-44, Rate of Return, November 2008
- Valley Water Systems, Docket No. 06-10-07, Rate of Return, May 2007

Delaware

- Tidewater Utilities, Inc., PSC Docket No. 11-397, Rate of Return, April 2012

District of Columbia

- Washington Gas Light Company, Formal Case No. 1180, Rate of Return, January 2025
- Washington Gas Light Company, Formal Case No. 1169, Rate of Return, May 2023

Florida

- Florida Power & Light (FPL), Docket No. 070001-EI, October 2007
- Florida Power Corp., Docket No. 060001 Fuel Clause, September 2007

New Jersey

- Aqua New Jersey, Inc., BPU Docket No. WR11120859, Rate of Return, April 2012

Maryland

- Delmarva Power & Light, Case No. 9317, Rate of Return, June 2013
- Columbia Gas of Maryland, Case No. 9316, Rate of Return, May 2013
- Potomac Electric Power Company, Case No. 9286, Rate of Return, March 2012
- Delmarva Power & Light, Case No. 9285, Rate of Return, March 2012

New Hampshire

- Public Service Company Of New Hampshire., Docket No. DG 24-07,0 Rate of Return, January 2025
- Liberty Utilities (Energy North Natural Gas) Corp., Docket No. DG 23-067, Rate of Return, February 2024
- Liberty Utilities (Granite State Electric) Corp., Docket No. DE 23-039, Rate of Return, December 2023

New York

- Consolidated Edison Company of New York, Inc., Docket No. 2025-S-0741, March 2026

North Dakota

- Montana-Dakota Utilities Co., Case No. PU-20-379, Rate of Return, January 2021
- Otter Tail Power Company, Case No. PU-17-398, Rate of Return, May 2018
- Montana-Dakota Utilities Co., Case No. PU-15-90, Rate of Return, August 2015
- Northern States Power, Case No. PU-400-04-578, Rate of Return, March 2005

Pennsylvania

- Aqua Pennsylvania, Inc., Docket No. R-2024-3047822, Rate of Return, August 2024
- Peoples Natural Gas Company LLC, Docket No. R-2023-304459, Rate of Return, March 2024
- UGI Utilities, Inc. – Electric Division, Docket No. R-2022-3037368, Rate of Return, April 2023
- Pennsylvania American Water Company, Docket No. R-2022-3031672 and R-2022-3031673, Rate of Return, July 2022
- UGI Utilities, Inc. – Electric Division, Docket No. R-2021-3023618, Rate of Return, May 2021
- Pennsylvania American Water Company, Docket No. P-2021-3022426, Rate of Return, February 2021
- Audubon Water Company, Docket No. R-2020-3020919, Rate of Return, November 2020
- Pennsylvania American Water Company, Docket No. R-2020-3019369 and R-2020-3019371, Rate of Return, September 2020
- Twin Lakes Utilities, Inc., Docket No. R-2019-3010958, Rate of Return, October 2019
- City of Lancaster Sewer Fund, Docket No. R-2019-3010955, Rate of Return, October 2019
- Community Utilities of Pennsylvania Inc. Wastewater Division, Docket No. R-2019-3008948, Rate of Return, July 2019
- Community Utilities of Pennsylvania Inc. Water Division, Docket No. R-2019-3008947, Rate of Return, July 2019
- Newtown Artesian Water Company, Docket No. R-20019-3006904, Rate of Return, May 2019
- Hidden Valley Utility Services, L.P. – Wastewater Division, Docket No. R-2018-3001307, Rate of Return, September 2018
- Hidden Valley Utility Services, L.P. – Water Division, Docket No. R-2018-3001306, Rate of Return, September 2018
- The York Water Company, Docket No. R-2018-3000019, Rate of Return, August 2018
- SUEZ PA Pennsylvania, Inc., Docket No. R-2018-000834, Rate of Return, July 2018
- UGI Utilities, Inc. – Electric Division, Docket No. R-2017-2640058, Rate of Return, April 2018
- Wellsboro Electric Company, Docket No. R-2016-2531551, Rate of Return, December 2016
- Citizens' Electric Company of Lewisburg, PA, Docket No. R-2016-2531550, Rate of Return, December 2016
- Columbia Gas of Pennsylvania, Inc., Docket No. R-2016-2529660, Rate of Return, June 2016
- Columbia Gas of Pennsylvania, Inc., Docket No. R-2015-2468056, Rate of Return, June 2015
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