Docket No.: A.25-03-010 et seq.
ALJ: Jonathan Lakey
Exhibit No.: SC/PCF-01
Witness: Mark E. Ellis

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company for Authority to Establish Its Authorized Cost of Capital for Utility Operations for 2026.	Application 25-03-010 (Filed March 20, 2025)
And Related Matters.	Application 25-03-011 (Filed March 20, 2025) Application 25-03-012 (Filed March 20, 2025) Application 25-03-013 (Filed March 20, 2025)

DIRECT TESTIMONY OF MARK E. ELLIS

ON BEHALF OF SIERRA CLUB AND THE PROTECT OUR COMMUNITIES FOUNDATION

JULY 30, 2025

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I. INTRODUCTION

A. Qualifications

Q. Please state your name and professional affiliation.

A. My name is Mark E. Ellis. I am an economic and financial consultant and Senior Fellow for Utilities at the American Economic Liberties Project (AELP). My business address is 8595 Nottingham Place, La Jolla, CA 92037.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Protect Our Communities Foundation (PCF) and the Sierra Club (SC).

Q. Do you certify under penalty of perjury that, to the best of your knowledge, the testimony you will give in this proceeding is true and correct?

A. Yes.

Q. Please summarize your education and professional work experience.

A. I graduated from Harvard University with a Bachelor of Science in Mechanical and Materials Sciences and Engineering. I graduated from the Massachusetts Institute of Technology with a Master of Science in Technology and Policy.

I have over 30 years of professional experience in the energy industry. Before starting my consulting practice in 2020, I was the Chief Economist and Chief of Corporate Strategy at Sempra for fifteen years. My responsibilities included developing and implementing the enterprise-wide cost of capital estimation process. This critical corporate finance function entailed thorough and ongoing research of the academic and practitioner literature on the historical cost of capital and the various cost of capital estimation methodologies and models; creating a process to estimate, quarterly, the forward-looking, risk-adjusted cost of capital for Sempra's portfolio of companies spanning a variety of geographies and lines of business; and calibrating the results against historical data and reputable, objective third-party estimates.

I have testified on rate of return and other financial issues in regulatory proceedings in California, Georgia, Minnesota, New Hampshire, North Carolina, Utah, and Wisconsin. I

published a widely cited paper on utility rate of return for AELP,[1] and my work on utility rate of return has been featured the *Los Angeles Times*,[2] *San Francisco Chronicle*,[3] *Politico*,[4] *New York Daily News*,[5] *Inside Climate News*,[6] *More Perfect Union*,[7] and other media. Previously, I held various positions in strategy, project development, and engineering with McKinsey, ExxonMobil, Southern California Edison, and Sanyo Electric. Attachment MEE-1 contains more detail about my background.

B. Testimony Summary

Q. What is the purpose of your testimony in this proceeding?

A. I have been asked to address issues 1 through 5 in the Scoping Memo,[8] by SC for Pacific Gas and Electric (PG&E) and Southern California Edison (SCE), and by PCF for San Diego Gas

[1] Exhibit SC/PCF-2, Mark Ellis, *Rate of Return Equals Cost of Capital: A Simple, Fair Formula to Stop Investor-Owned Utilities From Overcharging the Public* (American Economic Liberties Project: January 2025), available at https://www.economicliberties.us/wp-content/uploads/2025/01/20250102-aelp-ror-v5.pdf.

[2] Sammy Roth, *Californians pay too much for electricity. Here are three bold solutions* (Los Angeles Times: March 27, 2025), https://www.latimes.com/environment/newsletter/2025-03-27/californians-pay-too-much-for-electricity-here-are-three-bold-solutions-boiling-point.

[3] Mark Ellis, *I was a California energy strategist. Here's how the state lets PG&E give you a raw deal* (San Francisco Chronicle: February 20, 2025), available at https://www.sfchronicle.com/opinion/openforum/article/pge-utility-bill-california-20175554.php.

[4] Marie J. French, Blanca Begert, and Ry Rivard, *Squeezed by Trump, blue states try squeezing utilities in return* (POLITICO Pro: April 14, 2025), available at https://subscriber.politicopro.com/article/2025/04/squeezed-by-trump-blue-states-try-squeezing-utilities-in-return-00289590; Blanca Begert, *The affordability issue California Democrats and Matt Gaetz's dad agree on* (Politico: April 14, 2025), available at https://www.politico.com/newsletters/california-climate/2025/04/14/the-affordability-issue-california-democrats-and-matt-gaetzs-dad-agree-on-00290404.

[5] Mark Ellis, *The conspiracy adding 25% to your Con Ed bill* (New York Daily News: May 5, 2025), available at https://www.nydailynews.com/2025/05/05/the-conspiracy-adding-25-to-your-con-ed-bill/.

[6] Dan Gearino, *A Former California Utility Exec Explains Why Your Electricity Bills Are So High* (Inside Climate News: June 15, 2025), available at https://insideclimatenews.org/news/15062025/former-utility-exec-mark-ellis-talks-electricity-bills-energy-transition/.

[7] More Perfect Union (2025, July 14). *How Wall Street Created an Energy Crisis (And is Making You Pay for it).* YouTube. https://www.youtube.com/watch?v=PymMikfkiLk.

[8] A.25-03-010 et seq., Assigned Commissioner's Ruling Consolidating Four Applications and Scoping Memo and Ruling (July 16, 2025), p. 3.

& Electric (SDG&E) and Southern California Gas (SCG) (collectively, Utilities). Figure 1 summarizes the topics and witness testimony and topics I will discuss.[9]

Figure 1. Testimony reviewed and discussed, by Utility

	PG&E	SCE	SCG	SDG&E
Policy	Becker	Moss	Bille	Mijares
ROE	Bulkley	Villadsen	Nowak	Nowak
Capital structure	Raman	Deana	Mekitarian	Gonzalez
Cost of long-term debt	Manuel	Wong		

Q. Please summarize your testimony.

A. My summary opens with a discussion of two topics that lay the regulatory and financial foundation for the determination of utility rate of return. The first is what I call the "ROR=COC standard": the principle, rooted in fundamental finance principles, the statutory "just and reasonable" mandate, and the seminal *Hope* and *Bluefield* decisions – and acknowledged by the Commission and all four Utilities – that the authorized rate of return (ROR) should be set equal to the market-based cost of capital (COC).[10]

The cost of capital is the return investors expect to receive in exchange for taking on the risk of providing capital. Under cost-of-service ratemaking (COSR) any return above that, without proper justification, constitutes unjust enrichment: it exceeds what is necessary to attract capital and thereby imposes an unfair burden on customers.

In my testimony, I provide robust, independent evidence that conclusively demonstrates that authorized returns on equity (ROEs) nationwide have unnecessarily far exceeded the ROR=COC standard for decades. Consequently, ROEs in-line with those recently authorized in other jurisdictions, such as those proposed by the Utilities (which, in fact, substantially exceed most other jurisdictions'), likewise exceed the ROR=COC standard.

The second topic is the foundational financial principle of risk and return, and the relationship between the amount of debt in the capital structure and the costs of debt and equity. This relationship is reflected in the key financial metrics that are used by rating

[9] PG&E-1 (Becker), PG&E-2 (Bulkley), PG&E-3 (Raman), PG&E-4 (Raman); SCE-01 (Various), SCE-02 (Villadsen); SCG-01 (Mijares), SCG-02 (Gonzalez), SCG-03 (Nowak); SDG&E-01 (Bille), SDG&E-02 (Mekitarian), SDG&E-03 (Nowak).

[10] Pub. Util. Code, §451; *see also* Pub. Util. Code, §§ 454, 747, 1757, subd. (a)(1)-(2); *Federal Power Commission v. Hope Natural Gas Company* (1944) 320 U.S. 591, 603; *Bluefield Water Works v. Public Service Commission* (1923) 262 U.S. 679, 692-693.

agencies to assess credit quality and that determine the cost of debt, and in the models used to estimate the cost of equity (COE). Consequently, COE equity (COE) and, therefore, the authorized return on equity (ROE) cannot be determined independently of capital structure. Rather, they must be determined jointly – i.e., the calculation of ROE must *quantitatively* incorporate consideration of the key credit metrics, in particular cash flow-to-debt (CF/D), that ROE influences. With this analytical framework, the ROE, capital structure, and cost of debt (COD) can be optimized to minimize the cost to customers while ensuring the respective return requirements of both debt and equity investors are met.

My testimony then discusses in detail each Utility's ROE, capital structure and cost of debt (COD) analyses. I conclude with my own ROE, capital structure, and COD analysis and recommendations for each Utility. I include an estimate of customer savings from adopting my optimal ROE, equity-to-total capitalization ratio (E/C), and COE recommendations instead of the Utilities': approximately $6.1 billion per year statewide, 16% of customer costs.

Q. What are the key findings of your review of the Utilities' ROE testimonies?

A. The bulk of my assessment focuses on the Utilities' ROE recommendations and the analyses they use to develop them. Their analyses are rife with conceptual errors and systematically biased assumptions that result in inflated ROE recommendations.

To start, all four Utilities use the risk premium analysis (RPA); SDG&E and SCG also use the similar expected earnings analysis (EEA). The RPA and EEA are based on returns calculated from accounting book values, as opposed to the market values upon which investors base their expectations, and therefore do not even purport to measure the *cost* of equity, which must be based on market values. Utility cost of capital consultants have recognized this fundamental flaw of models based on book value for decades, and various regulators have disallowed their use.[11]

[11] *See, e.g.*, Exhibit SC/PCF-3, A. Lawrence Kolbe, James A. Read, George R. Hall, *The Cost of Capital Estimating the Rate of Return for Public Utilities* (The MIT Press: 1984), p. 24-27; *Ass'n of Bus. Advocating Tariff Equity v. Midcontinent Indep. Sys. Operator, Inc.*, Opinion No. 569 (November 21, 2019) 169 FERC ¶ 61,129 (hereafter "FERC Opinion No. 569"); *Ass'n of Bus. Advocating Tariff Equity v. Midcontinent Indep. Sys. Operator, Inc.*, Opinion No. 569-A (May 21, 2020) 171 FERC ¶ 61,154 (hereafter "FERC Opinion No. 569-A"); *Ass'n of Bus. Advocating Tariff Equity v. Midcontinent Indep. Sys. Operator, Inc.*(October 24, 2024) 189 FERC ¶ 61,036 (hereafter "FERC

The other models the Utilities use – the discounted cash flow model (DCF) and capital asset pricing model (CAPM) – are conceptually valid, but the Utilities introduce unjustified modifications or use economically implausible assumptions that yield unreasonably high COE estimates. Most egregiously, all four Utilities implement the DCF extrapolating expected near-term utility earnings growth into perpetuity, implicitly assuming they will overtake the entire U.S. economy – an obvious logical impossibility that produces transparently inflated ROE estimates. The Utilities' CAPM results are generally comparable to their RPA and DCF results, suggesting on their face that they have been similarly manipulated. For example, all four Utilities cherry-pick their beta estimates, and PG&E and SCE introduce unsupported modifications to the basic CAPM.

Q. How does your ROE analysis differ from the Utilities' approach?

A. My ROE analysis uses the two conceptually valid models that are also used by all four Utilities – the DCF and CAPM – but I use reasonable and realistic assumptions. In stark contrast to the Utilities', my results are consistent with the consensus of dozens of the largest and well-known investment firms.

Q. What are the key findings of your review of the Utilities' capital structure and COD testimonies?

A. The Utilities acknowledge the importance of credit quality in determining an appropriate equity ratio. Nonetheless, they provide no quantitative analysis in support of their E/C and COD recommendations. They invoke the well-known truism that higher equity ratios and ROEs reduce the market-based costs of debt and equity. Similarly, they raise the specter of credit downgrades and higher debt costs if their ROE and E/C proposals are not adopted. Yet they fail to adjust their ROE and COD recommendations to reflect their capital structure recommendations, or their E/C recommendations in light of their excessive ROEs. The Utilities acknowledge these potential trade-offs that could save customers money while still

Order on Remand"); *Generic Determination of Rate of Return on Common Equity for Public Utilities* (February 5, 1988) 53 FR 3342-01, (1988 WL 276401) (hereafter "FERC Generic Determination of ROR"), p. 3347.

meeting the expectations of their debt and equity investors, but the Utilities' unanimous response is "more of both" – more equity *and* a higher ROE.

The Utilities maintain that charging customers more than is necessary and what is required by law in order to reduce their costs of capital will somehow benefit customers. But they ignore the obvious: RORs above what are necessary and required by law do not benefit customers in any way. Excessive RORs are simply unearned and unlawful transfers of wealth from customers to utility shareholders and exacerbate California's utility affordability crisis.[12] As I demonstrate, the Utilities' Orwellian logic – "Our excessive profits are simply the price of affordability" – collapses under scrutiny.

In place of the Utilities' use of discredited methods, fear-mongering, and logical inconsistencies, my testimony explains the key inter-relationships between ROE, equity ratio, and credit quality, and uses those relationships to jointly optimize ROE and E/C to ensure the demands of both equity and debt investors are satisfied at minimal customer cost. Such analysis is necessary to determine a just and reasonable ROE and equity ratio that balances the investor and consumer interests. The Utilities provide no similar analysis upon which the Commission might develop an informed view of the appropriate capital structure for each of the Utilities.

The pervasive analytical flaws in the Utilities' testimony, paired with their disregard for foundational finance principles and regulatory precedent, raise serious questions about the credibility of their witnesses and the sincerity of the Utilities' commitment to serving the public interest.

Q. What are your recommended ROEs and equity ratios for each of the Utilities?

A. Figure 2 summarizes the results of my and the Utilities' ROE and capital structure analyses and recommendations. Compared to their proposals, my recommendations would save California IOU customers approximately $6.1 billion per year, 16% of total customer costs.

[12] *See* Jeff St. John, *California's utility bill crisis is clear to all. The solution, not so much* (Canary Media: March 12, 2025), available at https://www.canarymedia.com/articles/utilities/californias-utility-bill-crisis-is-clear-to-all-the-solution-not-so-much.

Figure 2. Comparison of Ellis and California Utilities' ROE and capital structure results
Percent (except beta and $ savings)

	Ellis				Utilities				
Model	PG&E	SCE	SCG	SDG&E	PG&E	SCE	SCG	SDG&E	**Critique of Utilities' methodology**
DCF	**6.99**	**6.90**	**6.98**	**7.00**	**10.35**	**10.09**	**10.24**	**10.30**	
Dividend yield	3.73	3.60	3.62	3.78	3.74	3.89	3.67	3.77	Inflated by excessive trailing price histories
Initial growth rate	7.02	7.00	7.60	6.84	6.49	7.16	6.46	6.41	[All use analyst growth forecasts]
Terminal growth rate	1.95	1.95	1.95	1.95	6.49	7.16|4.10	6.46	6.41	Economically impossible; imply utility profits exceed GDP
CAPM	**5.42**	**5.42**	**5.55**	**5.38**	**10.91**	**9.60**	**12.00**	**12.17**	
Risk-free rate	4.89	4.89	4.89	4.89	4.56	4.37	4.56	4.56	Use forecasts from biased source
Market return	5.81	5.81	5.81	5.81	12.15	9.90	13.35	13.35	Based on economically impossible CG DCF
Beta	0.58	0.57	0.71	0.53	0.84	0.95	0.85	0.87	Cherry-picked, manipulated, invalid for utility COE
ECAPM	**NA**	**NA**	**NA**	**NA**	**11.22**	**9.68**	**0.00**	**0.00**	Based on erroneous interpretation of academic research
Risk premium	**NA**	**NA**	**NA**	**NA**	**10.61**	**10.64**	**10.39**	**10.47**	Conceptually invalid; conflate COE and ROE
Expected earnings	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**9.79**	**11.27**	
Average	**6.20**	**6.16**	**6.27**	**6.19**	**10.77**	**10.00**	**10.88**	**10.97**	
Rate of return	**5.62**	**5.47**	**5.64**	**5.42**	**8.31**	**8.50**	**8.15**	**8.20**	
ROE	6.22	6.11	6.21	6.15	11.30	11.75	11.00	11.25	Only SCE adjusts for differences in proxy group E/C
Preferred	NA	NA	NA	NA	5.52	6.95	6.00	NA	
COD	5.01	4.70	4.99	4.61	5.05	4.75	5.02	4.62	Not adjusted for improved credit under proposed RORs
Capital structure									Not analyzed; based on Utilities' recommendations
Common equity	50.4	54.7	52.9	52.6	52.0	52.0	52.0	54.0	
Preferred equity	0.0	0.0	0.0	0.0	0.3	5.0	2.4	0.0	
Debt	49.6	45.3	47.1	47.4	47.7	43.0	45.6	46.0	
Annual savings ($ B)	**-3.33**	**-2.02**	**-0.44**	**-0.33**					
	-15.9	-17.5	-11.4	-11.9					

In closing my introduction, it is important to emphasize that utility regulatory proceedings are not the only venue in which the cost of equity capital is estimated; such estimates are required throughout finance, and it is one of the most thoroughly researched and well-developed areas of finance theory and practice. There are long-standing, theoretically sound, and empirically validated methodologies and assumptions. Contrary to common assertions, cost of capital is much "more science than art."

In addition, there are readily available independent benchmarks against which the Commission can benchmark and calibrate utilities' ROEs. There is no excuse to ignore this important information to improve the accuracy of COE estimates.[13]

II. THE COMMISSION SHOULD SET THE RATE OF RETURN EQUAL TO THE MARKET-BASED COST OF CAPITAL.

A. *Rate of Return on* Capital and *Cost of* Capital Are Not the Same: Rate of Return on Capital Is a Financial Performance Metric; Cost of Capital Is a Measure of Economic Cost.

Q. What should be the Commission's objective in this cost of capital proceeding?

A. The rate of return is the total return on capital that utilities are allowed to recover in customer rates. The Commission's duty in setting the authorized rate of return is to determine the amount of each source of capital – common equity, preferred equity, and debt in this proceeding – and a return on each that is as close as possible to the actual, market-based cost of each source of capital.

Q. How does the rate of return on capital differ from the cost of capital?

A. The rate of return on capital, often shortened to "rate of return," is a measure of financial performance, calculated by dividing the value *returned* to investors – e.g., interest, preferred dividend, net income – by the amount of each type of capital invested.

The cost of capital, by definition, is the return investors *expect* on their investment. The cost of capital is referred to as a cost because it reflects what investors demand in return for

[13] *See Bluefield Waterworks & Imp. Co. v. Public Service Commission* (1923) 262 U.S. 679, 690 ("… there must be a reasonable judgment having its basis in a proper consideration of all relevant facts").

assuming the risk of the investment and, therefore, what companies must pay for that investment.

The *rate of return* on each form of capital, whether calculated retrospectively or estimated prospectively, may or may not equal its respective *cost of capital*.

Q. Why is the distinction between the cost of capital and rate of return important?

A. The cost *of* capital and the rate of return *on* capital measure different things. The rate of return is a financial performance metric. The cost of capital is a well-defined economic concept. Nonetheless, the terms "cost of capital" and "rate of return" are frequently referred to interchangeably in utility regulatory proceedings. For example, SCG/SDG&E witness Nowak writes, "Since the ROE is a market-based concept and SDG&E is not publicly traded …"[14] In reality, though, while COE is a market-based concept, a utility's ROE may or may not be equal to the market-based COE.

PGE witness Bulkley has acknowledged her own conflation of the terms:

> Q I'm asking about … how you use those terms [return and equity and cost of equity] in your testimony given that they appear 600-some times.
> A Yes. And I'm saying that I have relied on one where I may have – it may have been more appropriate to rely on the other.[15]

The muddling of the difference between the cost of capital and the rate of return is not just of semantic concern, particularly when calculating the return on equity. Unlike outstanding debt, for which the cost of capital can be directly observed from contractual interest rates, the cost of equity cannot be directly observed and must be estimated using various models.

This confusion between the *cost of* capital and the *return on* capital has infiltrated some of the models that have been used in utility cost of capital proceedings to estimate the cost of equity, including the RPA used by all four Utilities and the EEA used by SCG and SDG&E. The Commission's past use of these models does not render them economically justifiable to provide a suitable basis for estimating the Utilities' cost of equity in this proceeding. Only

[14] SDG&E-03 (Nowak), p. 20.

[15] Exhibit SC/PCF-4, Public Service Commission of Wisconsin Docket No. 5-UR-110, Transcript of Party Hearing Session (October 5, 2022), p. 220, available at https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=451883.

methodologies that estimate the *cost of* equity should be used to determine the authorized ROE, based on the ROR=COC standard.

B. Adhering to the ROR=COC Standard Ensures the Utilities Will be Able to Attract Capital Sufficient to Enable the Utilities to Meet the Public's Needs.

Q. How can we be sure that setting ROR equal to COC will allow the utilities to attract capital?

A. If a utility can attract debt and equity capital at the market rate, it is operating successfully from a financial perspective. With respect to attracting debt, as I will explain in more detail later in my testimony, the ability to attract capital is largely a function of credit quality. It is long-standing and nearly universal practice for utilities to request, and regulators to approve, capital structures and rates of return that enable utilities to maintain high-quality credit ratings, "investment grade" (S&P BBB/Moody's Baa) or better, precisely for the purpose of ensuring their ability to attract debt capital. As long as utilities maintain investment grade credit ratings, they can raise debt at low cost.

Q. How can we be sure that setting the ROE equal to COE will allow the utilities to attract equity capital?

A. The cost of equity is synonymous with investors' expected return on the equity they provide. As explained in the widely used finance text *Valuation*, published by consulting firm McKinsey & Company:

> The cost of capital is the price charged by investors for bearing the risk that the company's future cash flows may differ from what they anticipate when they make the investment. The cost of capital to a company equals the minimum return that investors expect to earn from investing in the company. That is why the terms *expected return to investors* and *cost of capital* are essentially the same. The cost of capital is also called the discount rate, because you discount future cash flows at this rate when calculating the present value of an investment, to reflect what you will have to pay investors."[16]

[16] Exhibit SC/PCF-5, Tim Koller, Marc Goedhart, David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 5th ed. (John Wiley & Sons, Inc.: 2010), p. 35 (emphasis in original).

Prices in financial markets continuously adjust to reflect investors' current expectations of future returns. If investors believe the authorized ROE – the return on the *book* value of equity – is too low, the price of the stock will drop until the return on the *market* value of equity matches their return expectation, i.e., the market-based cost of equity. Investors will still provide capital by purchasing the utility's stock, but the price they are willing to pay will be lower. As long as the market price equals or exceeds book value, the "just and reasonable" capital attraction requirement is satisfied.

As SCG/SDG&E witness Nowak describes, the California Public Utilities Commission implicitly acknowledges the correspondence between expected market return, cost of capital, and ability to attract capital:

> We attempt to set the ROE at a level of return commensurate with market returns on investments having corresponding risks, and adequate to enable a utility to attract investors to finance the replacement and expansion of a utility's facilities to fulfill its public utility service obligation.[17]

Q. Is the ROR=COC standard recognized by the courts?

A. Yes. The ROR=COC standard derives from the "just and reasonable" statutory mandate discussed in *Hope*. *Hope* established that a utility is entitled to earn no more than its cost of capital:

> The ratemaking process under the Act, i.e., the fixing of "just and reasonable" rates, involves a balancing of the investor and the consumer interests.[18]

The California Legislature used similar "just and reasonable" language in Public Utilities Code section 451 as the "just and reasonable" mandate set forth in the Federal Power Act at issue in *Hope.*

As the United States Courts recognize, *Hope* and fundamental finance principles require regulators to endeavor to authorized rates of returns equal to the cost of capital:

> Recognizing that utility investors must be allowed an opportunity to earn returns sufficient to "attract capital," Federal Power Commission v. Hope Natural Gas Co., 320 U.S. 591, 605 [] (1944), and "to compensate [the]

[17] SDG&E-03 (Nowak), p. 8 (citing D.22-12-031 at 15; D.19-12-056 at 16; *see generally* D.18-03-035 at 6).

[18] *Federal Power Com. v. Hope Natural Gas Co.* (1944) 320 U.S. 591, 603.

> investors for the risks assumed," id., the Commission endeavors to set a utility's rate of return on equity at its cost of equity capital. "The cost of capital is the minimum rate of return necessary to attract capital to an investment." A. Lawrence Kolbe et al., The Cost of Capital: Estimating the Rate of Return for Public Utilities 13 (1984).[19]

Compensation that exceeds the cost of capital would be an unjust enrichment of investors at the expense of consumers and cannot be characterized as "just and reasonable."

Q. Is the ROR=COC standard recognized by regulators?

A. Yes. As far back as 1988, the Federal Energy Regulatory Commission (FERC) has recognized that the ROR=COC is required by *Hope*:

> There is compelling economic justification for relying on the market cost of capital approach addresses both the comparable earnings and attraction of capital standards of the Hope decision.[20]

More recently, in 2021 then-Commissioner Mark Christie observed:

> The goal of the utility regulator is to set a utility ROE that tracks as closely as possible the actual cost of equity capital in the marketplace and is consistent with the landmark Bluefield and Hope cases.[21]

The National Association of Regulatory Utility Commissioners (NARUC) has also endorsed the ROR=COC standard.[22]

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[19] *Tennessee Gas Pipeline Co. v. FERC* (D.C. Cir. 1991) 926 F.2d 1206, 1208, quoting A. Lawrence Kolbe et al., *The Cost of Capital: Estimating the Rate of Return for Public Utilities*, p. 13 (1984).

[20] FERC Generic Determination of ROR, p. 3347.

[21] FERC Docket No. ER13-1508-001 et al, Item E-1: Commissioner Christie Concurring Regarding Entergy Return on Equity (ROE) (May 20, 2021), available at https://www.ferc.gov/news-events/news/item-e-1-commissioner-christie-concurring-regarding-entergy-return-equity-roe.

[22] John D. Quackenbush, *Cost of Capital and Capital Markets: A Primer for Utility Regulators* (National Association of Regulatory Utility Commissioners: December 2019), p. 10 ("For a utility, a fair rate of return must be provided to investors and must be included in the revenue requirement in order to adequately cover the cost of doing business in ratemaking and tariff-setting. Fundamental financial concepts demonstrate that the fair rate of return to use in ratemaking for a utility is its cost of capital in order to achieve the proper balance between customers and investors. This overall fairness equation follows: ROR = WACC Where ROR = Rate of Return; and WACC = Weighted Average Cost of Capital."), available at https://pubs.naruc.org/pub.cfm?id=CAD801A0-155D-0A36-316A-B9E8C935EE4D&_gl=1*znlz4w*_ga*MTY0NTQyMjE3NC4xNzA0ODM4MzYw*_ga_QLH1N3Q1NF*MTcwNTE4NDA4MC4zLjAuMTcwNTE4NDA4MC4wLjAuMA../, 10.

Q. Is the ROR=COC standard recognized by cost of capital experts?

A. Yes. Regulatory economists and cost of capital practitioners have recognized the ROR=COC standard for decades. Well-known MIT finance professor Stewart C. Myers, co-author of the widely used introductory finance textbook *Principles of Corporate Finance*,[23] articulated this standard as far back as 1972: "Regulation should assure that the average expected rate of return on desired new investment is equal to the utility's cost of capital."[24]

In a 2015 paper titled, "A Half-Century of Computing the Cost of Capital for Utilities at NERA," economic consulting firm NERA also endorsed the ROR=COC standard:

> The regulatory compact in both countries [United States and Canada] is shaped by judicial decisions and includes the right to earn a "fair return" on investment, as determined by the opportunity cost of capital …[25]

Well-known utility-side ROR consultant Roger Morin's frequently cited *New Regulatory Finance* (2006) is more succinct: "The regulator should set the allowed rate of return equal to the cost of capital so that the utility can achieve the optimal rate of investment at the minimum price to the ratepayers."[26]

SCE witness Villadsen's firm, The Brattle Group, has been even more direct: "All [utility] regulators reviewed determine an authorised rate of return by estimating the cost of capital supplied by investors."[27]

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[23] Richard A. Brealey, Stewart C. Myers, Franklin Allen, *Principles of Corporate Finance*, 10th ed. (McGraw-Hill/Irwin: 2011).

[24] Stewart C. Myers, *The Application of Finance Theory to Public Utility Rate Cases*, The Bell Journal of Economics and Management Science Vol. 3, No. 1 (RAND Corporation: Spring 1972), p. 80, available at https://doi.org/10.2307/3003071.

[25] Jeff D. Makholm, *A Half-Century of Computing the Cost of Capital for Utilities at NERA (*NERA Economic Consulting: November 9, 2015), p. 10.

[26] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc: 2006), p. 23.

[27] Exhibit SC/PCF-6, John Anthony, Toby Brown, Lucrezio Figurelli, Dan Harris, Nguyet Nguyen, Bente Villadsen, *A Review of International Approaches to Regulated Rates of Return* (The Brattle Group: June 2020), p. 1, available at https://www.aer.gov.au/system/files/Report%20to%20the%20AER%20-%20A%20Review%20of%20International%20Approaches%20to%20Regulated%20Rates%20of%20Return%20-%2030%20June%202020.pdf.

Q. Do the California Utilities' cost of capital experts endorse the ROR=COC standard in this proceeding?

A. All three Utility witnesses endorse the ROR=COC standard. SCG/SDG&E witness Nowak writes:

> The allowed rate of return for a regulated utility is based on its weighted average cost of capital, where the costs of the individual sources of capital (i.e., debt and equity) are weighted by their respective book values. The ROE represents the *cost* of raising and retaining equity capital.[28]

Although, as explained above, PG&E witness Bulkley uses the terms ROR and COC interchangeably, she nonetheless recognizes the distinction and acknowledges the ROR=COC standard:

> I continue to use the terms interchangeably, yet recognize that the models estimate a cost of equity that the Commission uses to determine the appropriate return on equity.[29]

SCE witness Villadsen also endorses the ROR=COC standard, citing a seminal 1972 paper by her Brattle Group colleague and MIT professor Stewart C. Myers, which says in its introduction:

> Regulation should assure that the average expected rate of return on desired new utility investment is equal to the cost of capital.[30]

Curiously, though, witness Villadsen immediately contradicts herself, claiming without support or explanation:

> The allowed return on equity needs to be *at least as high* as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead.[31]

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[28] SCG-03 (Nowak), p. JCN-8-9; SDG&E-03 (Nowak), p. JCN-8-9 (emphasis added).

[29] Public Service Commission of Wisconsin Docket No. 5-UR-110, Rebuttal Testimony of Ann E. Bulkley (September 23, 2022), p. 3, available at https://apps.psc.wi.gov/pages/viewdoc.htm?docid=447955.

[30] SCE-02 (Villadsen), p. 10, fn. 15 (citing Stewart C. Myers, *Application of Finance Theory to Public Utility Rate Cases,* Bell Journal of Economics & Management Science 3:58-97 (1972)).

[31] SCE-02 (Villadsen), p. 11 (emphasis added).

Despite their explicit endorsement, none of the three Utility witnesses' ROR recommendations complies with the ROR=COC standard.

III. ROBUST, INDEPENDENT EVIDENCE CONCLUSIVELY DEMONSTRATES THAT AUTHORIZED ROES IN CALIFORNIA AND THROUGHOUT THE NATION FAR EXCEED THE ROR=COC STANDARD.

Q. How do we know that authorized rates of return far exceed utilities' actual costs of capital?

A. There is abundant evidence that utilities' authorized rates of return, both nationwide and in California, have far exceeded their actual cost of capital for decades. This evidence includes:

- Independent estimates of expected returns for the broad U.S. equity market, which provide an instructive benchmark for utilities' cost of equity;
- Utility market-to-book ratios, which provide direct, observable market feedback on the relationship between authorized ROEs and utilities' cost of equity; and
- Peer-reviewed academic research.

A. Investment Firms' Expected Return Forecasts for the U.S. Equity Market as a Whole – Which is Riskier, on Average, than Utilities – Are Consistently Lower than Utilities' Authorized ROEs.

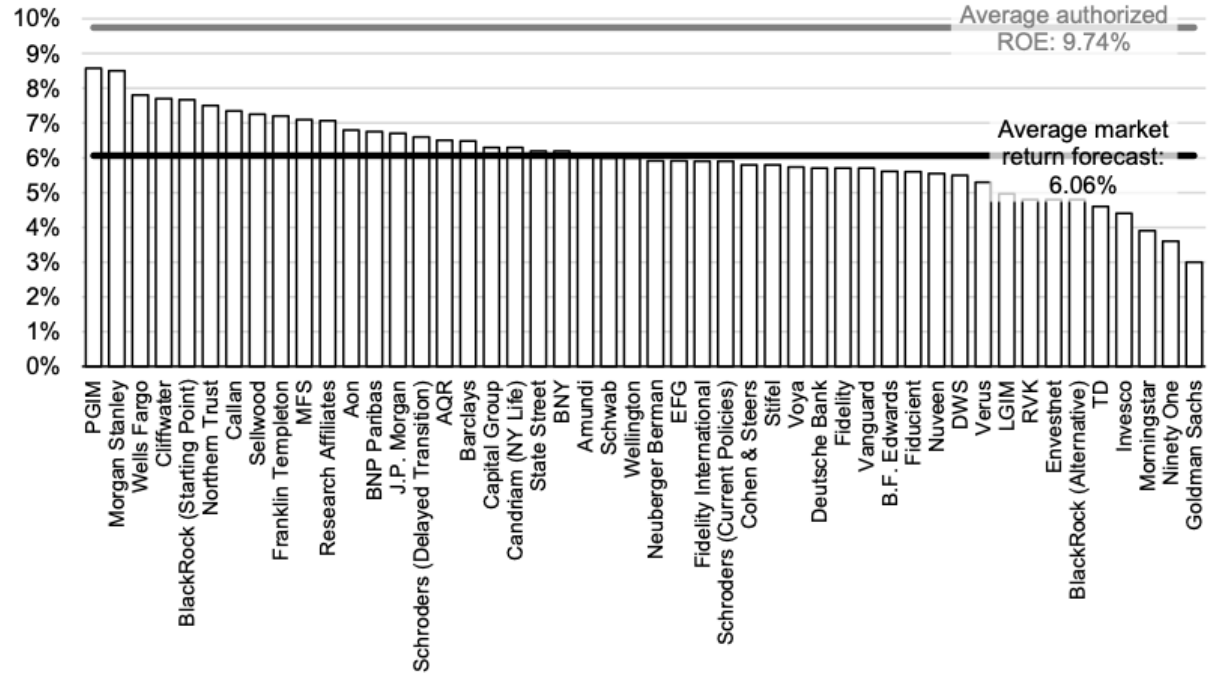
Q. What can be learned from the independent estimates of expected returns for the U.S. equity market?

A. Expected returns on equity are estimated for other purposes beyond their use in utility cost of capital proceedings. Investment firms, such as BlackRock, Goldman Sachs, JP Morgan, and Morgan Stanley, regularly publish capital market assumption reports (CMAs) – expected return forecasts for various assets classes. Figure 3 summarizes a survey of 46 investment firms' most recent U.S. equity market return forecasts, published between March 2024 and May 2025.

The CMA forecasts shown in Figure 3 are long-term, with forecast horizons of 10 years or more. The average expected long-term aggregate market return, 6.06%, is 38% lower than the average ROE, 9.74%, authorized for regulated utilities throughout the United States over

the same time period.[32] The highest of the expected return forecasts, 8.57%, is 117 basis points (1.17%) lower than the average authorized ROE.

Figure 3. U.S. equity market long-term (10 years or longer) expected returns[33]
Nominal, geometric



Q. Why are third-party estimates of the expected return on the overall U.S. equity market a relevant benchmark for utilities' cost of equity?

A. As explained in the above quote from *Valuation*, the "cost of capital" and investors' "expected return" are synonymous terms.

CMA equity return forecasts, i.e., cost of equity estimates, are a relevant and useful benchmark for utility ROEs because U.S. utilities are lower risk than the market as whole, both historically and prospectively, because of their cost-plus regulatory model and relatively stable long-term growth. For example, the popular personal finance website, The Motley Fool, explains:

[32] M. Ellis analysis of S&P Global Market Intelligence (S&P GMI) data: S&P Global, "Market Intelligence," S&P Global, https://www.spglobal.com/marketintelligence/en/ [last accessed June 7, 2025].

[33] M. Ellis analysis of investment firm CMA reports.

> Utility stocks typically make stable investments. Demand for utility services such as electricity, natural gas, and water distribution tends to remain steady, even during a recession.
>
> The rates utilities charge for delivering these services are either regulated (approved by a government entity) or contractually guaranteed (nonregulated). So utilities generate reliable earnings, allowing them to pay dividends with above-average yields.
>
> The combination of predictable profitability and income generation makes utility stocks lower-risk options for investors because they're less volatile.[34]

Investors therefore have *lower* expected returns for utilities than for the market as a whole. That authorized utility ROEs are so much higher than the expected returns on the higher-risk overall market is a compelling indicator that authorized ROEs far exceed utility investors' expected returns, i.e., utilities' actual cost of equity.

Q. What implications can be drawn from your investment firm CMA survey for the Commission's determination of appropriate ROEs for the Utilities?

A. The survey has two important implications for the Commission.

The survey compiles publicly available forecasts from nearly 50 firms, including some of the most highly regarded, well-known, and long-standing Wall Street institutions like Goldman Sachs, J.P. Morgan, Morgan Stanley, BlackRock, Vanguard, and Fidelity. Combined, these firms employ thousands of researchers and other finance professionals who participate in the markets on a daily basis, engaging with investors and transacting trillions of dollars every year. The average of their cost of equity estimates for the market as a whole is approximately 6%. The market-based cost of equity Utilities, which are widely viewed as lower risk than the market as a whole, is correspondingly lower. The survey conclusively demonstrates that the market's view of utilities' cost of equity is substantially lower than the ROEs authorized by state utility regulators, in California and elsewhere.

Additionally, not one of these firms' estimates of the market-average cost of equity is higher than 8.6%. Yet the Utilities estimate their COEs at 11.00% or more. In so doing, the

[34] Matthew DiLallo, *Investing in Top Utility Stocks* (The Motley Fool: Sept. 23, 2024), https://www.fool.com/investing/stock-market/market-sectors/utilities/ [last accessed Jul. 29, 2025].

Utilities are implicitly asserting that they somehow know better than *every single one* of these institutions. The Utilities' sharp divergence from the consensus of the world's most sophisticated and well-resourced institutions – they are not even in the same ballpark – raises serious concerns about the integrity and validity of their analyses.

B. Utility Market-to-Book Ratios Reveal that Utilities' Cost of Equity Is Substantially Lower than Authorized ROEs.

Q. What does a utility's market-to-book ratio tell us about its rate of return?

A. It has long been recognized that utilities' market-to-book (M/B) ratios provide insight into the relationship between authorized returns and the true cost of capital. Legendary regulatory economist Alfred Kahn[35] called attention to this relationship over fifty years ago in his 1970 classic *The Economics of Regulation: Principles and Institutions*:

> [T]he sharp appreciation in the prices of public utility stocks, to one and half and then two times their book value during this period, reflected … a growing recognition that the companies in question were in fact being permitted to earn considerably more than their cost of capital.
>
> …
>
> =The source of the discrepancy between market and book value has been that commissions have been allowing *r*'s [returns on equity] in excess of *k* [market cost of equity]; if instead they had set *r* equal to *k*, or proceeded at some point to do so … the discrepancy between market and book value … would have disappeared, or would never have arisen.[36]

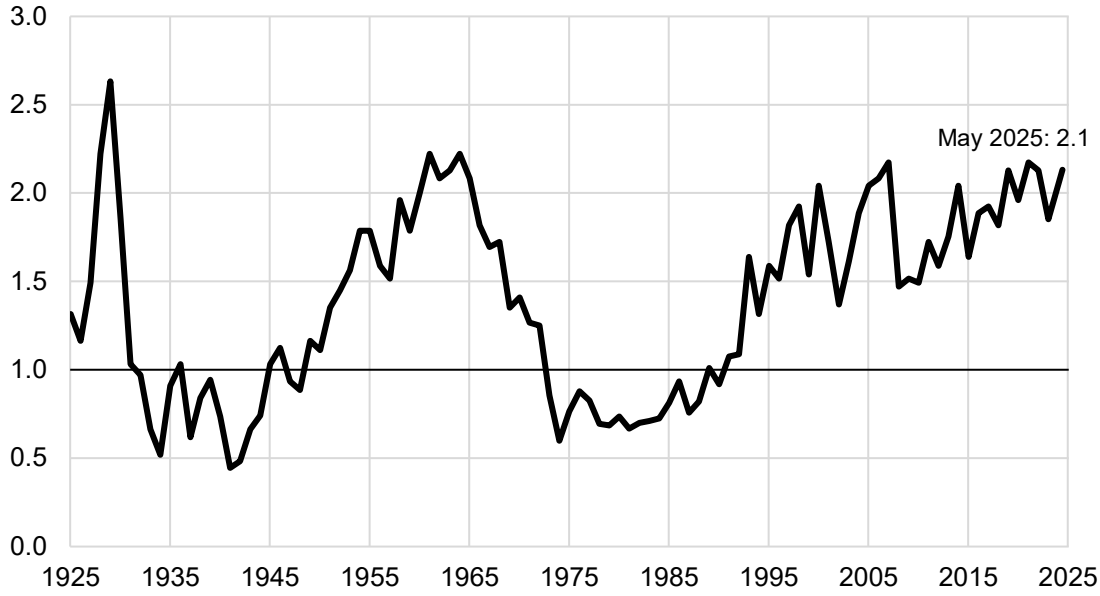
Kahn was referring to the period of the late 1940s to 1965, but the observation that utilities trade above book value is equally valid today. As seen in Figure 4, the utility sector average M/B ratio has generally exceeded 1.5 for over thirty years and currently averages 2.1. As Kahn observed, the utility sector trading at 1.5 to 2.0 times book value over the last

[35] *See, e.g.,* Wikipedia, *Alfred E. Kahn* (Wikimedia Foundation, Inc.: December 30, 2024), available at https://en.wikipedia.org/wiki/Alfred_E._Kahn [last accessed July 29, 2025).

[36] Exhibit SC/PCF-7, Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions* (John Wiley & Sons: 1970), p. 48-50, fn. 69.

three decades clearly demonstrates that utilities have once again been "permitted to earn considerably more than their cost of capital."[37]

Figure 4. Utility sector average market-to-book ratio[38]
Year-end



Another commonly referenced textbook on utility regulation, Kolbe, Read, and Hall's *The Cost of Capital: Estimating the Rate of Return for Public Utilities*, recommends using a M/B ratio of 1.0 as a "guide for regulators" in setting the cost of capital:

> The market-to-book ratio expresses the market value of the firm's outstanding common stock to the book value of its equity. If the two are equal the expected return on the book will equal the expected return on the market value of the company, which in turn will equal the cost of capital for a company of that degree of risk.[39]

[37] *Id.* at 50.

[38] M. Ellis analysis of French Data Library (FDL) data (Eugene F. Fama and Kenneth R. French, "Data Library," available at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html [last accessed June 8, 2025]) and S&P GMI data (S&P Global, "Market Intelligence", https://www.spglobal.com/market-intelligence/en [last accessed June 8, 2025]. FDL data are for all publicly traded utilities through December 2023. M/B ratios for December 2024 and May 2025 are estimated from a regression of the S&P 1500 Utilities Index M/B ratio against the FDL M/B from 2005 through 2023. The May 2025 S&P 1500 Utilities M/B is 2.25.

[39] Exhibit SC/PCF-3, Lawrence Kolbe, James A. Read, George R. Hall, *The Cost of Capital Estimating the Rate of Return for Public Utilities* (The MIT Press: 1984), p. 25.

Kahn and Kolbe, et al., drew their conclusions from a basic financial concept: a positive net present value (NPV), i.e., value net of investment, is the signature indicator of a rate of return that exceeds the cost of capital. NPV is equal to investment multiplied by (M/B – 1.0), so M/B exceeding 1.0 indicates that NPV is positive. That utilities trade at a premium to book value (i.e., invested capital), is prima facie evidence that they are earning more than their cost of capital.

Q. In practical dollars-and-cents terms, what does it mean for a utility to have a market value that is higher than its book value?

A. When a utility has a market value higher than its book value, for every dollar of equity that a utility invests, shareholders receive back not just their investment plus a reasonable return, which would be the case when M/B = 1.0, but additional value equivalent to their equity investment multiplied by (M/B – 1.0). At current M/B ratios above 2.0, authorized ROEs effectively double the value of utilities' equity investments, *in addition to* returning their cost of equity. Such high returns are not necessary to attract capital and needlessly increase customer costs.

Q. What is the cost to utility customers of excessive ROEs?

A. The annual cost to utility customers is over $55 billion per year nationwide,[40] approximately 10% of total utility revenue.[41]

[40] Market capitalization x (M/B – 1) / (M/B x forward price-earnings ratio x (1 – combined state and federal income tax rate). S&P 1500 and FDL market cap and M/B ratio, as of May 2025: $1.36 trillion and $1.60 trillion, 2.25 and 2.13. S&P 1500 Utilities forward P/E: 18.23. Combined tax rate: 25.63%. M. Ellis analysis of FDL, S&P GMI, and Tax Foundation data: S&P Global, "S&P Composite 1500 Utilities," S&P Global, https://www.spglobal.com/spdji/en/indices/equity/sp-composite-1500-utilities-sector/ [last accessed June 7, 2025], Cristina Enache, "Corporate Tax Rates Around the World, 2024," Tax Foundation, December 17, 2024, https://taxfoundation.org/data/all/global/corporate-tax-rates-by-country-2024/, [last accessed June 7, 2025].

[41] S&P 1500 Utilities price/sales ratio: 2.61: S&P Global, "S&P Composite 1500 Utilities."

C. Utilities' COC Experts' Explanations for M/B Ratios Greater Than 1.0 Are Flawed.

Q. Have utilities' cost of capital experts objected to using market-to-book ratios as a "guide to regulators"?

A. Yes. Various utility-side cost of capital experts have put forward arguments for regulators to disregard M/B ratios in assessing the reasonableness of utilities' requested ROEs. Because this unambiguous direct market feedback is so conclusive and compelling, they have devoted significant effort to developing various complicated alternative explanations for utility M/B ratios greater than 1.0. These explanations generally take one three forms: red herrings that do not address the issue; hypothesized explanations without any evidentiary support; and academic research quoted out of context.

Upon examination, none are valid, and several of them bear tell-tale signs of clear sophistry and manipulation. PG&E witness Bulkley, for example, conceded in a recent Minnesota proceeding that she fabricated her explanations; she cited her own filed testimony, but no such testimony existed. When her proposed explanations were investigated, the data proved the exact opposite of what she claimed.

These arguments are numerous and often complex, and refuting them requires some explanation. I have included an appendix in Section XI below that reviews and refutes each of them in detail.

None of the utilities' arguments changes the basic facts that: investors' expected return (the cost of equity) is based on expected cash flows *relative to the market price* of their investment; and the wide difference between utilities' market and book values cannot be explained by other factors to the exclusion of excessive ROEs.

D. Academic Research Has Also Concluded That Authorized ROEs Exceed Utilities' Actual Cost of Equity.

Q. Have any independent researchers examined the relationship between utilities' cost of equity and authorized ROEs?

A. Yes. At least two different research groups have investigated the relationship between utilities' cost of equity and authorized ROEs in the U.S. In a study published in 2019

exploring potential explanations, Carnegie Mellon researchers David Rode and Paul Fischbeck concluded:

> It would appear that regulators are authorizing excessive returns on equity to utility investors and that these excess returns translate into tangible profits for utility firms.
> …
> In the end, we may observe simply that what regulators *should* do, what regulators *say* they're doing, and what regulators *actually* do may be three very different things.[42]

In 2022, University of California, Berkeley researchers Karl Dunkle Werner and Stephen Jarvis similarly observed:

> The gap between the approved return on equity and other measures of the cost of capital have [*sic*] increased substantially over time.
> …
> Our analysis shows that the RoE that utilities are allowed to earn has changed dramatically relative to various financial benchmarks in the economy. We estimate that the current approved average return on equity is substantially higher than various benchmarks and historical relationships would suggest.[43]

I estimate that excessive ROEs cost utility customers roughly $50 billion dollars nationwide each year.[44]

E. Excess ROEs Incentivize Utilities to Unnecessarily Inflate Rate Base.

Q. Why is it so important for the Commission to close the gap between authorized ROE and the cost of equity?

A. The "just and reasonable" statutory mandate stipulates cost-of-service ratemaking (COSR): utility customer rates must be based on actual, prudently incurred costs, including their costs of capital, both equity and debt. It therefore cannot be considered "just and reasonable" to

[42] David C. Rode, Paul S. Fischbeck, *Regulated equity returns: A puzzle* (Energy Policy Vol. 133: October 2019), p. 1, 16 (emphasis in original), available at https://www.sciencedirect.com/science/article/abs/pii/S0301421519304690.

[43] Karl Dunkle Werner, Stephen Jarvis, *Energy Institute WP 329R: Rate of Return Regulation Revisited* (Energy Institute at Haas: revised March 2025), p. 14, 34-35, available at https://haas.berkeley.edu/wp-content/uploads/WP329.pdf.

[44] SC/PCF-2 Mark Ellis, *Rate of Return Equals Cost of Capital: A Simple, Fair Formula to Stop Investor-Owned Utilities From Overcharging the Public*, p.9.

allow utilities to recover, and require ratepayers to fund, more than the utilities' actual cost of capital. Excess ROEs violate the "just and reasonable" statutory mandate.

Utility management's primary fiduciary obligation is to maximize shareholder value. The principle of discounted present value described above tells us that an asset's value will equal the cost of the initial investment if and only if its expected return is equal to its risk adjusted cost of capital. As the expected return increases above the cost of capital, the value relative to the initial investment increases. This relationship between ROE and stock market value is not linear, i.e., a 10% increase in ROE, from, say, 10% to 11%, does not result in an increase in the stock price of 10%, but of 13% to 20%.[45] Utilities therefore have a powerful incentive to maximize ROE.

Beyond their direct impact on rates, which also includes the incremental taxes owed on the surplus profit, excess ROEs incentivize utilities to unnecessarily expand rate base at customer expense. And because of the non-linear relationship between stock market value and ROE, the greater the difference between ROE and COE, the stronger the incentive to inflate investment. For customers, excess ROEs are the epitome of a vicious cycle.

This perverse incentive structure is not just hypothetical. As explained above, with M/B ratios over 2.0, every dollar of equity invested creates more than two dollars of shareholder value – a powerful incentive to maximize investment.

The customer harm of excess ROEs is therefore several-fold: the immediate costs of the excess ROE; the incremental taxes owed on that excess ROE; the additional costs of unnecessary investment, including its cost of capital and associated taxes; the surplus shareholder profit from excess ROE on that unnecessary investment; and the associated taxes on that surplus profit. Excess ROEs' amplification of customer harms is precisely why COSR, especially for the cost of capital, is such a foundational principle of utility regulation.

[45] Based on a sustainable growth discounted cash flow model, $P = B$ x (ROE – g) / (COE – g) with COE = 6.0% and g = 2%-5%.

Q. Is there real-world evidence of this dynamic?

A. Yes. This dynamic was hypothesized over 60 years ago in the seminal work of Averch and Johnson[46] and has been confirmed empirically since then.[47] More recently, the UC Berkeley paper cited above analyzed the effect of excessive ROEs and investment and concluded that "higher regulated returns incentivize utilities to own more capital: a one percentage point rise in return on equity increases capital assets by 3–4%."[48]

Q. Have any regulators acknowledged this dynamic?

A. Yes. California Public Utilities Commissioner Darcie Houck publicly acknowledged the relationship between excessive ROEs and rate base inflation in the October 2024 voting meeting for Phase 2 of the 2023 cost of capital proceeding:

> And then one final consideration is that setting ROEs well above the cost of equity distorts utility profit incentives. So basically, utilities have an extra incentive to acquire additional capital if the allowable rate of return exceeds the cost of capital. … [T]his creates incentives for utilities to expand rate base as much as possible to benefit shareholders. And we know this because increasing profits is the fiduciary duty of the firm's management. … So we need to be clear in our understanding that while the utilities have ROEs set above their cost of equity, which is strongly supported by their current price to book ratios, they will be strongly incentivized to add as much capital as they can.[49]

[46] Harvey Averch, Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, The American Economic Review, Vol. 52, No. 5 (American Economic Association: Dec. 1962), p. 1052–1069, available at https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=412489.

[47] *See, e.g.*, Robert M. Spann, *Rate of Return Regulation and Efficiency in Production: An Empirical Test of the Averch-Johnson Thesis*, The Bell Journal of Economics and Management Science, Vol. 5, No. 1 (RAND Corporation: Spring, 1974), p. 38–52, available at https://www.jstor.org/stable/3003091.

[48] Karl Dunkle Werner, Stephen Jarvis, *Energy Institute WP 329R: Rate of Return Regulation Revisited* (Energy Institute at Haas: revised March 2025), p. 1, available at https://haas.berkeley.edu/wp-content/uploads/WP329.pdf.

[49] *See* California Public Utilities Commission Public Agenda 3553 (October 17, 2024) (video starting from 47:20), available at https://www.adminmonitor.com/ca/cpuc/voting_meeting/20241017/.

IV. ROE AND CAPITAL STRUCTURE ARE INTERDEPENDENT AND MUST BE DETERMINED JOINTLY BASED ON QUANTITATIVE ANALYSIS OF THEIR INTER-RELATIONSHIPS.

A. ROE and Capital Structure Both Affect Credit Quality and Therefore Cannot Be Determined Separately.

Q. What do you mean by the term capital structure?

A. When I refer to capital structure, I mean the shares of a utility's investment that are funded by debt, common equity, and (where applicable) preferred equity.

Q. How does capital structure impact customer costs?

A. Because equity generally has a higher cost than debt, assuming no change in authorized ROE, a higher equity-to-total capital ratio (E/C) tends to increase customer costs. Investors' interest in a higher equity ratio, which increases their income, therefore conflicts with customers' interest in lower costs.

Q. How does capital structure impact a utility's credit quality?

A. A primary determinant of a company's credit quality – its anticipated ability to repay its debts – is the amount of debt outstanding relative to the total amount of capital invested in the company. In general, a higher equity ratio tends to improve a utility's credit quality. Equity ratio is not the only determinant of credit quality, though. As will be explained in more detail below, a more important determinant of credit quality is the amount of cash available to service the debt.

1. The Utilities do not quantitatively analyze the interaction of ROE and capital structure in their ROR proposals.

Q. How do the Utilities develop their equity ratio proposals?

A. The Utilities acknowledge the cost trade-off between debt and equity (equity is more expensive) and that the costs of both debt and equity increase as the share of debt in the

capital structure increases. They also discuss the key metrics used by the major credit rating agencies to assess utility credit quality, highlighting CF/D and debt-to-total capital (D/C).[50]

Of the two key credit metrics highlighted by the Utilities, CF/D is the far more important; it is typically the first and only metric cited in credit rating agencies' press releases describing the outcome of their periodic assessments. [51] For utilities, ROE is the primary determinant of CF/D.[52] Given the well-understood linkage of credit quality to ROE, the Utilities implicitly acknowledge the trade-off between ROE and capital structure, i.e., a higher ROE can support more debt, or more equity can support a lower ROE, while maintaining the same credit rating.

As will be explained below, these relationships and trade-offs can be quantified and rigorously analyzed to determine the minimum equity ratio and ROE needed to maintain a desired credit rating. For example, CF/D can be calculated at a variety of equity ratio and ROE combinations (e.g., 45% to 60% at 1% intervals and 5% to 12% at 0.5% intervals, respectively). Similarly, COE and COD can be calculated across the same ranges of ROE and E/C and assessed for their impact on customer costs. The results of these analyses can be compared to determine a combined return on debt and equity that minimizes customer costs while maintaining a desired credit rating *and* providing equity investors a fair, risk-adjusted return.

But the Utilities provide no such analysis. As a result, how much their proposed ROEs and capital structures could be modified to reduce customer costs cannot be assessed from their applications. In clear violation of *Hope*'s requirement to balance the interests of

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[50] PG&E-4 (Raman), p. 4-1-8; SCE-01 (Deana), p. 57-66; SCG-02 (Gonzalez), p. RG-2-11; SDG&E-02 (Mekitarian), p. MM-2-19.

[51] *See, e.g.*, Natividad Martel, Michael G. Haggarty, *Moody's Ratings announces completion of a periodic review of ratings of Southern California Gas Company and San Diego Gas & Electric Company* (Moody's Ratings: November 28, 2024), available at https://www.moodys.com/research/Moodys-Ratings-announces-completion-of-a-periodic-review-of-ratings-Announcement-of-Periodic-Review--PR_499021#Related-Entities.

[52] S&P's preferred CF/D metric is funds from operations-to-debt (FFO/D); Moody's is cash flow from operations-to-debt pre-working capital (CFO/D pre-WC). The basic definition of FFO and CFO pre-WC is net income + depreciation and amortization + deferred taxes. Based on personal correspondence with Nana Hamilton, VP-Senior Analyst, Moody's Investor Service, Nov. 21 – Dec. 4, 2023. *See, also* Andrew Holmes, *Cash Flow and Liquidity* (Moody's Analytics: January 2014), available at https://rmgfinancial.com/core/files/rmgfinancial/uploads/files/Cash%20Flow%20and%20Liquidity%20(Holmes).pdf.

investors and consumers,[53] the Utilities focus solely on investors' interests. This is a significant, material oversight that precludes the Commission from accepting the Utilities' proposed ROEs and capital structures.

Q. How should a utility's capital structure be analyzed?

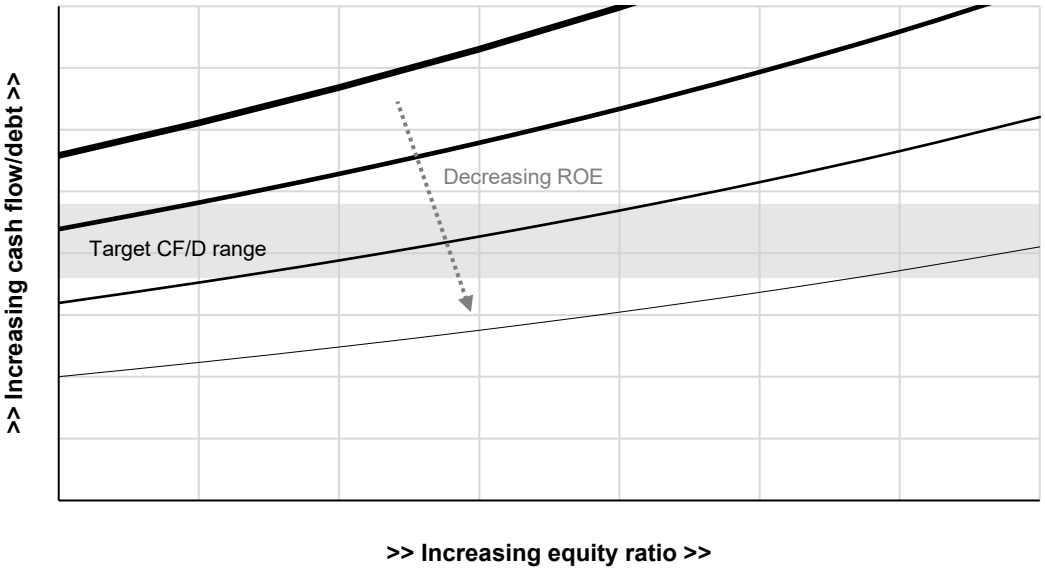
A. Rating agencies set cash flow-to-debt thresholds that correspond to different credit ratings.[54] These quantitative thresholds can be used to more rigorously determine the combination of equity ratio and ROE that optimally balances investor and customer interests.

Figure 5 illustrates the relationships between equity ratio, ROE, and CF/D. The horizontal axis is the equity ratio; the vertical axis is cash flow-to-debt. The light gray horizontal band represents the range of cash flow-to-debt that corresponds to the utility's desired credit rating. The black arcing lines correspond to different levels of authorized ROE, with increasing line thickness representing increasing ROE. Holding equity-to-capitalization (E/C) constant, CF/D declines as ROE is reduced (moving down from a thicker ROE line to a thinner line). But the decline in CF/D when ROE is reduced can be reversed by increasing E/C (moving along the thinner ROE line up and to the right). Any number of combinations of ROE and E/C can meet the level of CF/D needed to maintain a utility's credit rating. A higher ROE requires less equity to maintain the same CF/D and credit rating; a lower ROE can maintain the same CF/D and credit rating if it is paired with a higher E/C.

[53] *Federal Power Commission v. Hope Natural Gas Company* (1944) 320 U.S. 591, 603.

[54] *See, e.g.*, Jeffrey. F. Cassella, Laura Barrientos, and Ryan Wobbrock, *Rating Methodology: Regulated Electric and Gas Utilities* (Moody's Ratings: Aug. 6, 2024), p. 6, available at https://psc.nebraska.gov/sites/default/files/doc/Thomas%20D.%20Stevens%20Exhibits.pdf.

Figure 5. Relationships between E/C, ROE, and CF/D



2. ROE and capital structure interact to affect key credit metrics.

Q. Please explain how ROE influences the determination of an appropriate capital structure.

A. The Utilities acknowledge that cash flow is the most important consideration in assessing credit quality.[55] But they do not explain that net income is a key component of cash flow.[56] Net income, in turn, is the product of rate base, equity ratio, and ROE. Consequently, rate base, ROE, and equity ratio interact to determine cash flow. As ROE increases, some of the resulting increase in customer costs can be offset by increasing the amount of lower-cost debt in the capital structure while still maintaining the utility's credit quality. Similarly, as the ROE declines, some of the resulting customer savings would be offset by the higher equity ratio needed to maintain the same creditworthiness.

[55] PG&E-04 (Raman), p. 4-5; SCE-01 (Deana), p. 60; SCG-02 (Gonzalez) at RG-9; SDG&E-02 (Mekitarian), p. MM-4.

[56] The basic definition of FFO (or CFO pre-WC) is net income + depreciation and amortization + deferred taxes. Based on personal correspondence with Nana Hamilton, VP-Senior Analyst, Moody's Investors Service, Nov. 21 – Dec. 4, 2023.

B. COE and, Therefore, the Appropriate ROE Are Also Affected by Capital Structure.

Q. How does capital structure affect the cost of capital?

A. At any given ROE, a lower equity ratio tends to raise the *costs* of both equity and debt, i.e., the return investors require in exchange for providing capital to a utility. Similarly, at any given equity ratio, a lower ROE also tends to raise the market cost of both equity and debt. This can be understood intuitively. The cash generated by a business is pledged to holders of its debt and equity, with debtholders having first priority. As the equity ratio or ROE declines, there less cash is available to service debt, and a smaller share of that cash goes to equity owners. To the extent there is uncertainty in the total cash generated, it is amplified by a lower equity ratio or ROE, increasing the risk of those cash flows. This increased risk is reflected in higher costs of equity and debt.

1. The Utilities' claims that failure to approve their proposed ROEs and capital structures will increase customer costs is not supported by their testimony or financial analysis.

Q. Do higher market costs of equity and debt increase customer rates?

A. Utilities often oppose reductions in ROE and/or equity ratio because of potential adverse effects on their own financing costs, which would be passed through to customers. For example, SDG&E maintains:

> [I]f ROE is set too low it harms both ratepayers and shareholders, as investors will invest in other companies that have the same return with lower risk profiles—preventing adequate investments in needed areas like wildfire mitigation, grid modernization, and pipeline safety. And it can lead to increased financial leverage and/or credit rating downgrades, raising costs for customers.[57]

This argument is flawed for three reasons. First, SDG&E confuses ROE with investors' expected return, or COE. As explained previously, they are distinct. If ROE is reduced, investors will still buy the utility's stock, as they have for the last 100 years, but at a lower valuation. Their expected return, i.e., the cost of equity, does not change.

[57] SDG&E-01 (Bille), p. VAB-4. SCG makes similar assertions. *See* SCG-01 (Mijares), p. SPM-9.

The speciousness of this assertion is betrayed by the obvious fact that authorized ROEs vary across utilities. By SDG&E's logic, nobody would provide capital to, say, Xcel Energy, whose utility affiliates have among the lowest ROEs, and would instead funnel all their investment to Entergy and NextEra, with among the highest ROEs.[58] Yet investors still hold Xcel stock, and Xcel is able to raise both debt and equity capital.[59] Even when ROEs were below COE, which last occurred in the 1980s, utilities were still able to raise capital, and investors still bought their shares.[60]

Second, SDG&E's argument assumes, incorrectly, that customers pay the actual *market* costs of debt and equity. They do not; customers pay the rate of return authorized by the regulator. The authorized ROR often does not reflect the utility's actual costs of debt and equity (as explained above, the authorized return on equity generally far exceeds its market-based cost). To maintain that a *lower* ROE – the return on capital that customers actually pay – will *increase* customer costs is self-contradictory.

Third, SDG&E assumes that any reduction in customer costs arising from a lower ROE, equity ratio, or both will be more than offset by higher total interest costs. This is not true.

Q. Why is SDG&E wrong to argue that any reduction in customer costs will be offset by higher total interest costs?

A. The Utilities are correct that there are trade-offs between ROE, equity ratio, and the market-based costs of debt and equity. A lower ROE or equity ratio will tend to increase both COD and COE. However, it is virtually impossible to reduce ROE, equity ratio, or both so much that any resulting increase in interest costs would outweigh the customer savings from lower utility profits (ROE x E/C x rate base) – especially when the tax gross-up on equity is taken into account.[61]

SDG&E provides no analysis in support of its assertions. Nonetheless, the relationships between the relative amounts of debt and equity, ROE, and their respective market costs *can*

[58] S&P GMI, *Utility Parent Quality Measures Databook 2015Y - 2023Y as of August 5, 2024.*
[59] Value Line, *Xcel Energy* (Apr. 18, 2025).
[60] *See, e.g.*, Joe Daniel, Ryan Foelske, Steve Kihm, *Rebalancing 'Return on Equity' to Accelerate an Affordable Clean Energy Future* (Rocky Mountain Institute: Feb. 21, 2025), available at https://rmi.org/rebalancing-return-on-equity-to-accelerate-an-affordable-clean-energy-future/.
[61] Authorized ROE is after income taxes. The taxes associated with the authorized ROE are passed through to customers.

be quantified and used to estimate how changes in capital structure and ROE affect the market-based costs of debt and equity. In doing so, we find that, in fact, regulators can adjust ROEs and equity ratios to significantly reduce customer costs. The *market* costs of both debt and equity may go up, but not enough to offset the *customer* savings from a lower ROE and/or equity ratio. More importantly, as I will demonstrate later in my testimony, regulators can adjust ROEs and equity ratios to reduce *both* customer costs and the market-based costs of debt and equity – a win-win for investors and customers.

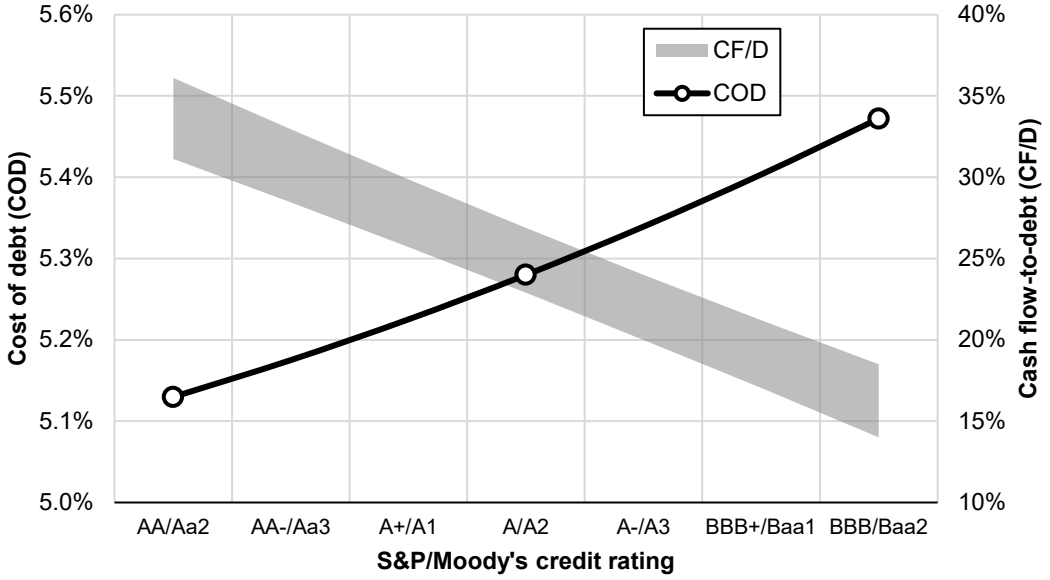
Q. How do customer costs vary with changes in ROE or equity ratio?

A. Changes in ROE or equity ratio influence customer costs both through their direct effect on the net income and interest recovered in rates and indirectly through their effect on the cost of debt. Both ROE and equity ratio influence the cost of debt through their influence on CF/D – the key financial metric used by the credit agencies in utility credit analysis – and, consequently, the utility's credit rating. For example, Figure 6 quantifies the relationships between credit rating, CF/D, and cost of debt for SDG&E, based on Moody's Utility Bond Index data as of June 2025 and Moody's April 2025 SDG&E credit opinion.[62] If SDG&E were downgraded from its current A3 to Baa1, its cost of new debt would increase by 0.06%, from 5.34% to 5.40% – an approximate 1% increase in the dollar cost of debt to customers.[63]

[62] M. Ellis analysis Moody's Utility Bond Index data (via S&P GMI); Moody's Ratings, *San Diego Gas & Electric Company: Update to credit analysis* (Apr. 3, 2025), p. 3; Moody's Ratings, *Ratings Methodology* (August 6, 2024), p. 6.

[63] In recent years, SDG&E has issued debt at approximately 0.65% below the corresponding rate implied by Moody's bond indexes on the date of issuance. M. Ellis analysis of Moody's Utility Bond Index data (via S&P GMI); SDG&E-02 (Mekitarian), p. A-2; Moody's SDG&E ratings history, available at https://www.moodys.com/entity/657000/ratings/view-by-class [last accessed Jul. 14, 2025].

Figure 6. Moody's Utility Bond Index interest rates and corresponding cash-flow-to-debt metrics by credit rating
June 2025 monthly average



According to Moody's credit opinion, the downgrade would correspond to a reduction in CF/D of about 19%.[64] Net income (NI) accounts for approximately 38% of SDG&E's current CF.[65] A 19% reduction in CF would therefore require a 49% reduction in net income, equivalent to a reduction in ROE from SDG&E's recent 8.5% to 4.3%,[66] or from 10.3% to 5.3% after grossing-up for taxes.[67] At SDG&E's current 52.6% equity ratio (as calculated by Moody's), the combined customer financing cost, including taxes, would drop from 8.1% to 5.5%, a 32% savings.

Alternatively, the downgrade would correspond to a decrease in equity ratio from 52.6% to 45.0%. Net income would decline by 14% (1 – 45.0%/52.6%), and interest costs would increase by 18%. Total customer costs would decline by only 4%.

Figure 7 summarizes the results of this analysis.

[64] M. Ellis analysis of Moody's SDG&E credit opinion. Difference in CF/D from current level (24.6%) to downgrade threshold (20%): 24.6% – 20% = 4.6% / 24.6% = 19%.

[65] NI/CF to reach 20.0% CFO/D at 8.5% ROE and 52.6% E/C. The other main components of CFO – depreciation and amortization and deferred taxes – do not vary with net income.

[66] Moody's SDG&E credit opinion, p. 16.

[67] At SDG&E's 17.6% average combined state and federal rate. At SDG&E's 24.3% average combined state and federal rate. *See* A.22-05-015/016, Exhibit SCF-401/SDG&E-401, Update Testimony of Southern California Gas Company and San Diego Gas & Electric Company (Jul. 2023), Attachment B SDG&E Summary of Earnings Tables, p. B-1 (Table RH-1), available at https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2205015;A2205016/6429/513343308.pdf.

Figure 7. Customer impact of reducing SDG&E's ROE or E/C
Percent

		Baa1		Change (Baa1/A3 – 1)	
	A3	Lower ROE	Lower E/C	Lower ROE	Lower E/C
CF/D	24.6	20.0	20.0	-19	-19
E/C	52.6	52.6	45.0	0	-14
NI/CF	38.3	24.1	34.6	-37	-9
ROE	8.5	4.3	8.5	-49	0
+ tax (25.5%)	10.3	5.3	10.3	-49	0
COD	5.6	5.7	5.7	2	2
Customer ROR	**8.1**	**5.5**	**7.8**	**-32**	**-4**
Weighted ROE + tax	5.4	2.8	4.6	-49	-14
Weighted COD	2.7	2.7	3.1	2	18

Q. What does your analysis demonstrate about the impact of a lower ROEs or equity ratio on customer costs?

A. This analysis soundly refutes utilities' arguments that a reduction in ROE or equity ratio will increase total customer costs. Either a reduction in ROE or in equity ratio would increase the *market* costs of debt and equity, but customers don't pay the market cost; they pay the authorized rate of return. The incremental interest costs that are passed through to customers would be overwhelmed by savings on utility profits.

My analysis also demonstrates that reducing ROE is a much more powerful lever to reduce customer costs than increasing debt. For the same credit rating impact, customer costs can be reduced roughly 7 times more by reducing ROE than by increasing debt.

Q. Have others identified similar flaws in utilities' claims about the impact of lower ROEs on their financial integrity and customer costs?

A. Yes. Rocky Mountain Institute published a paper in February 2025 that similarly dispels several "myths about lower ROEs."[68] Their overview included analysis of historical data demonstrating that even in periods where ROE was less than COE (as revealed in M/B ratios less than 1.0), utilities were still able to raise both debt and equity capital and continued to

[68] Joe Daniel, Ryan Foelske, Steve Kihm, *Rebalancing "Return on Equity" to Accelerate an Affordable Clean Energy Future* (RMI: February 2025), available at https://rmi.org/rebalancing-return-on-equity-to-accelerate-an-affordable-clean-energy-future/.

invest. Some of my customer-side cost of capital expert colleagues have included similar observations in their testimony.[69]

2. ROE and capital structure should be jointly optimized to minimize customer costs.

Q. The above analysis addresses the effect of ROE and capital only on the cost of debt. You also said ROE and capital structure influence the cost of equity. How do you incorporate that relationship into your analysis?

A. The relationship between equity ratio and COE can be analyzed similarly to that between CF/D and the cost of debt. The relationships between the relative shares of debt and equity and their respective market costs, in combination with the ROR=COC standard, can then be used to determine the optimal capital structure and weighted-average *market* cost of capital that minimizes the total *customer* cost of capital. I conduct such an optimization later in my testimony, after my cost of equity analysis.

V. THE RISK PREMIUM AND EXPECTED EARNINGS ANALYSES ARE CONCEPTUALLY INVALID; THEY DO NOT MEASURE THE *COST* OF EQUITY.

Q. Please provide an overview of your assessment of the models the Utilities use to estimate COE.

A. All four Utilities primarily on three models: the risk premium analysis (RPA), the DCF, and the CAPM. SCG and SDG&E also include the results of the expected earnings analysis (EEA). The RPA and EEA are conceptually invalid and have been rejected by FERC because these models inherently cannot estimate a market-based cost of equity. The Commission should likewise reject them. For the DCF and CAPM, which I also use, I will first provide a critique of the Utilities' implementations of these models and then explain my own.

[69] *See, e.g.,* Wisconsin Public Service Commission Docket No. 5-UR-110, Direct Testimony of Steve Kihm on Behalf of Citizens Utility Board (September 9, 2022), p. 77-84, available at https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=446996. *See, also,* Illinois Commerce Commission Docket No. 22-0486 et al., Direct Testimony of Edward C. Bodmer on Behalf of Illinois PIRG, p. 12-14, available at https://icc.illinois.gov/docket/P2023-0055/documents/338242/files/589803.pdf.

Following the development of my estimates for the Utilities' COEs, I will integrate each of them with the credit analysis described above to develop my capital structure, ROE, and COD recommendations for each Utility.

A. The Risk Premium and Expected Earnings Analyses Are Not Recognized COE Models.

Q. Please explain Witness Nowak's RPA and EEA.

A. As explained in the Utilities' testimony, the RPA is based on a statistical regression of authorized ROEs against the long-term Treasury rate.[70] SCG's and SDG&E's EEA is based on ROE forecasts provided by Value Line,[71] which, in turn, are based on recent authorized ROEs.[72]

Q. Are the RPA and EEA widely used elsewhere in finance to estimate the cost of equity?

A. No. The RPA and EEA are not used elsewhere in finance because they do not in fact estimate the market *cost* of equity. The past regulatory ROE decisions upon which the RPA and EEA are based generally do not reflect the actual cost of capital.

This is because ROE is a return on the book value of equity. Investors' expected return – i.e., the cost of equity – will equal the ROE if, and only if, investors can purchase the stock at book value. But investors cannot purchase stock at book value; investors must pay the market price, which has exceeded utilities' book value for more than three decades. Mathematically, this means investors' expected return – i.e., the cost of equity – *must be lower* than the authorized ROE.

Q. Why are models based on ROE, not COE, a problem?

A. As explained above, the legal standard is to set ROE equal to COE. But authorized ROEs can deviate from COE for any number of reasons. Once they do, use of book-based return models

[70] PG&E-2 (Bulkley), p. 2-26-29; SCE-02 (Villadsen), p. 57-61; SCG-3 (Nowak) p. JCN-31-34;SDG&E-03 (Nowak), p. JCN-33-35.

[71] SCG-3 (Nowak) p. JCN-34-36;SDG&E-03 (Nowak), p. JCN-35-37.

[72] *See, e.g.*, Value Line, *Ameren* (June 6, 2025) (Return on Com. Equity, footnote E: "Rate allowed on com. eq. in MO in '24: elec. & gas.").

virtually guarantees that future ROE determinations will be erroneous, as Kolbe et al. explain:

> Suppose that one regulatory commission makes a mistake in setting the allowed rate of return for a company under its jurisdiction. If another regulatory commission relies on the book rate of return for this company as evidence of the required rate of return, it will copy the mistake. The process could go on ad infinitum. Thus the data used in the [RPA] method become contaminated by the very use of the method when the comparable-risk sample consists of companies subject to rate-of-return regulation. In this case, the [RPA] method fails the test of logical consistency.[73]

As explained above, there is substantial and robust evidence that past regulatory ROE decisions did not reflect the cost of equity but have, in fact, far exceeded it. Basing future ROE decisions on flawed historical authorized ROEs simply perpetuates these errors. Looking at *actual* authorized ROEs to estimate the *required* ROE is akin to developing a diet recommendation based on what people *actually* eat, not what they *should* eat to be healthy.

Q. What is the difference between book and market value?

A. Book value reflects the historical net capital invested in the utility – essentially, what investors have put in. In contrast, market value reflects what investors are willing to pay today to own the company, based on expected future earnings and risk. Investors cannot buy utilities at book value; they must pay market value. Only the market value, therefore, incorporates current investor expectations, which is why market value is the appropriate basis for estimating the cost of equity. A return metric that is based on a non-market value, by definition, is not a market-based cost of capital.

[73] Exhibit SC/PCF-3, A. Lawrence Kolbe, James A. Read, George R. Hall, *The Cost of Capital Estimating the Rate of Return for Public Utilities* (The MIT Press: 1984), p. 51-52.

B. Regulators Have Rejected the RPA and EEA.

Q. Have any regulatory authorities recognized the inherent flaw of the RPA?

A. Yes. FERC has specifically ruled out these models for use in its rate of return proceedings. In Opinion No. 569 (November 2019), FERC concluded that the results of the RPA "def[y] general financial logic"[74] and rejected its use to estimate the cost of equity:

> [T]he Risk Premium model is likely to provide a less accurate current cost of equity estimate than the DCF model or CAPM because it relies on previous ROE determinations, whose resulting ROE may not necessarily be directly determined by a market-based method, whereas the DCF and CAPM methods apply a market-based method to primary data.
> …
> [C]ircularity is particularly direct and acute with the Risk Premium model because it directly relies on past Commission ROE decisions. … As a result, we share the concerns expressed by various parties that the circularity inherent in the Risk Premium model's use of prior ROE determinations would largely continue previously-approved ROEs and reflect past circumstances that influenced the previous ROE decisions.
> …
> Additionally, the record contains insufficient evidence to conclude that investors rely on risk premium analyses utilizing historic Commission ROE determinations or settlement approvals to determine the cost of capital and make investment decisions. Investors certainly observe regulatory ROEs and how changes in authorized ROE levels could affect utility earnings, but such considerations differ from the type of analyses employed by the [utilities] looking back at past decisions to determine the current cost of capital. We recognize that academic literature discusses this methodology, but the record indicates the greater prevalence of other methods.[75]

Although FERC subsequently reinstated the RPA in Opinion No. 569-A (May 2020), in August 2022 the United States Court of Appeals for the District of Columbia Circuit held that FERC's reinstatement of the RPA was arbitrary and capricious and vacated Opinion 569-A, citing "general financial logic," "'particularly direct and acute' circularity problems,"

[74] FERC Opinion No. 569, p. 61796.
[75] FERC Opinion No. 569, p. 61796.

the fact that "investors don't use this model,"[76] Upon remand, FERC reinstated Opinion No. 569 and rejected the RPA as a method for determining ROE.[77]

Q. Have any regulatory authorities recognized the inherent flaw of the EEA?

A. FERC has rejected the EEA for the same reason: book ROE does not measure the return investors expect and therefore does not represent the cost of equity:

> The returns estimated by the Expected Earnings model are divorced from the returns required by investors, because investors cannot purchase a company's stock at its book value;[78]

Indeed, FERC directly refutes Nowak's claim that the EEA is "consistent with a basic tenet of *Hope*: the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks.'"[79] In Opinion No. 575, FERC rejected the expected earnings model, based on forecast ROEs:

> In Opinion No. 569, the Commission explained that, under the Commission's market-based approach, the Commission set a utility's ROE at the estimated return that investors would require in order to purchase stock in the utility at its current market price. In *Hope*, the Supreme Court explained that "the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks." The Commission stated that, in order to determine this, the Commission must analyze the returns that are earned on "investments in other enterprises having corresponding risks." However, investors cannot invest in an enterprise at book value and must instead pay the prevailing market price for an enterprise's equity. As a result, the Commission states that the expected return on a utility's book value does not reflect "returns on investments in other enterprises" because book value does not reflect the value of any investment that is available to an investor in the market, outside of the unlikely situation in which market value and book value are exactly equal. Accordingly, we agree with Trial Staff, PUCT, and New Orleans Council and we continue to

[76] *MISO Transmission Owners v. FERC* (D.C. Cir. 2022) 45 F.4th 248, 263-264.
[77] FERC Order On Remand, p. 61,036.
[78] FERC Opinion No. 569-A, p. 62201.
[79] SCG-03 (Nowak), p. JCN-35; SDG&E-03 (Nowak), p. JCN-36.

find that the Expected Earnings model is not a market-based model and relying on it does not satisfy the requirements of *Hope*.[80]

FERC has established a standard that ROE models must, in fact, measure the cost of equity and that, in order to do so, they must be market-based. As I've explained in previous testimony before the Commission,[81] SCG/SDG&E witness Nowak submitted testimony in these FERC proceedings,[82] and FERC's decision was covered in industry media,[83] including by witness Nowak himself.[84] PG&E witness Bulkley also worked at Concentric Energy Advisors at the time, so they both are likely aware of the RPA's and EEA's deficiencies and invalidity. They nonetheless continue to use those two defective models.

Q. Have any state regulators recognized the inherent flaws of models based on book ROE?

A. Yes. Regulators in Massachusetts and California have explicitly rejected or dismissed proposals to use book ROE-based models.[85]

[80] *Entergy Ark., Inc.*, Opinion No. 575 (May 20, 2021) 175 FERC ¶ 61,136 (hereafter "FERC Opinion No. 575"), p. 61779.

[81] A.22-04-008 et seq., Exhibit PCF-10 (Ellis) (February 23, 2024), p. 6-9.

[82] James Coyne, Joshua Nowak, and Julie Lieberman, *Advancing FERC's Methodology for Determining Allowed ROEs for Electric Transmission Companies* (Concentric Energy Advisors: May 2020), available at https://ceadvisors.com/wp-content/uploads/2024/10/Advancing-FERCs-Methodology-for-Determining-Allowed-ROEs-for-Electric-Transmission-Companies.pdf.

[83] Zack Hale, *DC Circuit ruling gives FERC new chance to establish durable transmission ROEs* (S&P Global: August 12, 2022), available at https://www.spglobal.com/market-intelligence/en/news-insights/articles/2022/8/dc-circuit-ruling-gives-ferc-new-chance-to-establish-durable-transmission-roes-71694369.

[84] James Coyne, Joshua Nowak and Julie Lieberman, *Advancing FERC's Methodology For Determining Allowed ROEs for Electric Transmission Companies* (Concentric Energy Advisors: May 11, 2020), p. 1-3, *available at* https://ceadvisors.com/wp-content/uploads/2024/10/Advancing-FERCs-Methodology-for-Determining-Allowed-ROEs-for-Electric-Transmission-Companies.pdf.

[85] *See* Mass. Dep't of Pub. Util. 17-05, *Order Establishing Eversource's Revenue Requirement* (2018), p.702, available at https://www.mass.gov/files/documents/2018/01/26/17-05_Final_Order_Revenue_Requirement_11-30-17.pdf (rejecting as flawed FEA's risk premium analysis, which incorporated a proposal to use a book value component). *See, also,* D.19-12-056 (2020 Cost of Capital proceeding), p. 22 (utilities propose to incorporate a floating adjustment to the cost of capital because, among other reasons, they allege the market value of the company was lower than the book value; the Commission rejected this argument and proposal).

VI. THE UTILITIES IMPLEMENT THE CONSTANT GROWTH DCF WITH ECONOMICALLY IMPOSSIBLE ASSUMPTIONS.

Q. Please explain the basic concept of the DCF.

A. The DCF estimates the required return, i.e., the COE, implied by the current market price and expected future cash flows. The COE is the unique single discount rate at which the sum of the discounted present value of future cash flows equals the current market price.

A share of company stock is a claim on its dividends into perpetuity, so the DCF can be represented as:

$$M_0 = \sum_{i=1}^{\infty} \frac{D_i}{(1+k)^i},$$

where M_0 refers to the current market value (stock price); D_0, the current dividend; and k, the cost of equity. The DCF produces a single, constant return into perpetuity.[86]

Q. Please describe the constant-growth DCF model used by the Utilities' Witnesses.

A. The constant-growth DCF model (CG DCF) is based on the well-known and widely used mathematical formula for the value of a growing perpetuity stream of cash flows. It assumes a single, constant rate of cash flow growth. In the CG DCF commonly used in utility COE analyses, the cash flows are expected dividends, and the perpetuity value formula can be expressed as:

$$M_0 = D_0 \frac{(1+g)}{(k-g)},$$

where g is the forecast perpetuity growth rate. Rearranging terms, the cost of equity can be expressed as a function of the dividend yield, d (equal to $\frac{M_0}{D_0}$), and growth rate:

$$k = d(1+g) + g,$$

Typically, the cost of equity is estimated for each member of the proxy group, and the target company's cost of equity is set equal to the proxy group mean or median.

The general DCF model, which can allow for varying growth rates over time, is a particularly apt representation of stock returns because its assumptions realistically reflect several key features of share prices and expected cash flows. First, the DCF's perpetual cash

[86] Even if the current owner does not intend to hold the stock forever, the future price at which it will be sold will reflect the discounted present value of dividends from the time of sale into perpetuity. It can be shown mathematically that, assuming a constant discount rate, potential changes in ownership do not affect the DCF COE.

flow stream assumption mirrors equity's claim on a firm's cash flows into perpetuity. Second, the assumption of steady growth in dividends over time reasonably reflects dividends' much greater stability relative to other potential measures of profitability, like earnings or cash flow. Third, the resulting single discount rate into perpetuity is consistent with the no-arbitrage principle of finance. If investors expected higher (or lower) returns in the future, they would impute that into the price today and bid the price up (or down) accordingly, such that near-term and long-term returns roughly equilibrate.[87]

Q. How are the input assumptions to the CG DCF model estimated?

A. Estimating the current dividend yield is fairly straightforward, typically 4 times the most recent quarterly dividend divided by the recent stock price, although PG&E's, SCG's and SDG&E's calculations are upwardly biased, as I will explain below.

Estimating a dividend-per-share (DPS) growth rate that is valid into perpetuity is less straightforward. Cost of capital and valuation practitioners commonly use equity analysts' growth rate forecasts as an input to their DCF models. Due to data availability limitations – DPS forecasts are much less common than earnings-per-share (EPS) forecasts – practitioners often use forecast EPS growth rates as a proxy for DPS growth.

A. The Utilities' CG DCF Perpetuity Growth Assumptions Are Economically Impossible.

Q. What is the most critical common flaw in the implementation of the CG DCF model to estimate the COE in utility regulatory proceedings?

A. The most critical flaw in the Utilities' implementations of the CG DCF is their assumption that professional financial analysts' consensus EPS growth rate forecasts are valid into

[87] Some equity return projections vary with forecast horizon, generally because of a valuation-reversion assumption in the model, e.g., price-to-earnings ratios returning to their long-term historical average over an initial horizon and remaining at that level afterward. *See, e.g.*, BlackRock, *Capital market assumptions* (BlackRock Investment Institute: May 22, 2025), available at https://www.blackrock.com/institutions/en-us/insights/charts/capital-market-assumptions. Whether variation in expected equity returns across different forecast horizons can be estimated with any accuracy is a subject of ongoing debate among academic and investment professionals. Some forecasters assume no mean reversion in their return forecasts. *See, e.g.,* AQR, *2014 Capital Market Assumptions for Major Asset Classes*, Alternative Thinking (AQR Capital Management: 1Q 2014), available at https://www.aqr.com/Insights/Research/Alternative-Thinking/2014-Capital-Market-Assumptions-for-Major-Asset-Classes.

perpetuity. This assumption is not reasonable, and the Utilities' error is well-understood and obvious: the sources that compile the consensus forecasts explicitly state they are valid for only a few years. Even if that information was not provided, projecting analyst forecasts into perpetuity has economically impossible implications that unambiguously indicate the assumption is flawed. The Utilities' deliberate misuse of analyst forecasts in this manner invalidates the Utilities' CG DCF COE estimates.

Q. How do we know that it is unreasonable for the Utilities to assume that analysts' EPS growth forecasts are valid into perpetuity?

A. It is unreasonable to assume analysts' EPS growth forecasts into perpetuity for three main reasons. The most obvious is that analysts' "long-term" forecast horizons are not long-term at all, especially relative to the infinite forecast horizon of the CG DCF. Among commonly used analyst growth rates, the forecast horizons are 3 years for I/B/E/S, the Institutional Brokers' Estimate System;[88] 3 to 5 years for S&P[89] and Zacks;[90] 5 years for Bloomberg;[91] and 6 years for Value Line.[92] The Utilities use various subsets of forecasts from these sources, so their CG DCF growth rate assumptions are only valid for, at most, 6 years.[93]

Q. What is the second main reason it is unreasonable to assume utilities will maintain their current 3-to-5-year forecast growth rates into perpetuity?

A. The second main reason it is unreasonable to assume analysts' growth forecasts into perpetuity is because decades of academic research have consistently found that analyst forecasts tend to be upwardly biased. For example, McKinsey researchers found:

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[88] I/B/E/S Summary History – Version 2.0, p. 1, available at https://inside.rotman.utoronto.ca/financelab/files/2022/08/IBES_Summary-History-Utilization-Guide.pdf [last accessed Jul. 25, 2025].

[89] *See, e.g.*, S&P GMI, available at https://ycharts.com/glossary/terms/eps_est_long_term_growth [last accessed Jul. 25, 2025].

[90] Zacks, *Stocks*, Zacks Investment Research, available at https://www.zacks.com/stock/quote/DUK?q=duk [last-accessed Jul. 25, 2025].

[91] *See, e.g.*, Damodaran, Using the Bloomberg terminal for data, p. 27, available at https://pages.stern.nyu.edu/~adamodar/pdfiles/Bloombergfull.pdf [last-accessed Jul. 25, 2025].

[92] *See, e.g.,* Value Line report for Ameren (Jun. 6, 2025).

[93] PG&E-2 (Bulkley), p. 2-19; SCE-02 (Villadsen), p. 54-55; SCG-03 (Nowak), p. JCN-26; SDG&E-03 (Nowak), p. 24.

> [A]nalysts have been persistently overoptimistic for the past 25 years, with estimates ranging from 10 to 12 percent a year, compared with actual earnings growth of 6 percent. … On average, analysts' forecasts have been almost 100 percent too high.[94]

Q. What is the third main reason it is unreasonable to assume that utilities will maintain their current 3-to-5-year forecast growth rates into perpetuity?

A. The most compelling reason it is unreasonable to extrapolate analysts' utility growth forecasts into perpetuity is because the implications are economically impossible. The DCF is a model of expected future cash flows. In order to produce a reasonable result, the assumptions must be realistic, reflecting cash flows that could *actually* occur.

The average growth rate across the four Utilities' proxy groups is 6.6%[95] – significantly higher than the approximately 4% GDP growth rates forecasted by the Congressional Budget Office,[96] Energy Information Administration,[97] and Social Security Administration.[98] It is a simple mathematical truism that no segment of the economy can grow faster than GDP into perpetuity. A growth rate faster than GDP would imply that segment eventually overtaking the entire economy – but it's logically impossible for one part of the economy, e.g., the utility sector, to be larger than the whole U.S. GDP. A part can't be greater than the whole.

Figure 8 compares utility-sector dividend growth over the last nearly 100 years, adjusted for inflation and normalized to 2025, to the Utilities' proxy group-average forecast for the

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[94] *See, e.g.*, Marc Goedhart, Rishi Raj, Abhishek Saxena, *Equity analysts: Still too bullish*, (McKinsey & Company: April 2010),available at https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/equity-analysts-still-too-bullish. For a more recent example, *see* Stefano Cassella et al., *Horizon Bias and the Term Structure of Equity Returns* (November 2021), available at http://dx.doi.org/10.2139/ssrn.3328970.

[95] In this and all other analyses of the Utilities' results, I use only the electric utility proxy group for SCE, which is sufficiently large (26 members) to provide robust results. The other groups – natural gas and water utilities – each have fewer members and are clearly less comparable to SCE than its peer electric utilities. There is no justification for including these clearly less comparable companies in SCE's analysis.

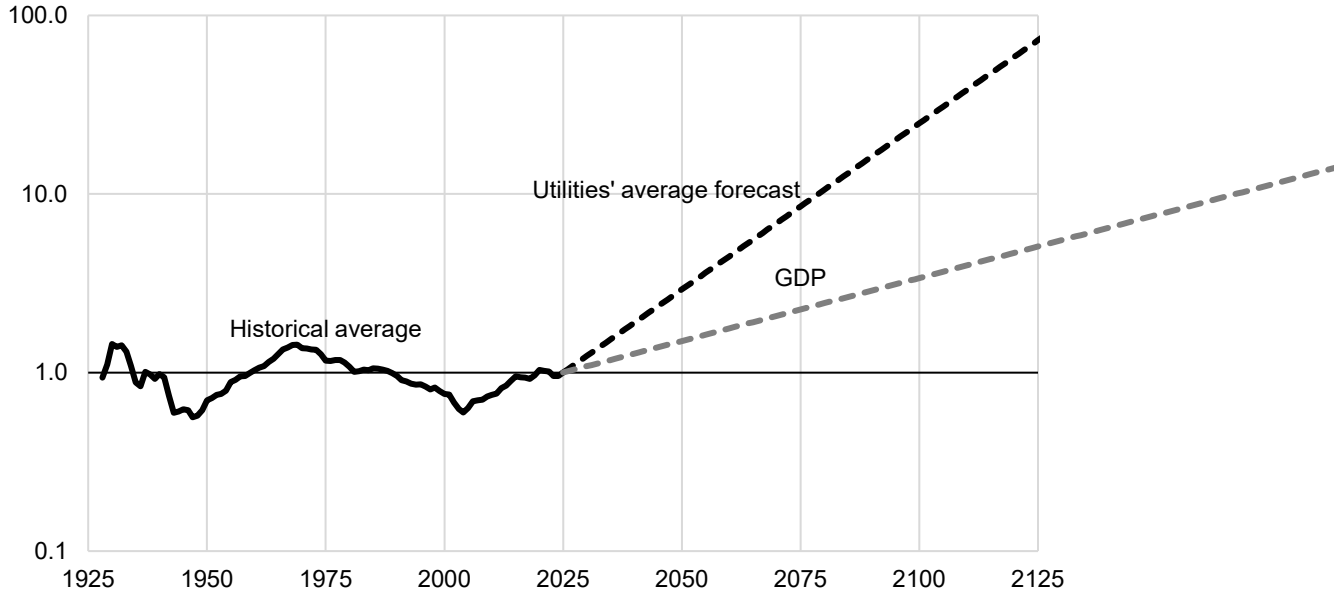
[96] Congressional Budget Office, *The Long-Term Budget Outlook: 2025 to 2055 – Long-Term Budget Projections* (CBO: March 2025), data available at https://www.cbo.gov/system/files/2025-03/57054-2025-03-LTBO-econ.xlsx.

[97] Energy Information Administration, *Annual Energy Outlook 2025 – Table 20: Macroeconomic Indicators* (April 2025), data available at https://www.eia.gov/outlooks/aeo/excel/aeotab20.xlsx.

[98] Social Security Administration, *The 2025 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds – Supplemental Single Year Tables* (June 2025), data available at https://www.ssa.gov/OACT/TR/2025/SingleYearTRTables_TR2025.xlsx.

next 100 years. The vertical axis is in logarithmic scale (multiples of 10 are equally spaced) because the Utilities' claimed expected growth so dwarfs the historical trend that plotting it in linear scale would render the variation in the historical trend imperceptible. Historically, while there have been periods of growth and decline, the long-term trend has been essentially flat – utility dividend growth has just kept pace with inflation for nearly 100 years. As demonstrated in Figure 8, the Utilities' forecasts' sustained sharp departure from the historical trend is clearly unrealistic.

Figure 8. Utility real dividend per share, 1928-2025[99]
2025 average=1.0 (logarithmic scale)



For comparison, the average of the CBO, EIA, and SSA GDP forecasts is shown, also normalized to 1.0 in 2025. The Utilities' CG DCF models project that the utility sector can grow substantially faster than the economy as a whole, such that its share of GDP, currently only 1.5%,[100] would nearly double by 2050. But keep in mind: the CG DCF is a model of cash flows *into perpetuity*. In advancing their versions of the CG DCF, the Utilities would have us believe this outsize growth will continue indefinitely, such that the utility sector would overtake the entire U.S. GDP by the end of the next century – an obvious absurdity.

[99] M. Ellis analysis of FDL and Bureau of Labor Statistics (BLS), data available at https://www.bls.gov/cpi/data.htm [last accessed Jun. 9, 2025].

[100] Bureau of Economic Analysis, *Value added by Industry as a Percentage of Gross Domestic Product* (June 26, 2025), available at https://www.bea.gov/itable/gdp-by-industry.

The Utilities' CG DCF growth assumptions are transparently unrealistic, and their CG DCF model results should be disregarded.

Q. Have any of the Utilities' witnesses justified their extrapolation of analysts' estimates into perpetuity?

A. No. To the contrary, they acknowledge the logical impossibility of their their CG DCF model assuptions but use them anyway. SCE witness Villadsen cited a similar critique, from the Research Foundation of CFA Institute, of projecting analysts' estimates beyond their forecast horizon:

> [C]onsensus long-term earnings growth estimates routinely exceed sustainable GDP growth. The current consensus growth rate for earnings on the S&P 500, according to the Zacks Investment Research survey, is 10 percent, which, if we assume a consensus inflation expectation of 2-3 percent, corresponds to 7-8 percent real growth. Real earnings growth of 8 percent is six times the real earnings growth of the past century, however, and three times the consensus long-term GDP growth rate. This growth is not possible.[101]

Roger Morin, who has testified in the past on behalf of SCG and SDG&E, has also acknowledged the unreasonableness of extrapolating analyst growth forecasts into perpetuity, explaining:

> Although the constant-growth DCF model does have a long history, analysts, practitioners, and academics have come to recognize that it is not applicable in many situations. A multiple-stage DCF model that better mirrors the pattern of future dividend growth is preferable. … *The problem is that . . . from the standpoint of the DCF model that extends into perpetuity, analysts' horizons are too short, typically five years. It is often unrealistic for such growth to continue into perpetuity.* … It is useful to remember that eventually all

[101] Dan Harris, Bente Villadsen, Francesco Lo Passo, *Calculating the Equity Risk Premium and the Risk-free Rate* (The Brattle Group: 2012), p. 30 (citing to Robert D. Arnott, *Equity Risk Premium Myths*, *Rethinking the Equity Risk Premium,* ed. P. Brett Hammond, Jr., Martin L. Leibowitz, and Laurence B. Siegel *(*Research Foundation of CFA Institute, 2011), p. 97), available at https://www.brattle.com/wp-content/uploads/2017/10/6240_calculating_the_equity_risk_premium_and_the_risk-free_rate_harris_villadsen_lo_passo_nov_26_2012.pdf.

> company growth rates, especially utility services growth rates, converge to a level consistent with the growth rate of the aggregate economy.[102]

PG&E witness Bulkley attempted to justify her extrapolation of analyst EPS growth rates into perpetuity by citing academic research on the predictive validity of analyst estimates for future stock prices and returns.[103] Her explanation is a red herring. The cited research says nothing about the validity of extrapolating analysts' estimates into perpetuity; it merely investigates potential relationships between analyst forecasts and future stock returns. I may observe a statistical correlation between watering a sapling and its growth; by no means can I therefore conclude that if I continue watering it, the resulting tree will eventually grow to the sky. PG&E witness Bulkley nonetheless expects us to accept just such an inference from the research on analyst forecasts.

Q. Are there any other concerns with relying so heavily on analysts' EPS growth rate forecasts?

A. The two reasons provided so far – systematic upward bias and economic impossibility – rule out extrapolating them into perpetuity, as the Utilities do in their CG DCFs. As I have explained in detail elsewhere, analysts' EPS growth rates should be used with caution in estimating COE for a variety of other reasons, including:

- Low correlation between analysts' EPS and DPS growth forecasts, due to the much greater volatility of earnings relative to dividends;
- Unknown starting period for analyst growth forecasts and therefore likely inconsistency with the DCF model's assumed starting period, the date the dividend yield is calculated;
- Inconsistency between the CG DCF results and analysts' own implied expected return estimates;
- Wide disparity between analyst forecasts and utilities' long-term historical DPS growth rates; and

[102] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc: 2006), p. 308 (emphasis added).

[103] *See, e.g.*, Public Service Commission of Wisconsin Docket No. 5-UR-110, Rebuttal Testimony of Ann E. Bulkley (September 23, 2022), p. 29-30, available at https://apps.psc.wi.gov/pages/viewdoc.htm?docid=447955.

- Wide disparity in model results across proxy group members that should, in principle, have similar costs of equity.[104]

B. The Utilities' DCF Dividend Yield Calculations Are Upwardly Biased.

Q. How do the Utilities calculate the dividend yields for their DCF models?

A. All four Utilities calculated the dividend yield by dividing the most recent quarterly dividend payment, annualized by multiplying by 4, by a trailing-average price. An average of multiple days' closing prices is used, rather than a single day's, to reduce the potential effect of any anomalous market events.[105] PG&E, SCG, and SDG&E all use three different trailing-average prices, calculated over the 30, 90, or 180 most recent trading days; SCE calculates its trailing-average price based on the most recent 15 trading days.[106]

Q. Is it common to use a multi-day average?

A. When estimating the dividend yield to be used in a long-term COE model like the DCF, it is common to use a multi-day average. PG&E's, SCG's, and SDG&E's averaging periods are much longer than necessary and introduce unnecessary error and systematic upward bias.

Q. How do PG&E's, SCG's, and SDG&E's averaging periods introduce unnecessary error and systematic upward bias?

A. The historical average generally does not reflect current, forward-looking market conditions; the longer the trailing history, the less representative of current market conditions the resulting average will be. In addition, stock prices tend to trend upward over time. Consequently, the historical-average price used to calculate the dividend yield both is inaccurate and tends to be lower than the current market price. Because the yield is the dividend *divided* by the price, a lower price estimate will tend to erroneously *inflate* the yield. This bias is seen in PG&E's, SCG's and SCE's DCF results, where the COE calculated

[104] A.22-05-008, Exhibit PCF-01, Direct Testimony of Mark E. Ellis on Behalf of the Protect Our Communities Foundation (August 8, 2022/September 8, 2022), p. 32-45, available at https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2204008/5457/496866314.pdf.

[105] *See, e.g.*, SCG-03 (Nowak), p. JCN-25.

[106] PG&E-2 (Bulkley), p. 2-19; SCE-02 (Villadsen), Appendix C, p. C3; SCG-03 (Nowak), p. 25; SDG&E-03 (Nowak), p. JCN-26.

using the 180-day average price is consistently higher than the 30- and 90-day average COEs.[107]

Q. What is an appropriate averaging period?

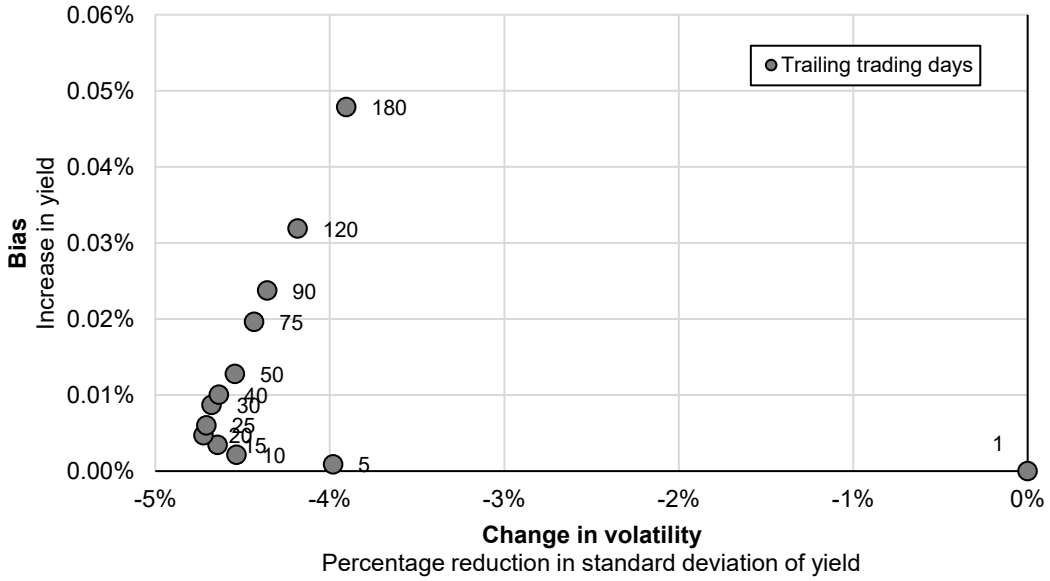
A. One month – typically 20 to 21 trading days – is a more appropriate trailing price history to use in calculating the dividend yield.

The purpose of using an average price is to reduce the effect of potential anomalous market events, but doing so inevitably introduces upward bias in the dividend yield. Consequently, there is a trade-off between reducing uncertainty in the yield estimate and introducing upward bias. The optimal averaging period can be determined by comparing the reduction in yield volatility – specifically, the change in the standard deviation of the yield estimate – to the increase in bias – the change in the average of the yield estimate – as the price averaging period is extended.

Figure 9 shows this trade-off for the S&P 500 Utilities Index based on price and dividend data for the 35 years through June 6, 2025. The horizontal axis is the percentage change in the standard deviation of the yield; the vertical axis is the upward bias in the yield and, therefore, ROE. As expected, bias increases with the length of the averaging period. Uncertainty is reduced as intended, but only up to a point. Beyond 20 to 25 trading days, uncertainty starts to increase, along with bias. The optimal averaging period is roughly one calendar month. PG&E's, SCG's, and SDG&E's 90- and 180-day trailing averages are clearly sub-optimal: they introduce 5 to 10 times more upward bias, with less reduction in uncertainty. Based on this analysis, a single calendar month, typically 20 to 21 trading days, is an appropriate price averaging period for the dividend yield input to the DCF model.

[107] PG&E-2 (Bulkley), p. 2-20; SCG-03 (Nowak), p. JCN-27; SDG&E-03 (Nowak), p. JCN-29.

Figure 9. Dividend yield bias-volatility trade-off[108]
June 1990 – June 2025



SCE's 15-day trailing average is reasonable. Nonetheless, in reviewing SCE witness Villadsen's spreadsheets, I found an error in the CG DCF dividend yield calculation that introduces upward bias into her CG DCF results. The 15-day average price, calculated over the period from the 13th through the 31st of January 2025, has "0" for each proxy group member's price on January 13. This reduces the average trailing price for each proxy group member by approximately 1/15, thereby raising the dividend yield a corresponding amount. The reported average yield for SCE's proxy group is 3.89%; it should be 3.63%, 0.26% less. SCE's average reported CG DCF result, 11.40%, should also be reduced, to 11.11%.[109]

This error only affects SCE's CG DCF results. Although the same, too-low, prices are shown in exhibits reporting both her CG DCF and MS DCF inputs (e.g., Schedules No. BV-6(a) and 6(b), respectively[110]), the underlying MS DCF calculations, in Workpaper #3 to Schedule BV-6(b),[111] use the correct average prices and are reported correctly in Schedule BV-6(b).

[108] M. Ellis analysis of S&P GMI data: S&P Global, "Market Intelligence" [last accessed June 7, 2025].
[109] SCE's DCF is quarterly and adjusts the trailing dividend yield for 1 quarter of growth. The change in the CG DCF result, 0.29%, is greater than the change in the dividend yield due to compounding effects.
[110] SCE-02 (Villadsen), p. H31-H32.
[111] SCE Response to EDF Data Request Set EDF-SCE-001, Appendix C Cost of Equity Model – Electric CONFIDENTIAL.

VII. THE MULTI-STAGE DCF CAN PRODUCE REASONABLE COE ESTIMATES, BUT ONLY IF IMPLEMENTED WITH REALISTIC ASSUMPTIONS.

A. The Multi-Stage DCF Allows for More Realistic Long-Term Growth Forecasts.

Q. What is the multi-stage DCF model?

A. The multi-stage DCF (MS DCF) addresses the key shortcoming of the CG DCF as typically implemented by utility COC consultants – assuming a relatively short-term growth rate into perpetuity – by incorporating different dividend growth rates over time. In its implementation for COE estimation, it assumes that analysts' estimated growth rates apply only for a limited period, after which they converge toward a sector-average terminal growth rate.

As we saw previously, analysts' estimated 3-to-5-year growth rates are too high to be sustained in perpetuity and tend to be biased. But analyst estimates should not be ignored completely. Despite the various deficiencies in analyst EPS forecasts, they are viewed as the best available estimates of near-term investor expectations and can provide useful information about the *relative* expected growth rates across companies. That said, relatively little weight should be placed on them in estimating the cost of equity, and the MS DCF can weight short-term estimates more realistically than the CG DCF.

Q. Do the Utilities' witnesses recognize the fundamental flaw in their implementations of the CG DCF and the superior ability of the MS DCF to produce more reasonable results?

A. Yes. In this proceeding, SCE witness Villadsen includes the MS DCF in her COE analysis, explaining:

> If there is reason to believe that investors do *not* expect a company's dividends to grow at a steady rate forever, but rather have different growth rate expectations in the near term (e.g., over the next five or ten years), compared to the distant future (e.g., a period starting ten years from the present moment), a "multistage" growth pattern can be modeled in the present value formula.[112]

[112] SCE-02 (Villadsen), Appendix B, p. 2 (emphasis in original).

Villadsen has ample reason to believe investors do not expect her proxy group companies' dividends to grow at their near-term rates forever. As explained above, Villadsen knows that "long-term earnings growth estimates routinely exceed sustainable GDP growth," and that "this growth is not possible" into perpetuity.

PG&E witness Bulkey has expressed similar "concerns" with the CG DCF, due to its "limiting assumption … (i.e., that earnings/dividend growth will continue at current rates into perpetuity)."[113] Bulkley and SCG/SDG&E witness Nowak both use the MS DCF – to the exclusion of the CG DCF – in their ROE analyses for other utilities, explaining, in identical language, that the "multi-stage DCF model addresses the possibility that mean five-year growth rates may not be reasonable in perpetuity."[114]

The Utilities' witnesses all recognize the same fundamental flaw in their implementations of the CG DCF, yet they use it anyway. Their deliberate use of a model they know and acknowledge is invalid should raise serious concerns among the Commission about the integrity of their analysis and testimony.

Q. Please describe your implementation of the MS DCF.

A. The MS DCF can incorporate any number of stages. For COE estimation, a three-stage model is commonly used, in which the initial stage uses analysts' estimates over their 3-to-5-year forecast horizon, and the terminal stage uses the long-term real historical growth rate plus current long-term inflation expectations. In between lies a transition phase in which the growth rate is the average of the initial and terminal rates. The MS DCF model can be expressed as:

$$1 = d\frac{1+g_1}{k-g_1}\left(1-\left(\frac{1+g_1}{1+k}\right)^{t_1}\right) + d\left(\frac{1+g_1}{1+k}\right)^{t_1}\frac{1+g_2}{k-g_2}\left(1-\left(\frac{1+g_2}{1+k}\right)^{t_2}\right) + d\left(\frac{1+g_1}{1+k}\right)^{t_1}\left(\frac{1+g_2}{1+k}\right)^{t_2}\frac{1+g_3}{k-g_3},$$

[113] South Dakota Public Utilities Commission Docket No. EL14-__, Direct Testimony and Schedules Ann E. Bulkley (Jun. 23, 2014), p. 31, available at https://puc.sd.gov/commission/dockets/electric/2014/EL14-058/volume2/bulkley.pdf [last accessed July 30, 2025].

[114] New York State Public Service Commission Case 23-W-___, Direct Testimony and Exhibits of Ann E. Bulkley and Christopher M. Wall (May 23, 2023), p. 37, available at https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={20ACE887-0000-CA70-8B16-517FEB158E1C}.

where d is the current dividend yield; g_1, g_2, and g_3 are the initial, transition, and terminal growth rates, respectively (where $g_2 = \sqrt{(1+g_1)(1+g_3)} - 1$);[115] t_1 and t_2 are the initial and transition stage durations; and k is the cost of equity such that the equation is true. Substantial precedent exists for the MS DCF model, in both its two- and three-stage forms, in both corporate finance and regulatory contexts.[116]

In my implementation of the MS DCF, I assume an initial growth stage of three years – the low end of analysts' EPS growth rate forecast horizon, to mitigate the effect of their upward bias – and a 7-year transition, for a combined 10-year above-long-term-trend growth phase, consistent with all four Utility witnesses' implementations of the MS DCF.[117] To account for the quarterly distribution of dividends, I convert the reported rates to quarterly and multiply the number of periods in the initial and transition phases by 4.[118] The dividend yield is the most recent quarterly dividend divided by the average price for June 2025.

Q. How do you estimate the initial growth rate for the MS DCF?

A. I use the consensus analysts' 3-to-5-year EPS growth forecasts from S&P Global Market Intelligence (S&P GMI).

Q. How do you select your proxy groups for each of the Utilities?

A. I use the proxy groups selected by the Utilities in both my MS DCF and CAPM analyses.[119]

[115] The geometric mean of g1 and g3 is used to ensure consistency between annual and quarterly versions of the model.

[116] *See, e.g.* Richard A. Brealey, Stewart C. Myers, Franklin Allen, *Principles of Corporate Finance*, 10th ed. (New York: McGraw-Hill/Irwin: 2011), p. 84-86; Surface Transportation Board, *Use of a multi-stage discounted cash flow model in determining the railroad industry's cost of capital* (2009); available at https://www.govinfo.gov/content/pkg/FR-2008-08-14/pdf/E8-18865.pdf.

[117] SCE-02 (Villadsen), p. 54; Bulkley, Ball, Liberty (2017), p. 36; Nowak, ConEd (2025), p. 29.

[118] All rates are converted from annual (ra) to quarterly (rq) using the formula: rq=1+ra14-1.

[119] I use only SCE electric utility proxy group. While SCE's analysis includes water and gas proxy groups, they are not used in developing SCE's ROE and capital structure recommendations. See SCE-02 (Villadsen), p. 13.

B. Utility-Sector Long-Term DPS Growth Is Linked to Inflation, Not GDP.

Q. How do you estimate the terminal growth rate for the MS DCF?

A. The terminal growth rate is intended to reflect a sector-wide dividend growth rate toward which all stocks in the peer group are expected to converge over the long term. Unless there is a compelling reason not to, it is reasonable to assume investors expect the sector-wide growth rate, in real terms, to revert to its long-term historical trend.

As explained above and shown in Figure 8, over the last nearly 100 years, utility-sector DPS growth has essentially tracked inflation. While there have been periods of growth and decline, the long-term trend has been essentially flat – utility dividend growth has just kept pace with inflation for nearly 100 years.

Q. How can you be sure we aren't experiencing a paradigm shift toward unusually high growth for the Utilities, resulting in a step-change in sustained higher growth – perhaps not at analysts' near-term growth rates, but in-line with GDP, as assumed in SCE's MS DCF?

A. SCE witness Villadsen simply assumes the utility sector's long-term dividend growth will track GDP without offering an explanation for why that should be the case.[120] The long-term historical trend suggests this almost certainly will *not* be the case.

For the market as a whole, long-term real DPS growth has tracked GDP *per capita*, about 1.8% per year – not total GDP.[121] At any given time, some sectors grow faster, some slower, but, similar to the explanation provided above, it is simply mathematically impossible for any individual sector to grow faster than the market as a whole into perpetuity. Thus, long-term growth, for utilities or any other sector, is capped at GDP per capita.

While the utility sector is currently experiencing a period of unusually high growth, there is compelling evidence to expect the industry's growth to revert to its historical average over the long-term. Over the last hundred years, the energy intensity of the U.S. economy – the

[120] SCE-02 (Villadsen), p. 54.

[121] M. Ellis analysis of FDL, BLS and https://www.measuringworth.com/datasets/usgdp/ data [all last accessed June 9, 2025]. *See, e.g.*, Ibbotson and Harrington, *Stocks, Bonds, Bills, and Inflation (SBBI)*, p. 157-160; Roger G. Ibbotson, Peng Chen, *Long-Run Stock Returns: Participating in the Real Economy,* Financial Analysts Journal (Jan/Feb: 2023).

amount of energy consumed per inflation-adjusted dollar of GDP – has declined 1.5% per year.[122] Virtually every developed country has experienced a similar decline; this is one of the most well-known phenomena in energy economics.[123]

The consistency of my MS DCF COE results with independent benchmarks like investment firm CMAs and utility market-to-book ratios provides additional, forward-looking validation of my long-term growth assumption.

Q. How do you estimate expected long-term inflation?

A. For expected long-term inflation, I use Treasury-TIPS spreads. TIPS are Treasury Inflation-Protected Securities, which provide investors a return equivalent to inflation plus the quoted TIPS yield. The difference in yield between Treasurys and TIPS of equal maturity is a current measure of the market's forward-looking inflation expectation over the life of the bonds. Because it is market-based, the Treasury-TIPS spread is widely used to forecast expected inflation.[124]

The MS DCF uses inflation for the terminal, not initial or transition, growth rate, so expected inflation into perpetuity is estimated from the end of the transition phase, based on the expected inflation rates from years 13 to 20 and 20 to 30. As with the prices used to calculate dividend yield, I use the monthly average. For June 2025, the long-term inflation rate is 1.95%.[125]

[122] M. Ellis analysis of EIA and measuringworth.com data, available at https://www.eia.gov/todayinenergy/detail.php?id=62444; https://www.measuringworth.com/datasets/usgdp/ [both last accessed Jul. 26, 2025].

[123] *See, e.g.*, Enerdata, World Energy & Climate Statistics – Yearbook 2025, available at https://yearbook.enerdata.net/total-energy/world-energy-intensity-gdp-data.html [last accessed July 30, 2025] ("In OECD countries, where the energy intensity is 26% lower than the global average, the continuing growth of renewable power generation contributed to reduce energy intensity by 1% though at a slower pace than over the 2010-2019 period.").

[124] *See, e.g.*, Will Kenton, *TIPS Spread: What it is, How it Works, Relevance*, (Investopedia: April 12, 2023), available at https://www.investopedia.com/terms/t/tips-spread.asp.

[125] M. Ellis analysis of Federal Reserve Economic Data (FRED) data: Federal Reserve Bank of St. Louis, *Treasury Constant Maturity*, available at https://fred.stlouisfed.org/categories/115 [last accessed June 11, 2025].

C. The MS DCF Produces COE Estimates Substantially Lower Than Witness Nowak's CG DCF.

Q. How do your DCF results compare to the Utilities'?

A. Figure 10 summarizes my and the Utilities' DCF assumptions and results. As explained, the Utilities use a range of assumptions for dividend yield and, in the case of SCE, long-term growth. For ease of comparison, I show the averages of the Utilities' assumptions and my results.

In general, while my yield and near-term growth assumptions do not differ significantly from the Utilities', my results are systematically about 3.3% lower, on average. The differences in our results, therefore, are mostly due to differences in methodology. Most notably, all four Utilities use the unrealistic and economically implausible CG DCF. Even in implementing the potentially more realistic MS DCF, SCE nonetheless assumes an unsupportable long-term growth rate, yielding an unreasonably high COE result.

Figure 10. Proxy-group average levered DCF COE assumptions and results
Percent

	PG&E	SCE		SCG	SDG&E
	CG	CG	MS	CG	CG
Utilities	**10.35**	**11.40**	**8.78**	**10.24**	**10.30**
Dividend yield	3.74	3.89	3.89	3.67	3.77
Near-term growth	6.49	7.16	7.16	6.46	6.41
Long-term growth	6.49	7.16	4.10	6.46	6.41
Ellis	**6.99**	**NA**	**6.90**	**6.98**	**7.00**
Dividend yield	3.73		3.60	3.62	3.78
Near-term growth	7.02		7.00	7.60	6.84
Long-term growth	1.95		1.95	1.95	1.95
Utilities – Ellis	**3.36**	**4.50**	**1.88**	**3.26**	**3.31**
	+48	*+65*	*+27*	*+47*	*+47*
Dividend yield	0.00	0.29	0.29	0.05	-0.01
Near-term growth	-0.53	0.16	0.16	-1.14	-0.42
Long-term growth	4.54	5.21	2.15	4.50	4.46

Both my and Utilities' DCF COEs are levered, reflecting each proxy group member's market-based capital structure. Later, in Section IX of my testimony where I conduct the joint ROE-capital structure analysis described in Section IV.B.2 above, I will unlever my COE results for each individual proxy group member, and then relever the average for each Utility proxy group at my recommended optimized capital structure.

Q. Do you use the MS DCF elsewhere in your analysis?

A. Yes. I use it to estimate the market risk premium for the CAPM.

VIII. THE UTILITIES CHERRY-PICK AND MANIPULATE THEIR CAPM ASSUMPTIONS TO PRODUCE UPWARDLY BIASED RESULTS.

A. The CAPM Is a Model of the Excess Return Over a Risk-Free Asset.

Q. Please provide an overview of the CAPM.

A. The capital asset pricing model (CAPM) expresses the COE in terms of the fundamental financial risk-reward trade-off: investors demand higher returns as risk increases. The CAPM estimates the cost of equity, k, from the formula:

$$k = r_f + \beta(r_m - r_f),$$

where r_f is the risk-free rate (typically a long-term U.S. Treasury bond), r_m is the expected return on the market, and β is a measure of risk of the company in question relative to the market.[126]

The difference between the market return and the risk-free rate – the market risk premium (MRP) – reflects the additional, or *excess*, return over the risk-free asset investors require as compensation for taking on equity market risk. To better reflect the CAPM's expression of COE in terms of the excess return over the risk-free asset, the CAPM formula is sometimes shortened to:

$$k = r_f + \beta MRP.$$

Unlike the DCF, which estimates a continuously compounded geometric return into perpetuity, the CAPM produces an expected return over a finite time period. The assumed beta and market risk premium should therefore be based on returns over a consistent investment horizon. Like the DCF, the CAPM is intended to be forward-looking. Consequently, each of its three parameters – risk-free rate, expected market return, beta – should be forward-looking.

[126] *See, e.g.*, SCE-02 (Villadsen), Appendix B, p. 6.

The CAPM is best known for its expression of the basic financial risk-return relationship as a premium to the risk-free rate. The other two attributes of the CAPM described above – that it is based on excess returns and its assumptions should reflect a single, consistent investment horizon – are often overlooked, but they have important implications for the implementation of the CAPM for estimating long-term COE.

Q. What are the implications of those less well-recognized attributes of the CAPM for its implementation in estimating long-term COE?

A. The first implication is for the choice of a risk-free rate. United States Treasury securities are generally considered the lowest-risk assets available and are typically used to represent the risk-free asset. Academic studies generally use a short-term rate (e.g., the 1-month T-bill) and estimate a correspondingly short-term COE. For a long-term COE, a Treasury bond yield – 10-, 20-, or 30-year – is generally used. As will be explained in further detail below, this difference between common academic and practitioner implementations of the CAPM must be kept in mind when reviewing and applying academic research on the CAPM.

The second implication is for the calculation of beta, the estimate of the company's risk relative to the market. As I will explain in more detail below, to satisfy the regulatory objective of estimating a long-term COE,[127] beta must reflect the long-term relationship between risk and return.

Q. What is your assessment of the Utilities' implementation of the CAPM?

A. Although the CAPM is conceptually straightforward – a simple expression of the fundamental and intuitive risk-reward trade-off – it is easy to manipulate by using unrealistic or biased assumptions. As with the Utilities' DCF models, their assumptions for all three CAPM parameters – the risk-free rate, beta, and MRP – are conceptually flawed and, with one exception, unrealistically high.

[127] *See, e.g.*, SDG&E-03 (Nowak), p. JCN-8. In principle, regulators could seek to set ROE equal to estimated COE over just the period through the next rate case. As explained above in footnote 85, the degree to which COE varies with investment horizon is unknown.

B. The Utilities' Use Forecast Risk-Free Rates Tends to Introduce Upward Bias.

Q. How do the Utilities estimate the risk-free rate?

A. All four Utilities develop risk-free rate estimates based on forecasts provided by Blue Chip Financial Forecasts. PG&E, SCG, and SDG&E also use a 30-day trailing average of the market-based Treasury yield.[128]

Q. What is your assessment of the Utilities' risk-free rate assumptions?

A. The correct approach is to use recent market rates only, not forecasts. As with the stock price used to calculate the DCF dividend yield, a multi-day average is recommended to reduce the effect of potential market anomalies.

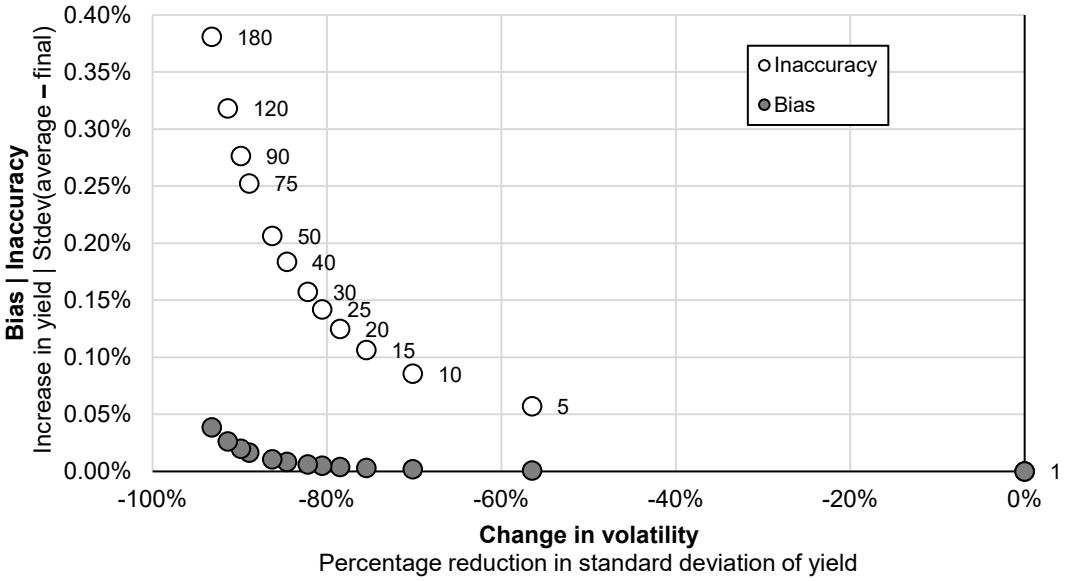
Q. Is PG&E's, SCG's, and SDG&E's 30-day trailing average appropriate? Is the bias-uncertainty trade-off you described above a concern with bond yields?

A. Bond yields do not tend to trend upward (or downward) over time, so bias is less of a concern than it is when calculating dividend yield. But a trailing history does introduce inaccuracy – the chance that the average does not reflect current market conditions – measured as the standard deviation of the difference between the trailing average and the final day's yield.

Figure 11 presents a similar analysis to the dividend yield bias-volatility trade-off explained above. It shows the changes in both bias and inaccuracy as the trailing averaging period increases. As expected, bias is virtually zero with trailing histories less than 40 trading days. Even at 180 days, it is less than 0.05% – a rounding error if the ROE is calculated to a single decimal point. In contrast, inaccuracy increases significantly beyond 20-30 trailing trading days, and the inaccuracy-volatility trade-off worsens. Extending the trailing history from 20 to 30 days reduces volatility by less than 5% (from -78% to -82%) but increases inaccuracy nearly 26% (0.12% to 0.16%). As with the stock price used to estimate dividend yield, one month (20 to 21 trading days) is an appropriate trailing average period for the Treasury bond yield used for the CAPM risk-free rate.

[128] PG&E-2 (Bulkley), p. 2-22; SCE-02 (Villadsen), Appendix B, p. 8; SCG -03 (Nowak), p. JCN-30; SDG&E-03 (Nowak), p. JCN-31.

Figure 11. 30-year Treasury yield inaccuracy-volatility trade-off[129]
June 1990 – June 2025



1. Current bond yields are better predictors of future yields than forecasts.

Q. What is wrong with the Utilities' use of forecast rates?

A. There are three problems with the Utilities' use of forecast rates. First, the use of forecast rates introduces an inconsistency with the DCF model. Second, forecast rates are less accurate predictors than current market rates. Third, the Utilities' chosen forecast provider, Blue Chip Financial Forecasts (BCFF), has a multi-decade track record of systematic upward bias in its forecasts.

Q. How is the use of forecast rates inconsistent with the DCF model?

A. The DCF calculates the discount rate at which an asset's stream of future cash flows, discounted to a "time zero" one period before the first cash flow, equals the asset's present value. The resulting discount rate is therefore as of that time zero. In our respective implementations of the DCF, time zero is the date of the dividend yield calculation – January 2025 for SCE; February 2025 for PG&E, SCG, and SDG&E; and June 2025 for me. Using an interest rate expected at some future date produces a COE as of that future date, so that COE is not directly comparable to the DCF's COE. The Utilities use forecasts across a 6-year

[129] M. Ellis analysis of FRED data [last accessed June 11, 2025].

range of future dates – from 2025 to 2030 – clearly not comparable to their DCF time-zeroes in early 2025.

Q. How do we know the current market rate is a better predictor of future market rates than forecasts?

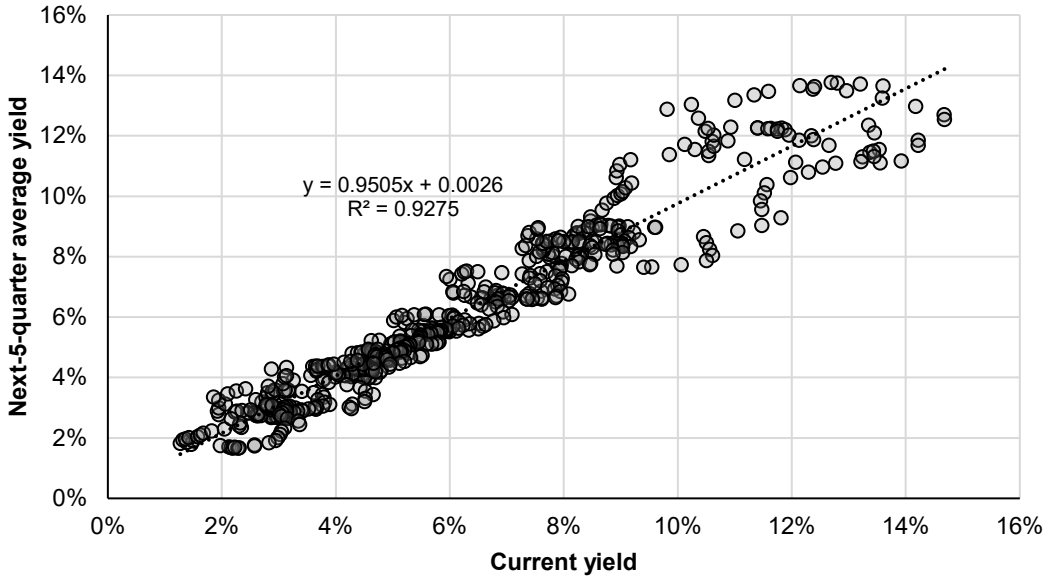
A. Even if we ignored the inconsistency concern and wanted to use a forecast rate anyway, my second concern is that commonly available interest rate forecasts are no better predictors of future interest rates than the current market rate. As frequently-cited utility-side cost of capital expert Roger Morin summarizes, "The literature suggests that on balance, the bond market is very efficient in that it is difficult to consistently forecast interest rates with greater accuracy than a no-change [from the current interest rate] model."[130]

These academic conclusions can be understood intuitively. Markets are forward-looking; if investors expect interest rates to rise, their expectations will be incorporated into current yields. Considering the implications of the alternative makes the intuition clear. Suppose an investor expects the yield on the 30-year Treasury to rise from its current ~5% to 6% over the next six months. There is an inverse relationship between a bond's value and a bond's yield; when the yield rises, the value falls, and vice versa. An investor who expects bond yields to rise would not buy a bond today, because to do so would be to invest expecting a loss; better not to buy the bond at all. But market participants *do* buy at the current 5%, implying that the market overall does *not* expect rates to rise in the future. Current yields are the best predictor of future yields, especially for longer-term bonds.

A simple analysis demonstrates the high predictive validity of current bond yields for future yields. Figure 12 is a cross-plot of the 30-year Treasury yield over the subsequent 5 quarters – analogous to SCG/SDG&E witness Nowak's near-term forecast, 25Q1 through 26Q2. Current yields account for approximately 95% of the variation in yields over the coming 5 quarters. For the average rate over the next 5 years, 2026 to 2030 – witness Nowak's second forecast – they account for 76%.

[130] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc: 2006), p. 172.

Figure 12. 30-year Treasury yield, next-5-quarter average vs. current[131]
February 1977 – June 2025



As importantly, regardless of the forecast horizon, the current rate is unbiased – exhibiting no tendency to be systematically too high or too low. The predictive validity of a forecast can be assessed from the decomposition of the mean square error (MSE) – the average of the squared differences between predicted and actual yields – into bias, inefficiency, and random variation components. Bias is the difference between the average prediction of the model and the true value – the systematic error. A high bias means the model consistently makes incorrect assumptions and fails to reasonably capture the underlying pattern in the data. Inefficiency measures how poorly the current yield predicts the future yield. An efficient yield prediction model has a regression slope close to 1.0. Random variation is the residual error not explained by bias or inefficiency – the unpredictable ups and downs in the future yield that can't be explained by today's yield. In a scatterplot of future vs. current yields, random variation is the dispersion around the regression line.[132]

[131] M. Ellis analysis of FRED data [last accessed June 11, 2025].
[132] *See, e.g.*, Jacob A. Mincer, Victor Zarnowitz, *The Evaluation of Economic Forecasts,* Economic Forecasts and Expectations: Analysis of Forecasting Behavior and Performance (NBER: 1969), p. 3-46, available at https://www.nber.org/system/files/chapters/c1214/c1214.pdf [last accessed July 30, 2025].

Over the nearly 50 years from 1977 to 2025, the current 30-year Treasury yield's root mean square error (RMSE) in forecasting the average yield over the next 5 quarters was 0.82%. Of this total, 96.2% was attributable to random noise, 3.3% to inefficiency, and only 0.4% to bias. The current market rate is the best available predictor of future market rates.

Q. How do BCFF forecasts' predictive validity and bias compare to the current yield as a forecast?

A. When BCFF's forecast error is similarly analyzed, its severe upward bias becomes clear. Figure 13 compares several key regression statistics for BCFF's 5-quarter forecast, from December 1996 through December 2023, to the corresponding statistics for the current yield forecast. While the current yield is slightly less efficient (0.83 slope vs. BCFF's 0.92), BCFF is inferior on nearly every other measure. Its average error and RMSE are both greater. Most importantly, BCFF's forecasts are strongly upwardly biased. BCFF's forecast bias (0.36%) accounts for over 6 times more error than the current yield's bias (0.06%). BCFF's slightly greater efficiency reduces its forecast error by just 0.12% (0.22% vs. 0.10%). The contributions of random noise are nearly the same for both BCFF and the current yield forecasts, 0.5%.

Figure 13. 30-year Treasury forecast model regression statistics, BCFF vs. current yield, December 1996 – December 2023
Percent (except slope and R-squared)

	BCFF	Current yield
Slope	0.92	0.83
Intercept	0.01	0.63
R-squared	0.84	0.82
Average error	0.36	0.06
Bias/MSE	**34**	**1**
Inefficiency/MSE	3	16
Random variation/MSE	63	83
Root mean square error (RMSE)	0.63	0.56
Bias	**0.36**	**0.06**
Inefficiency	0.10	0.22
Random variation[133]	0.52	0.51
RMSE/average actual yield	15.4	13.9

The consistent errors in BCFF forecasts are well-known; the Congressional Budget Office has issued public reports on BCFF's interest rate forecasting errors for more than twenty years.[134]

2. Experts' rationales for using forecast rates do not withstand scrutiny.

Q. How do utility cost of capital consultants justify the use of forecasts with such a poor track record?

A. Only SCE witness Villadsen provides an explanation for her use of forecast interest rates:

> I not believe the *current* yield on long-term Treasury bonds is a good estimate for the risk-free rate that will prevail over the time period relevant to this proceeding. For this reason, I rely on the average of Blue Chip's forecast …[135]

[133] Bias, inefficiency, and random variation sum to MSE, so their individual square roots sum to more than RMSE.

[134] *See, e.g.,* Congressional Budget Office, *CBO's Economic Forecasting Record* (Congressional Budget Office, November 2002), p. 13, 18, available at https://www.cbo.gov/sites/default/files/107th-congress-2001-2002/reports/11-07-economicforecast.pdf [last accessed July 30, 2025]. *See, also,* Congressional Budget Office, *CBO's Economic Forecasting Record: 2023 Update* (Congressional Budget Office, June 2023), p. 5, available at https://www.cbo.gov/system/files/2023-06/59078-Economic-Forecasting-Record.pdf [last accessed July 30, 2025].

[135] SCE-02 (Villadsen), App. B, p. 8 (emphasis in original).

As explained in the previous subsection, witness Villadsen's confidence in forecast rates over the current market rate is unfounded, and her solution is well-known to be upwardly biased. None of the Utility witnesses' testimonies addresses the well-known problems with using forecast interest rates in general and with BCFF forecasts specifically.

SCG/SDG&E witness Nowak's Concentric colleague James Coyne, also a utility-side cost of capital expert, cited a Massachusetts regulatory decision to argue that "Blue Chip Financial Forecasts is widely relied on by investors and provides a useful proxy for investor expectations for the risk-free rate."[136] Similarly, Roger Morin has argued, "the fact that investors are willing to purchase such expensive services confirm [*sic*] the importance of economic/financial forecasts in the minds of investors."[137]

These "investor reliance" and "willingness to purchase" arguments implicitly assume that investors rely *only* on BCFF forecasts, to the exclusion of all other ways that investors might develop their expectations; that they rely on BCFF's forecasts as-is, with no adjustment for their historical inaccuracy; and that investors' only use of the forecasts is for investment decisions. None of these assumptions is true.

BCFF may be relied upon by *some* investors, but there is no basis for Mr. Coyne's claim that BCFF forecasts represent a reasonable proxy for investor expectations. BCFF has no more than a hundred thousand subscribers,[138] less than 0.1% of the hundreds of millions of investors who are use Treasury rates for direct investments or as a benchmark for other investments.[139] Although utility cost of capital experts routinely argue that these forecasts

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[136] A.22-04-008, Ex. SDG&E-04 (Coyne) (Apr. 20, 2022), p. 39, available at https://www.sdge.com/sites/default/files/regulatory/SDG%26E-04%20ROE%20Coyne%20TY%202023.pdf [last accessed July 30, 2025].

[137] App. of Duke Energy Progress, LLC for Authority to Adjust and Increase Its Electric Rates Schedules and Charges, 2022-254-E, *Direct Testimony of Roger A. Morin for Duke Energy Progress, LLC* (Pub. Svc. Comm'n of South Carolina: Sept. 2022), p.39, available at https://dms.psc.sc.gov/Attachments/Matter/e12e6f38-0e98-45de-9540-8532452ec047 [last accessed July 30, 2025].

[138] In the 2020 annual report of Wolter Kluwers (BCFF's owner), $905 million of revenue was attributed to the Legal & Regulatory segment, of which BCFF is just 1 of 99 offerings. *See* Wolters Kluwer, *Annual Report 2020,* p.38 available at https://assets.contenthub.wolterskluwer.com/api/public/content/a547e20265c14c94a3bc4c9ee5370877?v=b3d04a1d [last accessed July 30, 2025]. BCFF costs approximately $2,500/year. Even assuming BCFF accounts for 10% of segment revenue – roughly ten times the segment average – BCFF has no more than 40,000 subscribers.

[139] More than half of U.S. adults and households are invested in the stock market. *See, e.g.*, Gallup, *What Percentage of Americans Own Stock?* (Gallup News: May 5, 2025), available at

represent the "market's view," 0.1% in no way represents the market. The market has tens of millions of participants responding to all kinds of information, and the small slice of the market that uses BCFF does not represent an adequate or reasonably proxy.

BCFF reports include dozens of other forecasts, as well as commentary and analysis. Investors might rely on BCFF's reports for that other content, not BCFF's interest rate forecasts, per se. Given that the consistent errors in BCFF forecasts are well-known, among investors who do consult BCFF interest rate forecasts, many undoubtedly take them with a grain of salt and inform their decisions with other forecasts and information.

Roger Morin has additionally argued in defense of forecast interest rates that "investors price securities on the basis of long-term expectations, including interest rates," "investors' required returns can and do shift over time with changes in capital market conditions, hence the importance of considering interest rate forecasts," and "the empirical evidence demonstrates that stock prices do indeed reflect prospective financial input data."[140] It is certainly true that investors price securities based on their expectations, and those expectations – and therefore investors' required returns – change over time. But the truth of these statements by no means requires or even implies that investors rely on third-party forecasts in general, or BCFF forecasts specifically, in doing so. This argument is a red herring. The Utilities do not provide any justification for their use of forecast rates because they have none.

https://news.gallup.com/poll/266807/percentage-americans-owns-stock.aspx [last accessed July 30, 2025]. *See, also,* Kim Parker, Richard Fry, *More than half of U.S. households have some investment in the stock market* (Pew Research Center: Mar. 25, 2020), available at https://www.pewresearch.org/fact-tank/2020/03/25/more-than-half-of-u-s-households-have-some-investment-in-the-stock-market/ [last accessed July 30, 2025].

[140] App. of Duke Energy Progress, LLC for Authority to Adjust and Increase Its Electric Rates Schedules and Charges, 2022-254-E, *Direct Testimony of Roger A. Morin for Duke Energy Progress, LLC* (Pub. Svc. Comm'n of South Carolina: Sept. 2022), p. 39-40, available at https://dms.psc.sc.gov/Attachments/Matter/e12e6f38-0e98-45de-9540-8532452ec047 [last accessed July 30, 2025]..

C. The Utilities Cherry-Pick and Manipulate Their Beta Calculation Methodologies to Produce Inflated Estimates.

Q. Please explain the CAPM beta.

A. In the CAPM, beta is a measure of an individual stock's (or other security's) risk *relative* to the market.

Q. Why does the CAPM focus on relative risk, and not total risk?

A. The CAPM's focus on relative risk derives from one of the most important insights in finance: Modern Portfolio Theory (MPT). MPT formalized the concept of diversification of risk. The overall risk of a portfolio of multiple securities will generally be less than the sum of their individual risks. This is because the risks of individual securities tend not to be perfectly correlated – when one stock is up, another might be down. Because the cost of assembling a diversified portfolio is low (e.g., through ETFs), the expected return on any single security reflects only the risk it contributes to the overall market, known as systematic risk, not its specific risk.[141] Beta is intended to measure just the systematic part of a stock's risk. MPT and the CAPM are so foundational to finance that their creators were awarded the Nobel Prize in 1990.[142]

Q. How is beta typically estimated?

A. The most common method to estimate beta is to calculate the slope of the linear regression of the target security's total – not excess – periodic returns against the market's total periodic returns over the last few years. This is a simple analysis that can be performed in a spreadsheet in a few minutes.

It's important to recognize that beta is intended to be a forward-looking estimate of future risk. Using historical return data implicitly assumes that the security's future risk will be similar to its past risk.

[141] *See, e.g.*, CFI Team, *Modern Portfolio Theory* (Corporate Finance Institute: 2025), available at https://corporatefinanceinstitute.com/resources/career-map/sell-side/capital-markets/modern-portfolio-theory-mpt/ [last accessed July 30, 2025].

[142] The Royal Swedish Academy of Sciences, *This Year's Laureates Are Pioneers in the Theory of Financial Economics and Corporate Finance,* (The Nobel Prize: October 16, 1990), available at https://www.nobelprize.org/prizes/economic-sciences/1990/press-release/.

Q. Is it reasonable to assume that a stock's future risk will be similar to its past risk?

A. This assumption is generally reasonable for large publicly traded stocks like the proxy group companies used in utility cost of equity analysis. But any time we use historical data to estimate future performance, it is necessary to examine different approaches and exercise judgment in assessing their reasonableness in estimating future performance.

Q. Previously, you described the CAPM as a model of *excess* returns (over the risk-free asset), but beta is typically calculated using total returns. Is this a problem?

A. Using total returns is not a problem when estimating a short-term expected return, but it is for estimating a long-term COE, which is the objective in utility regulatory proceedings. When calculating beta to estimate a short-term expected return, the return on the risk-free asset tends to be much lower than the returns on the stock in question and the market. The error introduced by this simplifying assumption is therefore small.

But when calculating beta to estimate a long-term expected return, the return on the risk-free asset can be significant relative to the returns on the stock in question and the market, and the error introduced by using total returns instead of excess returns materially affects the resulting beta estimate. This means that we cannot use any of the common, off-the-shelf betas reported by Value Line, Yahoo! Finance, Bloomberg, or S&P. They calculate beta using total returns and therefore produce estimates that are valid only for estimating a short-term expected return. These off-the-shelf betas are not useful for projecting long-term utility COE.

1. For estimating long-term COE, beta should be calculated using monthly returns, not weekly.

Q. What are examples of different approaches that might be investigated in determining a reasonable beta estimate?

A. In estimating beta, the most common calculation parameters that are investigated are the length of the trailing history (typically 1 to 5 years) and the frequency of the return calculation (daily, weekly, or monthly). Other parameters that are sometimes investigated include the market index (e.g., S&P 500, Russell 3000), the type of return (simple or logarithmic), relative return interval end (e.g., day of the week or month), and various

adjustments based on empirical observations about the historical validity of beta in predicting future risk. The fact that we are estimating long-term COE for utilities constrains our choices among these beta calculation parameters.

Q. What considerations should be taken into account in choosing among alternative beta calculation methodologies when estimating utility COE?

A. The first consideration is the return horizon. The CAPM is a single-period model. Because we are trying to estimate a long-term return, the return period should likewise be long-term. But there's a trade-off. Because beta is calculated from historical returns, longer return periods reduce the number of data points available to estimate beta. At least 50 data points are typically needed; if we use annual returns – still well short of our long-term horizon – we would need to use 50 years of historical data to estimate beta, which may not be available or, if it is, likely does not accurately reflect *current* investor expectations. Weekly or daily returns provide more data – potentially improving the accuracy of the beta estimate – but they also introduce more random noise into the return data due to asynchronous trading and non-trading day effects. This noise biases betas toward 1.0.[143] For long-term estimates, therefore, 5 years of trailing monthly returns – 60 data points – is typically recommended.[144] Betas calculated using 5 years of trailing monthly returns are also commonly used in academic research, including *all* of the papers cited by SCE witness Villadsen in support of the (conceptually flawed) empirical CAPM, which I will discuss later in my testimony.[145]

A second consideration is potential adjustments to beta based on empirical findings about how betas for individual stocks tend to evolve over time.

[143] Aswath Damodoran, *Estimating Beta* (2020), p. 133. available at https://pages.stern.nyu.edu/~adamodar/podcasts/cfspr20/session7slides.pdf; Aswath Damodaran, *Applied Corporate Finance* Stern School of Business, NYU (2014), p. 35, available at https://pages.stern.nyu.edu/~adamodar/pdfiles/acf4E/acf4Ebook.pdf.

[144] *See, e.g.*, Michael J. Mauboussin, Dan Callahan, *Cost of Capital: A Practical Guide to Measuring Opportunity Cost* (Morgan Stanley Investment Management: February 2023), p. 22, available at https://www.morganstanley.com/im/publication/insights/articles/article_costofcapital.pdf. *See, also*, Exhibit SC/PCF-5, Tim Koller, Marc Goedhart, David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 5th ed. (John Wiley & Sons, Inc.: 2010), p. 317.

[145] SCE-02 (Villadsen), Appendix B, p. 11.

Q. What are the Utilities' sources for their beta assumptions?

A. Collectively, the Utilities use beta from two sources. All four Utilities use Value Line's most recent betas, as reported. PG&E, SCG, and SDG&E also use one of two betas provided by Bloomberg, although they override Bloomberg's default calculation parameters. Although they refer to them as "Bloomberg" betas, in overriding Bloomberg's default beta calculation parameters, PG&E, SCG, and SDG&E create their own, bespoke betas. PG&E also uses a third beta estimate, an average of the last 10 years of Value Line's reported betas.

The Utilities' betas raise several concerns. Both Value Line and their custom Bloomberg betas use weekly returns. As explained above, weekly returns are not suitable for estimating long-term COE because they introduce random noise and upward bias. Plus, the Utilities' betas are "adjusted," a modification to the linear regression model that is not valid for utilities and introduces upward bias, as I explain in detail in the next subsection. The Utilities clearly cherry-pick their beta sources and, with the exception of SCE, introduce unconventional, and unsupported, manipulations of their betas to produce upwardly biased results.

Q. Are betas calculated using weekly returns valid for estimating a long-term COE?

A. As explained above, because the CAPM is a single-period model, in principle, the beta return calculation interval should match our long-term return forecast horizon. Although there is a trade-off between return calculation interval and observation quantity, when estimating COE for a multi-year horizon, there is simply no justification for using weekly returns while also using 5 or more years of trailing historical data. Five years of monthly data provide a sufficient sample size, and monthly returns more closely match our long-term investment horizon than weekly returns.

Q. Could the Utilities have consulted other sources with different beta calculation methodologies?

A. Yes. Other financial data providers also provide beta estimates, calculated using different methodologies. It is notable that at least two of the other sources cited for the Utilities' EPS growth forecasts – Zacks and S&P – as well as perhaps the most widely-used financial website, Yahoo! Finance, all estimate beta using different methodologies, yet all four

Utilities chose to ignore their betas.[146] Zacks and Yahoo! Finance report the 5-year monthly betas that are recommended for long-term COE estimation.[147] S&P reports shorter-term betas using 1 or 3 years of daily returns.[148] The Utilities' omission of betas from other commonly used sources, including those they use elsewhere in their analyses, is unambiguous evidence of cherry-picking.

2. The Utilities' "adjusted" betas are not valid for utilities.

Q. Please explain adjusted beta.

A. "Adjusted beta" refers to a mathematical revision to the "raw" regression-based beta that is derived from an analysis conducted by Wharton professor Marshall Blume in the early 1970s. Analyzing beta-sorted portfolios, he found a tendency for betas, on average, to regress toward the market average beta, 1.0, from one time period to the next.[149] Based on this finding, some providers of beta estimates report adjusted betas that are a weighted average of the raw estimate and the market beta (1.0 by definition). The most common weighting is 2/3 on the raw beta, 1/3 on the market beta:[150]

$$\beta_{adjusted} = \frac{2}{3}\beta_{raw} + \frac{1}{3}.$$

For stocks with raw betas below 1.0, like most utilities, the effect of the adjustment is to increase the beta one-third of the way toward 1.0. For example, a stock with a raw beta of 0.4 would have an adjusted beta of 2/3 x 0.4 + 1/3 = 0.6.

Q. Is beta always adjusted?

A. No. As SCE's Villadsen has noted, "analysts have different views on whether to use raw or adjusted betas,"[151] and many commonly used sources of beta report only unadjusted betas,

[146] SDG&E-03 (Nowak), p. JCN-27. Yahoo! Finance and Zacks, both of which, like Value Line, provide free beta estimates, have, respectively, 10,420 and 78 times as much organic traffic from unpaid search results as Value Line. *See* Ahrefs, Ahrefs Pte. Ltd. https://ahrefs.com/ [last accessed June 14, 2025].
[147] *See, e.g.*, https://finance.yahoo.com/quote/DUK/ [last accessed Jul. 26, 2025].
[148] S&P GMI [last accessed Jul. 29 2025]
[149] Marshall E. Blume, *On the Assessment of Risk,* The Journal of Finance Vol. 26, No. 1 (1971), p. 1-10.
[150] The 2/3 and 1/3 weights are based on the regression coefficients Blume presented in his original paper, which regressed betas in one period against betas in the previous period.
[151] Villadsen et al., *Risk and Return for Regulated Industries*, p. 80.

including Yahoo! Finance, Zacks, and S&P. Bloomberg reports both raw and adjusted betas. Value Line reports only adjusted betas.[152]

Q. Is the Blume adjustment valid for utilities?

A. No. The Blume adjustment is based on an observation of the tendency of betas, *on average*, to regress toward 1.0. But not every stock exhibits this tendency. Blume did not investigate whether and how this tendency might vary across stocks with different characteristics.

Rutgers professor Richard Michelfelder investigated the validity of the beta adjustment specifically for utility stocks and found no evidence of the average tendency observed by Blume.[153] As will be shown in Figure 14 below, beta for the utility sector as a whole has tended to regress toward 0.5, not 1.0.[154]

Blume speculated as to why betas, on average, tend to regress toward 1.0 over time.[155] High-beta firms tend to be newer and smaller; as they mature and grow, they become more risk-averse. In contrast, low-beta firms tend to run out of low-risk investment opportunities and must accept more risk to stay in business. Neither of these causal explanations applies to utility operating companies or the publicly traded members of their proxy group. They are large and mature, and their investments tend to have consistently low risk profiles over time. These attributes combine to keep utilities' betas sustainably and significantly below 1.0.

For low-beta stocks like utilities, the Blume adjustment raises beta closer to 1.0. But because the Blume adjustment is not valid for utilities, adjusted beta overstates actual utility risk relative to the market and thus their actual cost of equity.

[152] Value Line's adjustment weights vary slightly, 0.67 and 0.35, respectively. Value Line also uses logarithmic, not simple, returns and reports beta rounded to the nearest 0.05. Value Line, "Value Line's Estimation of Beta" and personal correspondence, Oct. 6, 2021.

[153] Richard A. Michelfelder, Panayiotis Theodossiou, *Public Utility Beta Adjustment and Biased Costs of Capital in Public Utility Rate Proceedings,* The Electricity Journal Vol. 26, No. 9 (November: 2013), p. 60-68.

[154] One might ask whether the utility sector average reflects the tendency of individual utility stocks. Betas are additive, so a tendency for individual utility stocks to regress toward 1.0, on average, would be reflected in the industry beta. Blume used the same logic to extrapolate from the portfolios he analyzed to individual stocks. *See* Eugene F. Fama and Kenneth R. French, *The Capital Asset Pricing Model: Theory and Evidence,* Journal of Economic Perspectives Vol. 18, No. 3 (Summer: 2004), p. 25-46, 31, available at https://pubs.aeaweb.org/doi/pdfplus/10.1257/0895330042162430.

[155] Marshall E. Blume, *Betas and Their Regression Tendencies*, The Journal of Finance Vol. 30, No. 3 (June 1975), p. 785-795, available at https://doi.org/10.2307/2326858.

3. The Utilities manipulate their beta trailing return histories to inflate their estimates.

Q. What do you mean when you say the Utilities "manipulate" their betas?

A. The Utilities manipulate their betas in two ways. First, as explained above, the Utilities cherry-pick high beta sources. They selectively use only sources that report adjusted beta (which overstates utilities' actual beta) – Value Line and Bloomberg (just Value Line for SCE) – while omitting those same sources' raw betas[156] and betas from other data sources used elsewhere in their analyses.

But PG&E's, SCG's, and SDG&E's manipulation of beta goes beyond just cherry-picking. Bloomberg's standard raw and adjusted betas are based on 2 years of weekly returns.[157] Bloomberg also allows users to override its default return interval and trailing history parameters. In addition to ignoring Bloomberg's raw betas altogether, PG&E and SCG/SDG&E witnesses Bulkley and Nowak override Bloomberg's default trailing return history, increasing it from 2 years to 10. But they fail to clarify that the "Bloomberg" betas they report are based on their overrides of Bloomberg's standard assumptions, and the language they use to describe the resulting betas appears intended to deceive the reader into thinking their "Bloomberg" betas reflect what Bloomberg reports by default, not their own bespoke calculations:

> [T]he beta coefficients reported by Bloomberg are calculated using ten years of weekly returns relative to the S&P 500 Index;[158]

and:

> [T]he reported Beta coefficients from Bloomberg (which are calculated using ten years of weekly data against the S&P 500 Index).[159]

Calculating betas over 10 or more years is a highly unconventional approach, one I have never seen used in practice in my 30+ years of experience working on the cost of capital.

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[156] While Value Line does not report raw beta, un-adjusting their reported betas is a simple mathematical operation: raw=10.67adjusted-0.35.

[157] J. Willard Marriott Library, *Bloomberg Terminal Guide: Beta* (University of Utah: 2025), https://campusguides.lib.utah.edu/c.php?g=160745&p=1052911.

[158] PG&E-2 (Bulkley), p. 2-22.

[159] SCG-03 (Nowak), p. JCN-30; SDG&E-03 (Nowak), p. JCN-31.

Bulkley and Nowak provide no explanation for doing so. Instead, they misleadingly associate their novel, bespoke use of a 10-year trailing return history to Bloomberg, clearly intending to lend their manipulations an air of legitimacy.

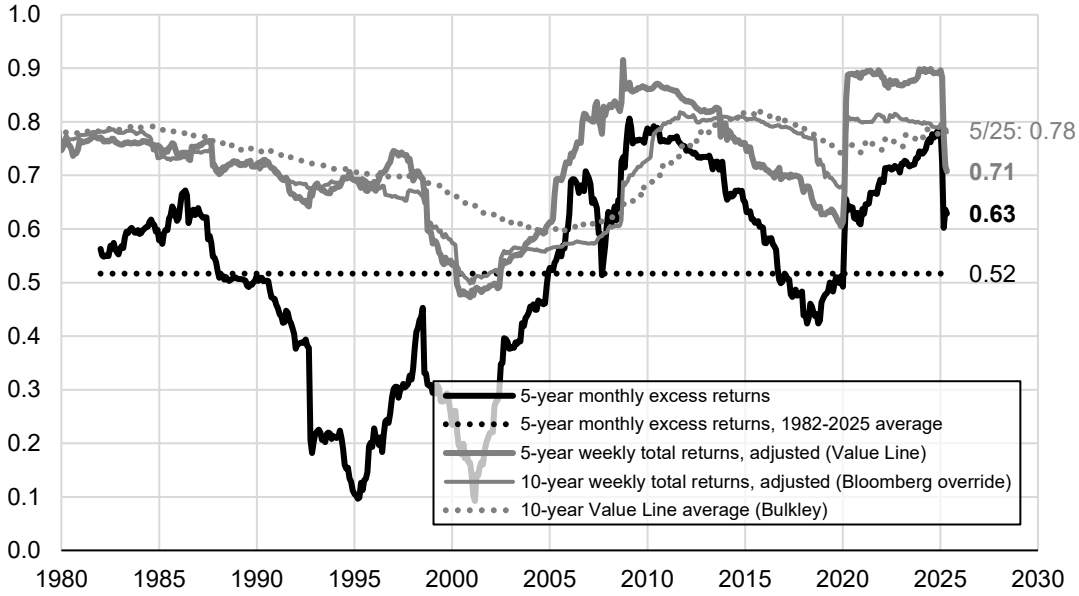
PG&E witness Bulkley takes her manipulation one step further with Value Line's betas. In addition to Value Line's most recent beta and her adjusted and cherry-picked "Bloomberg" beta, she also calculates a third beta for each proxy group member based on the average of the last 10 years of Value Line's reported betas.[160] Because Value Line betas are based on 5 years of trailing data, these betas effectively reflect the last 15 years of returns, an even more unusual trailing history than 10 years.

Q. What effect does the Utilities' cherry-picking and manipulation of Bloomberg's and Value Line's methodologically flawed (for long-term utility COE) betas have on the Utilities' resulting COE estimates?

A. Manipulating the data inflates the Utilities' beta estimates. Figure 14 shows utility-sector average beta calculated according to my and the Utilities' various methodologies, going back to 1980. The Utilities' cherry-picked and manipulated methodologies produce systematically higher betas – 35% to 40% higher, on average.

[160] PG&E-2 (Bulkley), p. 2-22.

Figure 14. Utility-sector average beta calculated under Ellis and Utilities methodologies[161]
January 1980-May 2025



Focusing on the various methodologies' behavior over the last few months sheds light onto the likely motivation behind PG&E's, SCG's, and SDG&E's custom 10-year betas. Utility betas calculated under all methodologies shifted upward in early 2020, due to unusual volatility in utility stocks at the start of the Covid pandemic. As long as that period of volatility is included in the trailing history used to calculate beta, it will elevate betas. Extending the trailing return history to 10 years (15 in Bulkley's 10-year Value Line average) ensures that anomalous period of unusual utility-sector volatility will continue to elevate utility betas for another 5 to 10 years.

Beta is intended to reflect investors' *current forward-looking* expectations. In her book *Risk and Return for Regulated Industries*, SCE witness (and Bulkley's Brattle Group colleague) Villadsen cautions against the use of excessive trailing return histories that don't reflect investors' current, forward-looking expectations:

> "Structural change" means that the risk of the asset relative to the market could change over the estimation period, so that the resulting beta estimate would be a "blend" of the risk of the asset over the historical estimation period

[161] Market capitalization-weighted average of all NYSE-, AMEX-, or NASDAQ-listed utilities. M. Ellis analysis of FDL data [last accessed Jul. 17, 2025]. While it appears betas calculated using weekly returns are more stable over time, this is an artifact of the beta adjustment, which reduces their volatility by 33%. Monthly returns produce more stable raw betas than weekly returns.

> instead of representing the forward-looking risk of the asset today. The choice of a very long-run horizon (say, 10 years) introduces the potential structural change problem for beta estimation, since many economic relationships shift in fundamental ways over a 10-year period. Asset risk relative to the market may not be stable over such shifts, so that return data from early in the estimation period represent a risk relationship with the market that is no longer applicable.[162]

The Covid pandemic was a once-in-a-century global economic disruption that produced an anomalous spate of unusual utility-sector volatility that lasted approximately 4 months, after which utility-sector average beta returned to a level consistent with its long-term historical norm. Bulkley's and Nowak's 10-year (or longer) trailing histories, which include this anomalous volatility that is not reflective of current investor expectations, are exactly what Villadsen cautions against in estimating beta. The anomalous volatility of early 2020 was temporary. As Villadsen states, betas incorporating return data from that period "represent a risk relationship with the market that is no longer applicable."

4. Betas properly calculated for long-term utility COE are significantly lower than the Utilities' estimates.

Q. What are more appropriate betas than the Utilities' cherry-picked, manipulated estimates?

A. As explained previously, the proper way to calculate beta for use in estimating a long-term utility COE is to use 5 years of trailing monthly excess returns (over the return on the risk-free asset), without the Blume adjustment. While betas calculated using this methodology are not available pre-calculated from a third-party, it is relatively simple to calculate them with a spreadsheet model using the same historical return data commonly used elsewhere in cost of capital analysis. Figure 18 summarizes the Utilities' and my beta sources, methodologies, and estimates. The Utilities' betas are all significantly higher, by 18% to 66%.

[162] Villadsen et al., *Risk and Return for Regulated Industries* (Elsevier: 2017), p. 74.

Figure 15. Beta sources and methodologies, Utilities' manipulations, and results

Source	Default methodology	Manipulation	Beta PG&E	Beta SCE	Beta SCG	Beta SDG&E
Utilities		Average	**0.84**	**0.95**	**0.85**	**0.87**
Value line	5-year weekly total returns, adjusted	• None	0.94	0.95	0.92	0.94
		• 10-year average	0.78			
Bloomberg	2-year weekly total returns, raw and adjusted	• 10-year override; omit raw	0.79		0.77	0.79
Ellis	5-year monthly excess returns, raw	None	**0.58**	**0.57**	**0.71**	**0.53**
Utilities – Ellis			**0.26**	**0.37**	**0.13**	**0.34**
			+45%	*+66%*	*+18%*	*+64%*

D. The Utilities' CAPM Market Risk Premiums Are Unrealistically High.

Q. How do the Utilities estimate their CAPM market risk premiums?

A. The CAPM market risk premium is the difference between the forward-looking returns on market return and risk-free rate. All four Utilities correctly use forward-looking market MRPs. SCE incorrectly also cites two historical MRP estimates.[163] For decades, academics and practitioners have known that historical returns have been inflated by various one-off factors and should not be used to estimate future returns.[164]

Nonetheless, the methodologies the Utilities use to estimate their forward-looking MRPs are deeply flawed. The Utilities all estimate expected market returns using the same economically impossible CG DCF they used with their proxy groups. They therefore arrive at unrealistically high market return forecasts.

Q. How do you know the Utilities' CG DCF market returns are unrealistically high?

A. In the Utilities' expected market return CG DCFs, the forecast market DPS growth rates range from 10.0% to 13.8%.[165] Even at the low end of this range, the Utilities' market CG

[163] SCE-02 (Villadsen), p. 44-45.

[164] *See, e.g.*, Eugene F. Fama and Kenneth R. French, *The Equity Premium*, The Journal of Finance Vol. 57 No. 2 (Apr. 2002), p. 637–659. *See, also,* Aswath Damodaran, *Equity Risk Premiums (ERP): Determinants, Estimation, and Implications – The 2025 Edition* (Mar. 5, 2025).

[165] PG&E-2 (Bulkley), p. 2-22; SCE-02 (Villadsen), p. 44-45; SCG-03 (Nowak), p. JCN-30-31; SDG&E-03 (Nowak), p. JCN-32-33.

DCF models project corporate profits, which currently account for approximately 13% of GDP, overtaking the entire US economy in no more than 40 years.[166] The Utilities' grossly unrealistic growth assumptions render their CG DCF-based MRPs useless.

SCE considers two more forward-looking MRPs, from Bloomberg and Kroll. Unsurprisingly, these independent estimates are significantly lower than SCE witness Villadsen's conceptually flawed historical average and CG DCF results. Erroneously comparing them to the historical average, she assigns "little weight" to the lower of the two and considers the higher a "lower bound."[167]

E. The Expected Market Return Should Reflect Realistic Long-Term DPS Growth.

Q. How do you estimate the expected market return?

A. I estimate the long-term expected market return using the MS DCF described in VII above.

Q. What is your assumed current S&P 500 dividend yield?

A. As of June 2025 (using the monthly-average index price), the S&P 500 dividend yield is 1.29%.[168]

Q. What is the source for your MS DCF near-term market return forecast?

A. I use the most recent estimate from S&P Dow Jones Indices (S&P DJI), which is freely available from its website.[169] S&P DJI's near-term market return forecast is released

[166] M. Ellis analysis of FRED data [last accessed Jul. 20, 2025].

[167] SCE-02 (Villadsen), p. 44-45. The referenced historical average, in addition to being conceptually invalid, is arithmetic, not the geometric return that is required when estimating long-term COE. Even if "past performance *is* an indicator of future returns" (which it is not), the arithmetic average is not a valid estimate. *See, e.g.*, Tim Koller, Marc Goedhart, David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 6th ed. (Hoboken, NJ: John Wiley & Sons, Inc., 2015), p. 852-853. Aswath Damodaran, "Discussion Issues and Derivations," last viewed June 14, 2025, available at http://people.stern.nyu.edu/adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html [last accessed July 30, 2025].

[168] M. Ellis analysis of S&P GMI data [last accessed Jul. 16, 2025].

[169] S&P Global, *S&P Dow Jones Indices: S&P 500 EPS estimates* [Excel file] (S&P Global: July 15, 2025), available at https://www.spglobal.com/spdji/en/documents/additional-material/sp-500-eps-est.xlsx [last accessed July 20, 2025].

approximately every other week by S&P DJI's Senior Index Analyst, Howard Silverblatt.[170] As of June 30, 2025, the forecast growth rate for the S&P 500 was 14.3%.

Q. What is the source for your MS DCF market return terminal growth rate?

A. There is a substantial body of research on the relationship between the profits of publicly traded companies and GDP. This research has concluded that the best proxy for long-term *per-share* earnings and dividend growth is per-capita GDP, not total GDP as is commonly assumed.[171] Over the last nearly 100 years, from 1927 to 2024, per-capita GDP growth averaged 1.84%; aggregate market DPS, 1.83% – remarkably close.[172]

To estimate long-term per-capita GDP growth, I use the average, 1.37%, of the most recent long-term real forecasts from three government agencies – the Congressional Budget Office (CBO),[173] the Energy Information Administration (EIA),[174] and the Social Security Administration (SSA)[175] – and add the current market-based inflation forecast, 1.95%, to arrive at an estimated long-term market DPS growth rate of 3.34%.[176]

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[170] *Id.*

[171] M. Ellis analysis of FDL, BLS and Measuring Worth data. *See, e.g.,* Louis Johnston and Samuel H. Williamson, MeasuringWorth, *What Was the GDP Then?* (MeasuringWorth), available at https://www.measuringworth.com/datasets/usgdp/ [lastaccessed June 9, 2025]. *See, e.g.*, Ibbotson and Harrington, *Stocks, Bonds, Bills, and Inflation (SBBI)*, 157-160; Ibbotson and Chen, "Long-Run Stock Returns;" Arnott, "Equity Risk Premium Myths," *Rethinking the Equity Risk Premium*, CFA Institute (2011), p. 71-100.

[172] M. Ellis analysis of FDL, BLS, and Measuring Worth data, *supra*. *See, also, e.g.*, Roger G. Ibbotson and James P. Harrington, *Stocks, Bonds, Bills, and Inflation (SBBI): 2021 Summary Edition* (Duff & Phelps: 2021), p. 157-160 available at https://rpc.cfainstitute.org/sites/default/files/-/media/documents/book/rf-publication/2021/sbbi-summary-edition-2021.pdf. Roger G. Ibbotson and Peng Chen, *Long-Run Stock Returns: Participating in the Real Economy,* Financial Analysts Journal Vol. 59, No. 1 (2003).

[173] Congressional Budget Office, *The Long-Term Budget Outlook: 2025 to 2055 – Long-Term Budget Projections* (CBO: March 2025), available at: https://www.cbo.gov/system/files/2025-03/57054-2025-03-LTBO-econ.xlsx [last accessed July 30, 2025].

[174] Energy Information Administration (EIA), *Annual Energy Outlook 2025 – Table 20: Macroeconomic Indicators* (EIA: Apr. 2025), available at https://www.eia.gov/outlooks/aeo/excel/aeotab20.xlsx.

[175] Social Security Administration, *The 2025 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds – Supplemental Single Year Tables* (June 2025), data available at https://www.ssa.gov/OACT/TR/2025/SingleYearTRTables_TR2025.xlsx [last accessed July 30, 2025].

[176] Growth rates are compounded annually: (1 + 1.37%) x (1 + 1.95%) – 1 = 3.34%.

Q. What is your forward-looking market return?

A. The S&P 500 MS DCF yields a forecast return of 5.81%. This result is in-line with the CMA return forecasts summarized in Figure 3, which average 6.06%. My slightly lower expected market return is likely the result of the market's strong performance in the months since the CMA reports were published. The market has recently been trading at all-time highs. In general, higher stock prices imply lower expected returns.

Q. Your market return forecast is lower than your proxy group average MS DCF COE. How do you explain that?

A. The fact that my market return forecast is so close to the CMA forecasts gives me confidence that my methodology is reasonable. I am less confident that my proxy group average is not overstated.

Q. Why is that?

A. The proxy group DCF results use analysts' EPS growth rates. The analysts who provide the individual stock forecasts that go into the consensus estimates reported by Bloomberg, S&P, Zacks and Yahoo! Finance, and others all come from the "sell side" of the finance sector. The sell side engages in the creation, promotion, and selling of securities offerings. Their clients are not the institutional or public investors that ultimately buy the securities, but the companies, like utilities, seeking to raise money. They are in the business of transactions, not picking the best investments. Hence the ever-present suspicion of optimism bias in their forecasts: they are trying to curry favor with their existing and potential clients and to present the securities they market in the most favorable light.

The likely explanation for the relatively high proxy group MS DCF COEs is that their stock prices haven't risen commensurately with analysts' EPS growth forecasts. Investors are skeptical utilities' earnings growth targets will be met.

Q. If analysts are biased, why should we trust the CMA return forecasts any more than the analyst consensus EPS growth forecasts?

A. CMAs come from the "buy side" – the institutional investors and asset managers that buy securities on behalf of others. They are in the business of trying to find the best investments.

Until a few years ago, few firms publicly distributed their CMA reports, so there is not sufficient data to determine whether they suffer from bias to the same extent as sell-side earnings-per-share (EPS) estimates. But given their objectives, they are incentivized to produce unbiased and accurate forecasts: pessimism risks losing clients, while optimism risks disappointing them.[177]

F. PG&E's and SCE's Empirical CAPM Is Based on Misapplication of Academic Research.

1. The research on which the ECAPM is based is not relevant to long-term utility COE estimation.

Q. Which Utilities use the empirical CAPM?

A. PG&E and SCE use the empirical CAPM (ECAPM).

Q. What is the empirical CAPM?

A. The empirical CAPM (ECAPM) is a modification of the traditional CAPM. It is based on an empirical observation in various historical academic studies that low-beta stocks tended to perform better than predicted by the CAPM, and high-beta stocks worse, resulting in a "flattened" security market line (SML), the relationship between beta and return. To adjust for this flattened relationship, some cost of capital consultants, including PG&E and SCE witnesses Bulkley and Villadsen, modify the traditional CAPM. Bulkley uses the formula:

$$k = r_f + 0.75\beta\left(r_m - r_f\right) + 0.25\left(r_m - r_f\right);$$[178]

and Villadsen:

$$k = r_f + \alpha + \beta\left(r_m - r_f - \alpha\right),$$

where α represents an adjustment to the y-intercept of the SML.[179] Mathematically, the effect of the ECAPM is similar to the Blume beta adjustment, equivalent to adjusting beta toward 1.0. When the ECAPM is used with adjusted betas, the net effect is to further close the gap between the expected market return and the COE calculated using the traditional CAPM with unadjusted beta.

[177] *See, e.g.*, Fajasy, *Why Analyst Estimates Are Often Useless* (StableBread: Mar. 20, 2025), available at https://stablebread.com/why-analyst-estimates-useless/ [last accessed July 30, 2025].
[178] PG&E-2 (Bulkley), p. 24-25.
[179] SCE-02 (Villadsen), p. 46-48.

Q. Is the ECAPM widely used?

A. The ECAPM is used only in utility cost of capital proceedings, particularly by experts testifying on behalf of utilities. No papers validating or endorsing the ECAPM, per se, have been published in peer-reviewed journals, and the ECAPM is not included in commonly used finance textbooks for students and corporate finance professionals. The papers commonly cited in support of the ECAPM discuss only the empirical observation of the flatness of the security market line (SML); they do not propose or validate the ECAPM itself.[180] The ECAPM is mentioned only in utility-focused practitioner guides, such as Morin's *New Regulatory Finance* and Villadsen et al.'s *Risk and Return for Regulated Utilities*.[181] Notably, all the studies cited in both texts calculate beta using monthly returns.

2. The research findings do not support the ECAPM modification to the traditional CAPM for estimating long-term utility COE.

Q. Is the ECAPM valid for estimating the cost of equity for a utility?

A. The ECAPM is not valid for estimating the cost of equity for a utility because the assumptions and data used in the academic studies on which it is based are not analogous to how the CAPM is implemented in utility cost of capital proceedings. There are two important differences.

First, the academic studies Morin and Villadsen et al. cite in support of the ECAPM all use a short-term risk-free rate, typically the 1-month Treasury bill (T-bill) rate. But utility COE CAPMs typically use a long-term risk-free rate – the Treasury bond (T-bond) rate – as I and all the Utilities do in this proceeding. As can be seen in Figure 16, using a short-term rate has the effect of making the SML steeper; the risk-free rate is lower, while the market return is unchanged. The Utilities' ECAPM is based on the observation of a slope that appears flatter than the steeper, short-term T-bill SML in Figure 16. The short-term T-bill SML is the wrong baseline for assessing a long-term CAPM's validity. The appropriate SML for

[180] *See, e.g.*, SCE-02 (Villadsen), App. B, p. 10-11. *See, also,* Morin, *New Regulatory Finance,* p. 189-192.

[181] *Id.* at 189-192. *See, also,* Villadsen et al., *Risk and Return for Regulated Industries*, p. 82-84.

assessing the CAPM's empirical validity for estimating long-term COE is the flatter T-bond SML..[182]

Second, the academic studies cited in support of the ECAPM do not examine utilities specifically. The Utilities' ECAPM implicitly assumes research findings about the market as a whole are necessarily valid for utilities. That may not be true. As observed with beta, utilities' regulatory model can cause their stock returns to behave differently from the market as a whole.

In addition, the academic studies Morin and Villadsen et al. cite in support of the ECAPM are all at least 20 years out of date. The most recent study was published in 2004, based on data through 2003.[183]

When analyses in the papers cited in support of the ECAPM are re-run using a long-term risk-free rate and more recent data, the "flatness" in the SML largely disappears for the market as a whole and completely disappears for utilities. Figure 16 replicates the well-known Fama-French (FF) analysis that is frequently cited in support of the ECAPM, including by SCE's Villadsen.[184] The original FF analysis compared the regression of average annualized monthly total returns of various beta-sorted portfolios against their realized betas, to an SML defined by the market return and the T-bill. It found that the regression was too "flat." [185]

To better reflect how the CAPM is used to estimate utility COE – with a long-term risk-free rate – my FF replication substitutes the total monthly return on the 30-year Treasury bond (T-bond) for the 1-month T-bill yield and calculates beta using excess returns over the

[182] In substituting a long-term Treasury for a short-term risk-free rate, as is typically done in utility cost of capital analyses, analysts are implicitly adopting the zero-beta CAPM developed by Fisher Black, co-creator of the Nobel Prize-winning Black-Scholes option pricing equation. This more general version of the CAPM does not require the existence of a risk-free rate (over the long term, the short-term rate is not risk-free, as investors are exposed to inflation and reinvestment risk; the long-term rate is subject to inflation if held to maturity and capital gains or losses due to interest rate changes if not), just an investable asset or portfolio with a beta equal to zero. Long-term government bonds meet this criterion.

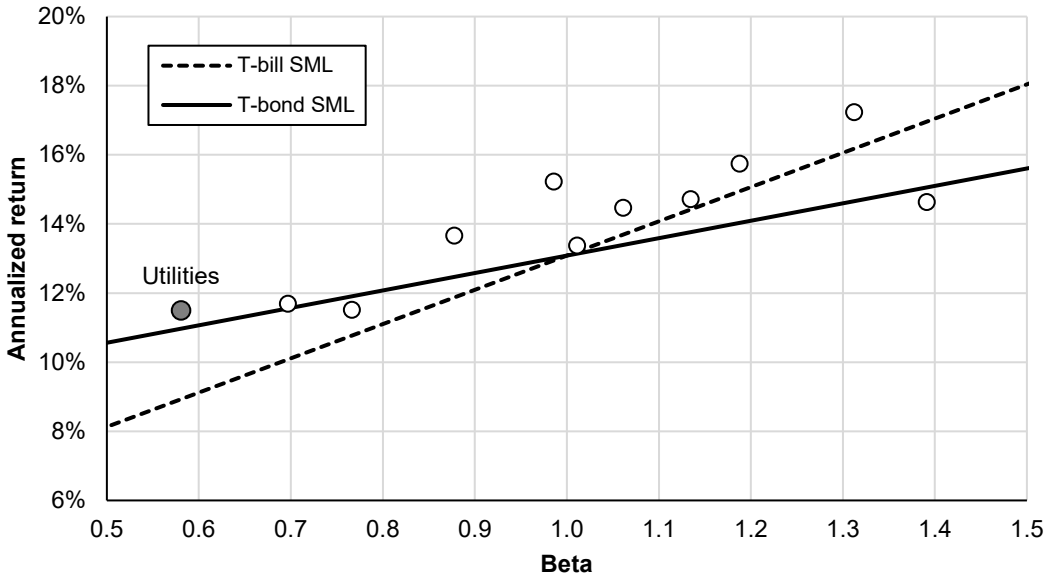
[183] Morin, *New Regulatory Finance*, p. 222. Villadsen, *et al.*, *Risk and Return for Regulated Industries*, p. 83.

[184] SCE-02 (Villadsen), App. B, p. 10-11.

[185] Eugene F. Fama, Kenneth R. French, *The Capital Asset Pricing Model* (Journal of Economic Perspectives, Vol. 18, No. 3: Summer 2004), available at https://mba.tuck.dartmouth.edu/bespeneckbo/default/AFA611-Eckbo%20web%20site/AFA611-S6B-FamaFrench-CAPM-JEP04.pdf [last accessed July 30, 2025].

T-bond return.[186] The data span the 40 years from January 1985 through December 2024. While the beta-sorted portfolios lie slightly above the SML, their regression slope and intercept coefficients are not statistically significantly different than the SML's (t-statistics of 0.90 and 0.33, respectively). Figure 16 also shows where the utility sector lies relative to the SML; its performance is also not statistically significantly different than the SML's prediction (t-statistic of 0.82).[187]

Figure 16. Fama-French CAPM analysis replication with long-term risk-free rate



When the studies upon which the ECAPM is predicated are replicated using a long-term risk-free rate, the traditional CAPM is revealed to be a robust and accurate model of stock market returns, including for the utility sector. As explained above, for low-beta stocks like utility, the ECAPM effectively increases the estimated COE, but this increase is unwarranted. The ECAPM therefore introduces upward biased when estimating utility COE.

[186] M. Ellis analysis of FDL and FRED data [last accessed Jul. 17, 2025].

[187] The t-statistic is the ratio of the departure of the estimated value of a parameter from its hypothesized value to its standard error. In regression models, t-statistics above 2.0 typically indicate that the estimates are statistically significantly different from the hypothesized values – in this case, the slope and intercept of the SML defined by the average T-bond and market returns. The t-statistics of the replicated FF analysis are both well below 2.0, indicating no statistically significant difference between the regression line of portfolio returns and the SML. The t-statistic for the utility sector is also below 2.0, suggesting that its average return is not statistically significantly different from what the SML predicts for its beta.

Despite its name, the empirical data do not support PG&E's and SCE's ECAPM modifications to the traditional CAPM for use in estimating utility COE. Their ECAPM models and results should be disregarded.

G. Implementing the CAPM With Realistic Assumptions Produces Reasonable, Financially Sound COE Estimates.

Q. Please summarize your implementation of the CAPM.

A. I implement the traditional CAPM using:

- Risk-free rate: most recent monthly-average yield on the 30-year Treasury;
- Beta: 5 years of trailing monthly returns;
- Market return forecast: MS DCF based on the S&P 500's current dividend yield and EPS near-term growth rate forecast (from S&P), with terminal growth equal to forecast GDP-per-capita.

Q. How do your CAPM COE results compare to the Utilities'?

A. Figure 17 compares my and the Utilities' CAPM assumptions and resulting COEs. My internally consistent and more realistic CAPM produces COEs of approximately 5.4%, roughly half the Utilities' inflated estimates.

Figure 17. Utility proxy group average levered CAPM assumptions and COE
Percent (except beta)

	PG&E	SCE	SCG	SDG&E
Utilities	**10.91**	**9.60**	**12.00**	**12.17**
Risk-free rate	4.56	4.37	4.56	4.56
Expected market return	12.15	9.90	13.35	13.35
Beta	0.84	0.95	0.85	0.87
Ellis	**5.42**	**5.42**	**5.55**	**5.38**
Risk-free rate	4.89	4.89	4.89	4.89
Expected market return	5.81	5.81	5.81	5.81
Beta	0.58	0.57	0.71	0.53
Utilities – Ellis	**5.48**	**4.18**	**6.44**	**6.79**
	+101	*+77*	*+116*	*+126*
Risk-free rate	-0.33	-0.52	-0.33	-0.33
Expected market return	6.34	4.09	7.54	7.54
Beta	0.26	0.37	0.13	0.34

As explained in IV.B.2 above, the individual proxy group members' COEs, which reflect their respective market-based capital structures, will be unlevered, averaged, and then relevered at each Utility's optimized capital structure. I walk through this analysis in the next section.

IX. OPTIMIZING THE UTILITIES' ROES AND CAPITAL STRUCTURES CAN REDUCE CUSTOMER COSTS 16% WHILE MEETING INVESTOR RETURN REQUIREMENTS.

A. COE Estimates Should Account for Differences in Proxy Group Members' Capital Structures.

Q. In Section IV.B above, you explained that ROE and capital structure must be jointly determined because of the inter-relationships between ROE, capital structure, and credit quality. How do you incorporate your COE results into your integrated ROE-capital structure analysis?

A. All of the proxy group members have some debt, so the COE models produce levered costs of equity. Consequently, the resulting COE estimates are specific to each proxy group member's capital structure. The publicly traded utility holding companies that are, of necessity, used in proxy groups also often hold debt at the parent level, so their equity ratios and COEs will not necessarily accurately reflect even those of their own utility subsidiaries. For these reasons, the resulting proxy group COEs must be adjusted to reflect differences in equity ratio.

To account for differences in capital structure among the proxy group members, the levered COE results must be unlevered to estimate the cost of equity assuming 100% equity financing.[188] The resulting unlevered COEs are then averaged to produce each target utility's unlevered COE. Their respective ROEs are then set equal to their respective relevered COEs, each calculated at its target capital structure.

[188] SCE-02 (Villadsen), App. B, p. 12-15.

Q. Do any of the Utilities adjust their COE results for differences in capital structure?

A. Only SCE does.[189] While the details differ, SCE's general approach similar to mine: unlever each proxy group member's levered COE, using the market value of its outstanding debt and equity, to estimate the expected return on the underlying assets of the company as a whole; average the results to estimate the unlevered cost of capital for the target Utility (e.g., SCE); relever at the target's Utility's recommended capital structure.

A critical difference between my approach and SCE's approach, though, is that my target capital structure is based on explicit, quantitative analysis of the interactions between the relevered COE, capital structure, and credit quality. In contrast, SCE witness Villadsen takes SCE's proposed new capital structure as given.[190] She does not examine whether alternative ROE and capital structure combinations could reduce customer costs. As explained in Section IV.B.1 above, there is ample scope to optimize ROE and capital structure to reduce customer costs while still meeting the return expectations of the Utility's debt and equity providers.

Q. How do you calculate unlevered COE?

A. In the CAPM, the unlevered cost of equity, k_u, is typically expressed as an adjustment to beta:

$$k_u = r_f + \beta_u(r_m - r_f),$$[191]

where the unlevered beta, β_u, is expressed in terms of the levered equity beta, β_e:

$$\beta_u = \frac{E}{D+E}\beta_e.$$[192]

[189] The unlevered cost of equity differs from the weighted average cost of capital (WACC). The unlevered cost of capital assumes 100% equity financing; the WACC assumes the company's current capital structure. While under the Modigliani and Miller theorem of capital structure independence, the cost of capital should be the same regardless of capital structure, the WACC typically overstates the unlevered cost of equity because the *expected* return on corporate debt is lower than the yield due to default and liquidity risk.

[190] SCE-02 (Villadsen), Schedule No. BV-8.

[191] Aswath Damodaran, *Damodaran on Valuation: Security Analysis for Investment and Corporate Finance*, 2nd ed. (Wiley: 2006), p. 129.

[192] Unlevered beta is sometimes adjusted for taxes (the "Hamada" adjustment). As explained in *Valuation*, when the capital structure is constant over time, as it is with utilities, then the value of tax shields tracks the value of operating assets. Thus, the risk of tax shields will mirror the risk of operating assets and have the same discount rate, i.e., the unlevered cost of equity. Ex. SC/PCF-5, Tim Koller, Marc

For consistency and comparability, the same methodology – unlevering relative to the risk-free rate, not the company's cost of debt – should be applied to the MS DCF model results:

$$k_u = r_f + \frac{E}{D+E}\beta_l(r_m - r_f);$$

$$k_e - r_f = \beta_l(r_m - r_f);$$

$$k_u = r_f + \frac{E}{D+E}(k_e - r_f);$$

$$k_u = \frac{D}{D+E}r_f + \frac{E}{D+E}k_e;$$

where D and E refer to debt and equity, respectively.

Best practice is to use market, not book, values for both debt and equity as market reflects investors' actual exposure and expected returns; they buy and sell securities at market value, not book.[193] Market values for the debt carried by proxy group members are not readily available, and they tend to closely track book value, so book value is assumed.

Figure 18 shows each Utility's proxy group members' average levered MS DCF and CAPM COEs, market equity-to-capitalization ratios, and unlevered COEs. The underlying businesses of the proxy group members are very similar, so their risk profiles and corresponding overall costs of capital are expected to be similar. Their market equity ratios vary considerably, though, from 31% to 81%, which introduces variation in their levered costs of equity. To calculate each Utility's ROE, its proxy group members' COEs must be stripped of the effects of differences in leverage and converted to a consistent, unlevered basis.

Goedhart, and David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 7th ed. (John Wiley & Sons, Inc.: 2020), p. 805-811.

[193] *See, e.g.*, Tom Copeland, Tim Koller, Jack Murrin, *Valuation: Measuring and Managing the Value of Companies*, 3rd ed. (John Wiley & Sons, Inc.: 2000), p. 204 ("Where possible, you should estimate *market* values of the elements of the current capital structure") (emphasis added).

Figure 18. Utility proxy group levered COEs, equity ratios, and unlevered COEs
Percent

	PG&E	SCE	SCG	SDG&E
Levered COE	**6.20**	**6.16**	**6.27**	**6.19**
MS DCF	6.99	6.90	6.98	7.00
CAPM	5.42	5.42	5.55	5.38
Equity ratio	**53.4**	**54.7**	**54.0**	**53.3**
Unlevered COE	**5.56**	**5.56**	**5.59**	**5.55**

Q. How do you relever the Utilities' unlevered COEs?

A. The unlevered COE is relevered using the same formula described above, the terms of which can be rearranged as:

$$k_e = \frac{D+E}{E} k_u - \frac{D}{E} r_f.$$

As explained above, the equity ratio required to maintain a desired credit rating depends on the ROE. ROE, in turn, depends on the equity ratio. They can be determined jointly, in an iterative calculation process that is easily performed in common spreadsheet software like Microsoft Excel or Google Sheets.

B. Jointly Optimizing ROE and Capital Structure Can Significantly Reduce Customer Costs.

1. Jointly optimizing ROE and E/C would reduce SDG&E customer costs by $330 million (12%) per year.

Q. But could the ROE or equity ratio be reduced so much that the increases in the cost of equity or cost of debt overwhelm the customer savings?

A. Figure 19 applies the analysis illustrated in Figure 5 to the financial data provided in Moody's April 2025 Credit Update for SDG&E.[194] As before in Figure 5, different levels of ROE are represented by the upward curving lines. As the equity ratio increases along the horizontal axis, so does the cash flow-to-debt ratio, depicted on the vertical axis. Two arcs are shown. The black arc corresponds to SDG&E's requested 11.25% ROE. The second, gray arc reflects the ROE-equity ratio combinations that appropriately balance the consumer

[194] Moody's Ratings, *San Diego Gas & Electric Company: Update to credit analysis* (Apr. 3, 2025), p. 16.

and investor interests, with the ROE set equal to SDG&E's unlevered COE, 5.55% from Figure 18 above, relevered according to the formula discussed above.

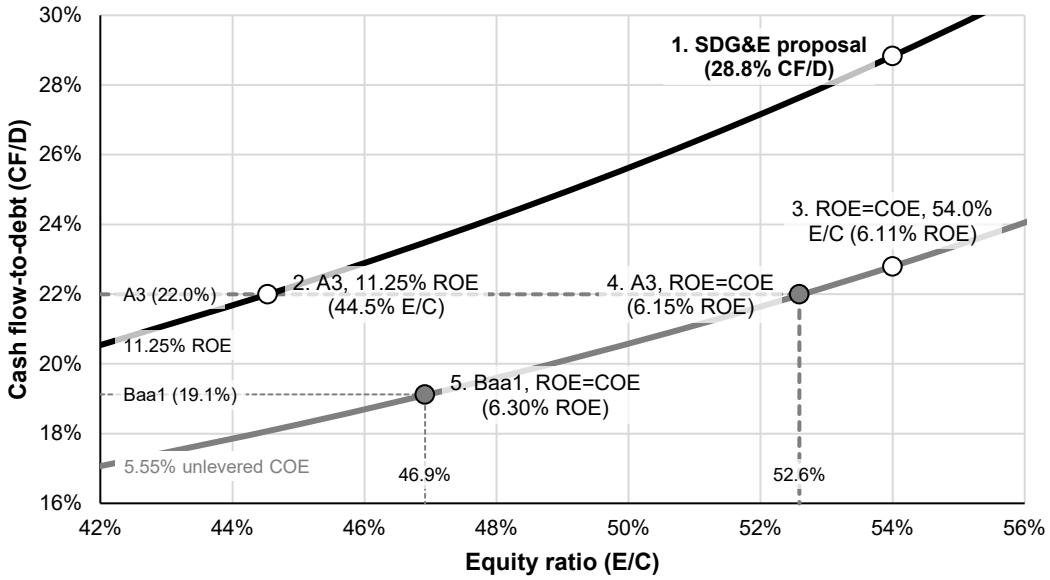
At SDG&E's proposed 11.25% ROE and 54.0% E/C (Scenario 1), CF/D is 28.8%, well above the 22.0% needed to maintain its current A3 rating.[195] At SDG&E's proposed 11.25% ROE, its equity ratio could be as low as 45.3%, and it would still maintain the 22.0% CF/D required for its A3 rating (Scenario 2). Alternatively, at SDG&E's proposed 54.0% E/C, its ROE could drop as low as 6.11%, and it would be able to satisfy the demands of both equity and debt investors (Scenario 3). Scenarios 1 and 2 are above the gray COE arc. Their ROEs are greater than COE, in violation of the ROR=COC standard, i.e., they would effect a wealth transfer from consumers to shareholders. Scenario 3 is on the gray arc, but the corresponding CF/D, 22.8%, is slightly higher than necessary to maintain SDG&E's A3 rating. Maintaining SDG&E's current A3 credit rating with an ROE equal to its COE would require a 52.6% equity ratio and 6.15% ROE (Scenario 4).

SDG&E was recently upgraded by Moody's from Baa1 to A3. Reverting back to Baa1 would correspond to moving down and to the left along the gray arc in Figure 19, to a lower equity ratio (46.9%) and higher ROE (6.30%) in Scenario 5.[196]

[195] CF/D required to maintain current rating estimated as midpoint of Moody's up- and downgrade thresholds.

[196] The CF/D required to maintain a lower rating is estimated from Moody's utility rating methodology and Moody's April 2025 Credit Opinion.

Figure 19. SDG&E CF/D under alternative ROE and E/C scenarios



Q. What are the implications of these various scenarios for customer costs, relative to SDG&E's proposal?

A. The customer impact of these different ROE-equity ratio combinations can be compared by looking at "customer ROR" – the weighted average cost of debt and ROE, the latter grossed-up for the income taxes that are passed through to customers[197] – shown in Figure 20.

For an apples-to-apples comparison with SDG&E's proposal, the cost of future issuance in SDG&E's embedded cost of debt is adjusted by the difference in June 2025 interest rates corresponding to the various credit ratings assumed in Scenarios 2-5. For example, the June 2025 rate corresponding to the A3 rating in Scenarios 2 and 4 is 5.99%, while the Baa1 rate in Scenario 5 is 6.06%, 0.07% higher. Because only future debt issuance is adjusted, the impact on the total cost of debt is just 0.01%. SDG&E's proposed COD does not appear to have been adjusted to reflect its recent upgrade, so COD in Scenario 1 is not adjusted for the credit improvement that a 28.8% CF/D, well above the 24% threshold for an A2 rating, would entail.

Scenario 2 demonstrates that, even if we were to accept that SDG&E's proposed ROE reflects its true cost of equity – although we should be skeptical, given that it was developed

[197] Marginal tax rate from 2024 General Rate Case A.22-05-015/-016, Southern California Gas Company (U 904 G) and San Diego Gas & Electric Company (U 902), "Update Testimony" (Jul. 2023), Table RH-15, p. B-15.

without any consideration of credit metrics – scope exists for a lower equity ratio, 44.5%, to reduce the tax-affected customer ROR by 10.1% without jeopardizing SDG&E's current credit rating. Figure 20 also shows the impact of the various scenarios on SDG&E's total revenue (or average customer rate), under "ΔSDG&E proposal." Under SDG&E's proposal, the customer cost of capital – interest, net income, income tax – accounts for 28% of total revenue of $2.75 billion, so a 9% reduction in customer ROR would reduce customer costs by $90 million, or 3%.[198]

Reducing the ROE to the minimum required to maintain an A3 credit rating at 54.0% E/C (Scenario 3) would produce substantially more savings: 37% in customer ROR and $330 million (12%) in total customer costs. Coincidentally, SDG&E's proposed 54.0% E/C is close to the optimal E/C under the ROR=COC standard and SDG&E's current A3 credit rating (Scenario 4), which produces comparable savings. Scenarios 3 and 4 demonstrate that, in general, reducing the ROE, even if it requires a higher equity ratio, is a much more effective way to reduce customer costs than reducing the equity ratio.

Figure 20. Customer rate of return and savings relative to SDG&E proposal
Percent (unless otherwise indicated)

	Scenario				
	1. SDG&E proposal	2. A3, 11.25% ROE	3. ROE=COE, 54.0% E/C	**4. A3, ROE=COE**	5. Baa1, ROE=COE
ROE	11.25	11.25	6.11	**6.15**	6.30
E/C	54.0	44.5	54.0	**52.6**	46.9
CF/D	28.8	22.0	22.8	**22.0**	19.1
COD	4.62	4.61	4.61	**4.61**	4.62
ROR	8.20	7.57	5.42	**5.42**	5.41
Customer ROR	10.87	9.77	6.87	**6.84**	6.71
ΔSDG&E proposal					
Customer ROR		-10.1	-36.8	**-37.1**	-38.3
Total revenue ($ B)		-0.09	-0.32	**-0.33**	-0.34
Total revenue		-3.2	-11.8	**-11.9**	-12.3

Scenario 5 is the optimal ROE and E/C – 6.30% and 46.9%, respectively – at SDG&E's Baa1 credit rating prior to its recent upgrade. Customer ROR is lower than under its new A3 rating (6.71% vs. 6.84%), suggesting the credit upgrade was not necessarily in customers'

[198] Total revenue from D.24-12-074, Decision Addressing the 2024 Test Year General Rate Cases of Southern California Gas Company and San Diego Gas & Electric Company, App. A, p. 5 (adjusted for SDG&E's proposed rate of return).

interest, although the total customer savings – $10 million – is relatively modest. Although the data presented here show the effect of the different credit ratings on only incremental debt, a sensitivity assuming all debt is repriced at the corresponding credit rating produced similar results – SDG&E's total ROR, grossed up for taxes, would be 0.1% lower at a Baa1 credit rating than at its current A3.

Q. What are your recommended ROE and equity ratio for SDG&E?

A. Based on the foregoing analysis, I recommend Scenario 4 (shaded) – 6.15% ROE and 52.6% E/C – which minimizes customer costs while maintaining SDG&E's current A3 credit rating. This ROE and equity ratio would reduce customer bills by approximately 12% on average, $330 million per year in aggregate.

2. Jointly optimizing ROE and E/C would reduce SCG customer costs by $440 million (11%) per year.

Q. How do you incorporate SCG's preferred equity into your ROE and E/C analysis?

A. SCG has requested preferred equity financing for 2.40% of rate base, with a 6.00% return. In modeling SCG's proposal, I use the weighted average of SCG's preferred and common returns, 10.78%, and the sum of their shares of total capital, 54.4%.[199]

I do not include preferred equity in the other modeled scenarios. At SCG's current $12.3-billion rate base,[200] its proposed 2.4% preferred equity layer would equal $300 million. SCG has only $21.6 million of preferred equity outstanding[201] – 0.17% of rate base – and does not plan to issue more.[202] SCG's proposed 6.00% preferred return – which, as a distribution of profit, would be grossed-up for taxes to 8.5%[203] – would cost customers $10 million per year more than if the same 2.40% of rate base were financed with debt at SCG's proposed 5.02% embedded COD. SCG provides no explanation for why the Commission should allow it to

[199] (52.0% x 11.00% + 2.40% x 6.00%) / (52.0% + 2.40%) = 10.78%.
[200] D.24-12-074, Decision Addressing the 2024 Test Year General Rate Cases of Southern California Gas Company and San Diego Gas & Electric Company, App. A, p. 5, available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M550/K961/550961350.pdf.
[201] SCG Embedded Cost of Debt Exhibits, App. B.
[202] SCG-02 (Gonzalez), p. RG-14.
[203] At SCG's 1.41 N-T-G multiplier from 2024 General Rate Case A.22-05-015/-016, Southern California Gas Company (U 904 G) and San Diego Gas & Electric Company (U 902), "Update Testimony" (Jul. 2023), Table RH-15, p. A-15.

collect from customers the costs of this relatively expensive form of capital, over 90% of which are "phantom" costs that SCG does not currently incur nor plan to in the future.

SDG&E has recommended eliminating preferred equity from its capital structure, having determined that:

> Preferred stock is rarely used by utility operating companies. SDG&E can only find two utility operating companies that have outstanding preferred stock issued in the last decade. The relative cost of issuing preferred stock remains significantly higher than debt financing. … By contrast, SDG&E has been successful at issuing debt at low interest rates and using common equity to fund its large capital investment plan, further arguing against using preferred stock.[204]

Given that SCG's own sister company has determined that preferred stock is neither necessary nor cost-effective, SCG has scant grounds to request any for itself, and certainly not 14 times more than what it plans to maintain.

Q. What about the outstanding $21.6 million of preferred equity? Wouldn't that impact your results?

A. All scenarios were analyzed with and without SCG's current outstanding $21.6 million of preferred equity in the capital structure. The incremental cost to customers relative to SCG's embedded cost of debt is less than $1 million, too small to affect the results presented in Figure 20, which are rounded to the nearest $10 million.[205]

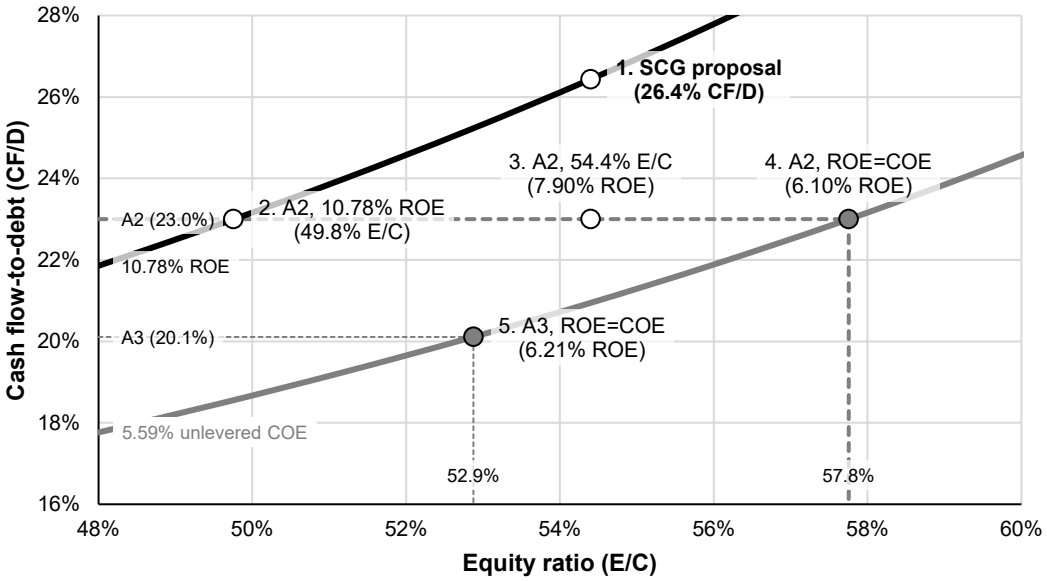
Q. What ROE and E/C scenarios did you analyze for SCG?

A. I analyzed a set of CF/D scenarios similar to those for SDG&E, also using data from Moody's April 2025 Credit Update[206] and shown in Figure 21. In Scenario 1, SCG's proposed 10.78% weighted-average ROE and 54.4% E/C, CF/D is 26.4%, well above the 23.0% needed to maintain its current A2 rating. Scenario 2 reflects the minimum E/C, 49.8%, needed at SCG's proposed 10.78% ROE to maintain the 23.0% CF/D commensurate with its

[204] SDGE-02 (Mekitarian), p. MM-9.
[205] $21.6 million x (8.46% – 5.02%) = $0.74 million.
[206] Moody's Investors Service, *Southern California Gas Company: Update to credit analysis* (Moody's Investor Service: April 3, 2025), p. 16.

current A2 rating. Scenario 3 reflects the minimum ROE, 7.90%, required to maintain its A2 rating at its proposed 54.4% E/C. Scenario 4 reflects the combined ROE (6.10%) and E/C (57.8%) that minimize customer ROR while meeting the requirements of both equity and debt investors at its current A2 rating. Finally, Scenario 5 is the combined ROE (6.21%) and E/C (52.9%) that minimize customer ROR while meeting the requirements of both equity and debt investors at a lower A3 rating.

Figure 21. SCG CF/D under alternative ROE and E/C scenarios



Q. How do the customer costs of these alternative scenarios compare?

A. Figure 22 presents the same customer impact data for SCG summarized in Figure 20 for SDG&E. Directionally, the results are the same:

- SCG's proposed 10.78% combined ROE could support a substantially lower E/C – 49.8% vs. 54.4% – while maintaining its current A2 credit rating (Scenario 2), reducing customer costs by 1.6%, $60 million in aggregate;[207]
- Alternatively, SCG could maintain an A2 rating at its proposed 54.4% E/C and a 7.90% ROE, reducing customer costs by 7.1% or $270 million (Scenario 3);
- Neither of these is optimal, though;

[207] D.24-12-074, Decision Addressing the 2024 Test Year General Rate Cases of Southern California Gas Company and San Diego Gas & Electric Company, App. A, p. 4, available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M550/K961/550961350.pdf.

- Maintaining an A2 rating while adhering to the ROR=COC standard (Scenario 4) would require a 6.10% ROE and 57.8% E/C and would reduce customer costs by 11.1% ($430 million);
- Moving to a lower A3 rating (Scenario 5), at 6.21% ROE and 52.9% E/C, would further reduce customer costs, by 11.4% ($440 million).

Figure 22. Customer rate of return and savings relative to SCG proposal
Percent (unless otherwise indicated)

	Scenario				
	1. SCG proposal	2. A2, 10.78% ROE	3. ROE=COE, 54.4% E/C	4. A2, ROE=COE	**5. A3, ROE=COE**
ROE	10.78	10.78	7.90	6.10	**6.21**
E/C	54.4	49.8	54.4	57.8	**52.9**
CF/D	26.4	23.0	23.0	23.0	**20.1**
COD	5.02	4.98	4.98	4.98	**4.99**
ROR	8.15	7.87	6.57	5.63	**5.64**
Customer ROR	10.56	10.07	8.33	7.07	**6.99**
ΔSCG proposal					
Customer ROR		-4.7	-21.1	-33.0	**-33.8**
Total revenue ($ B)		-0.06	-0.27	-0.43	**-0.44**
Total revenue		-1.6	-7.1	-11.1	**-11.4**

Q. What are your recommended ROE and equity ratio for SCG?

A. Based on the foregoing analysis, I recommend Scenario 5 (shaded) – 6.21% ROE and 52.9% E/C – which minimizes customer costs while maintaining a still-strong A3 credit rating, comparable to SDG&E's. This ROE and equity ratio would reduce customer bills by over 11% on average, $440 million per year in aggregate.

Q. What is your recommendation for preferred equity?

A. The Commission should direct SCG to retire its preferred equity. At a minimum, it should include in its authorized capital structure only the actual $21.6 million of preferred equity (0.24% of rate base) actually outstanding. If the existing preferred equity is maintained, the total equity ratio – common and preferred – should still be 52.9% (of which only 0.16% would be preferred). Assuming SCG's requested 6.00% preferred return, SCG's ROE on the 52.7% of rate base financed by common equity should be the same 6.21%.

3. Jointly optimizing ROE and E/C would reduce SCE customer costs by $2.02 billion (18%) per year.

Q. What are your recommended ROE and equity ratio for SCE?

A. Figure 23 and Figure 24 present the same set of analyses for SCE that were conducted for SDG&E, SCG, and PG&E.[208] SCE's proposed combined 11.33% ROE and 57% E/C would yield a CF/D of over 30%, placing it well into the A1 rating band, 3 full notches above its current Baa1 rating.

As with PG&E, I recommend an ROE and E/C that will increase SCE's CF/D enough to qualify for an upgrade, to A3: 6.11% ROE and 54.7% E/C. Total customer savings would be $2.02 billion (18%) per year.

As with SCG, I recommend retiring SCE's outstanding preferred equity. If SCE's proposed 5.0% preferred equity layer with a 6.95% preferred is adopted, SCE's common equity ratio should be reduced to 54.7% – 5.0% = 49.7% and its common equity ROE reduced to 6.03%.

[208] Moody's Ratings, *Southern California Edison Company: Update to credit analysis* (Moody's Ratings: March 31, 2025), p. 3, 9-10. *See, also,* A.23-05-010, Proposed Decision on Test Year 2025 General Rate Case for Southern California Edison Company, Appendix B (CPUC: July 28, 2025), p. 6 (describing Post Test Year Summary of Earnings).

Figure 23. SCE CF/D under alternative ROE and E/C scenarios

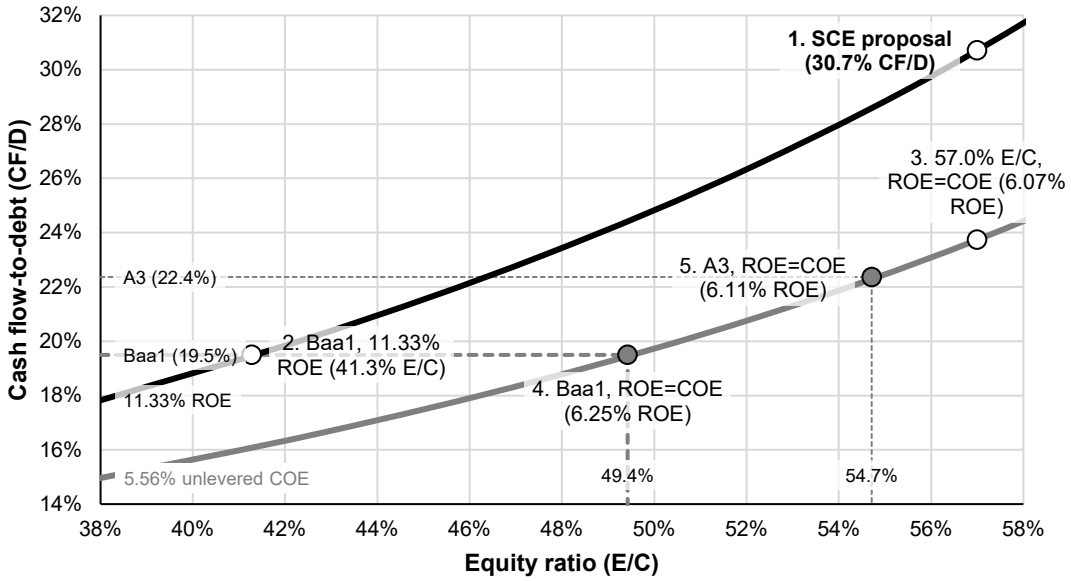


Figure 24. Customer rate of return and savings relative to SCE proposal
Percent (unless otherwise indicated)

	Scenario				
	1. SCE proposal	2. Baa1, 11.33% ROE	3. 57.0% E/C, ROE=COE	4. Baa1, ROE=COE	**5. A3, ROE=COE**
ROE	11.33	11.33	6.07	6.25	**6.11**
E/C	57.0	41.3	57.0	49.4	**54.7**
CF/D	30.7	19.5	23.7	19.5	**22.4**
COD	4.75	4.70	4.69	4.70	**4.70**
ROR	8.50	7.44	5.48	5.46	**5.47**
Customer ROR	11.35	9.50	7.00	6.83	**6.95**
ΔSCE proposal					
Customer ROR		-16.3	-38.3	-39.9	**-38.8**
Total revenue ($ B)		-0.85	-1.99	-2.07	**-2.02**
Total revenue		-7.4	-17.3	-18.0	**-17.5**

4. Jointly optimizing ROE and E/C would reduce PG&E customer costs by $3.30 billion (16%) per year.

Q. What are your recommended ROE and equity ratio for PG&E?

A. Figure 25 and Figure 26 present the same set of analyses for PG&E that were conducted for SDG&E, SCG, and SCE.[209] PG&E's proposed 11.27% combined ROE and 52.3% E/C would yield a CF/D of 24.8%, placing it in the A3 rating band.

Given PG&E's current relatively low Baa3 credit rating, I recommend an ROE and E/C that will increase PG&E's CF/D enough to qualify for an upgrade to Baa2: 6.22% ROE and 50.4% E/C. Total customer savings would be $3.33 billion (16%) per year.

As with SCG and SCE, I recommend retiring PG&E's outstanding preferred equity. If PG&E's preferred equity is maintained, its total E/C, including preferred and common equity, and ROE would be unchanged: 50.4% and 6.22%, respectively.

[209] Moody's Ratings, *Pacific Gas & Electric Company: Update to credit analysis following upgrade* (Moody's Ratings: April 2, 2025), p. 3, 15-16. A.25-05-009, Application of Pacific Gas and Electric Company for Authority, Among Other Things, to Increase Rates and Charges for Electric and Gas Service Effective on January 1, 2027, Attachment E, Table 1 (May 15, 2025), available at https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M566/K363/566363587.PDF.

Figure 25. PG&E CF/D under alternative ROE and E/C scenarios

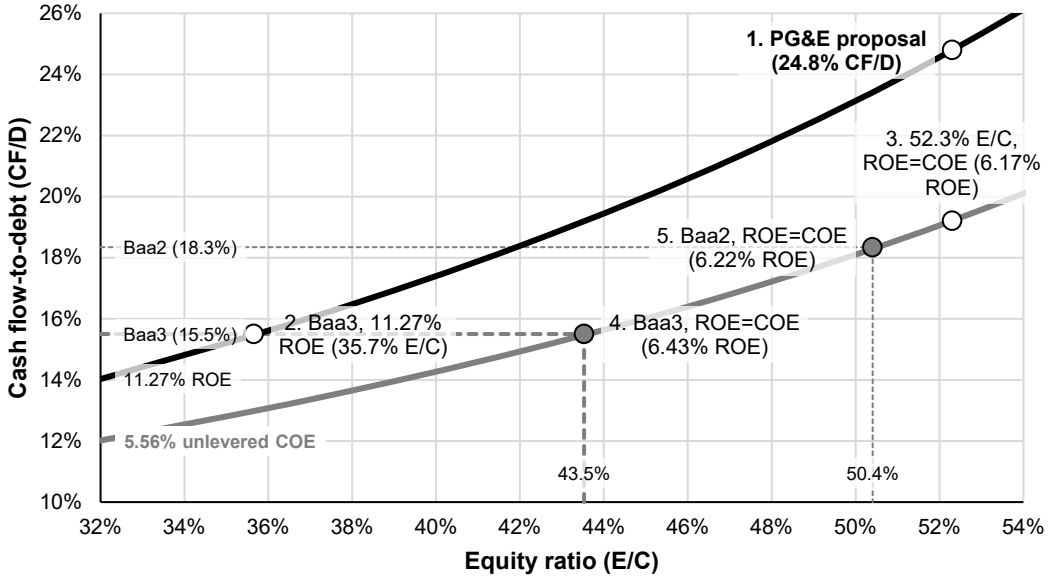


Figure 26. Customer rate of return and savings relative to PG&E proposal
Percent (unless otherwise indicated)

	Scenario				
	1. PG&E proposal	2. Baa3, 11.27% ROE	3. ROE=COE, 52.3% E/C	4. Baa3, ROE=COE	**5. Baa2, ROE=COE**
ROE	11.27	11.27	6.17	6.43	**6.22**
E/C	52.3	35.7	52.3	43.5	**50.4**
CF/D	24.8	15.5	19.2	15.5	**18.3**
COD	5.05	5.02	5.00	5.02	**5.01**
ROR	8.30	7.25	5.61	5.63	**5.62**
Customer ROR	10.89	9.01	7.03	6.86	**7.00**
ΔPG&E proposal					
Customer ROR		-17.3	-35.4	-37.0	**-35.8**
Total revenue ($ B)		-1.61	-3.30	-3.44	**-3.33**
Total revenue		-7.7	-15.8	-16.5	**-15.9**

Combined, my ROE and capital structure recommendations would save the Utilities' customers nearly $6.1 billion (16%) per year.

C. Potential Objections to Immediately Setting ROE Equal to COE Do Not Withstand Scrutiny.

Q. Would lower ROEs adversely impact the Utilities' parent companies' stock prices?

A. Yes. The Utilities' parent companies' stock price would likely experience a one-off downward adjustment if SDG&E's and SCG's RORs were aligned with their market-based

COCs. But maintenance of the parent company's stock price, per se, is not a direct regulatory concern; balancing the interests of consumers and investors is regulators' primary concern. *Hope* settled this question over 80 years ago:

> Ratemaking is indeed but one species of price-fixing. The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. But the fact that the value is reduced does not mean that the regulation is invalid. It does, however, indicate that "fair value" is the end product of the process of ratemaking, not the starting point, as the Circuit Court of Appeals held. The heart of the matter is that rates cannot be made to depend upon "fair value" when the value of the going enterprise depends on earnings under whatever rates may be anticipated.[210]

Under *Hope* "[t]he Commission is not obligated to set ROEs so as to maintain current stock values."[211]

Q. Should the regulator be concerned about reducing ROE to COE in a single step?

A. No. The principle of gradualism typically applies to sudden, dramatic rate *increases*. Reducing ROE to COE would reduce, not increase, rates. The magnitude of the rate reduction from setting ROE equal to COE is significant –16% on average – but it would only offset a portion of SDG&E's and SCG's recent rate increases, which customers would undoubtedly appreciate.

The Utilities' credit ratings, by design, would be at their target levels. The only material difference would be a reduction in the profit available for the Sempra Utilities to distribute to their parent.

It is important to keep in mind that an ROE above COE effects an unnecessary and unearned wealth transfer from SDG&E and SCG customers to Sempra shareholders. If it were discovered that either Sempra Utility were otherwise overcharging customers – through,

[210] *Federal Power Commission v. Hope Natural Gas Co.* (1944) 320 U.S. 591, 601.

[211] FERC Opinion No. 569, p. 61,769 ("The Commission is not obligated to set ROEs so as to maintain current stock values.[] As the Supreme Court held in *Hope*, the 'fair value' of a regulated enterprise 'is the end product of the process of ratemaking, not the starting point ... The heart of the matter is that rates cannot be made to depend on "fair value" when the value of the going enterprise depends upon earnings under whatever rates are anticipated.'[] Consistent with this holding in *Hope*, the Commission has stated, 'The market value of an enterprise or its common stock depends upon its earnings or anticipated earnings, which in turn depend upon the rates allowed. Thus, market value is the result of the ratemaking process and may not properly be the beginning of that process as well.[]'")

say, faulty billing software – the Commission would not delay in directing them to correct the problem, regardless of the cost to Sempra shareholders. Excessive RORs should be seen in the same light.

X. THE UTILITIES' CLAIMS THAT THEIR UNIQUE RISKS JUSTIFY HIGHER ROES CONTRADICT FOUNDATIONAL FINANCE PRINCIPLES.

Q. In developing your ROE recommendation, you took the simple average of your individual model results. Do the Utilities' witnesses do the same?

A. No. As shown in Figure 2, the averages of the results of the Utilities' COE models (DCF, CAPM, ECPAM, RPA, EEA) are 10.77%, 10.00%, 10.88%, and 10.97% for PG&E, SCE, SCG, and SDG&E, respectively – lower than their final ROE recommendations of 11.30%, 11.75%, 11.25% and 11.00%. They justify these higher recommendations by citing various business and financial risks.[212]

Q. Do the various risks described by the witnesses justify a higher ROE?

A. The witnesses present no evidence or justification in support of any specific numeric adjustment for the risks they identify. The magnitude of their adjustments is arbitrary.

Q. But doesn't higher risk necessarily entail a higher return (the risk-return trade-off), as you described in VIII.A above?

A. It is true that higher-risk investments generally have higher expected returns. There are well-established financial principles and methodologies that can be used to adjust the cost of capital for risk; merely listing various risks and making arbitrary adjustments is not one of them.

Q. Please explain those financial principles and methodologies.

A. One of the most fundamental principles of finance, the Nobel Prize-winning modern portfolio theory (MPT), is that firms are only rewarded for their systematic, non-diversifiable

[212] PG&E-2 (Bulkley), p. 2-29-40; SCE-02 (Villadsen), p. 62-72 ; SCG-03 (Nowak), p. JCN-38-57, 59; SCG-03 (Nowak), p. JCN-37-44, 46.

risk, not their unique, firm-specific risks. As PG&E and SCE witnesses Bulkley's and Villadsen's Brattle Group colleagues explain:

> Finance theory explicitly distinguishes the type of risk that affects the cost of capital from risks that do not. The cost of capital is a function of the first: the systematic risk of the assets owned by the company. Another portion of the total risk is the unique risk, which can be eliminated through diversification and so does not affect the cost of capital. This distinction between diversifiable and non-diversifiable risk is based upon modern portfolio theory, which demonstrated that a portion of an investment's total risk can be eliminated or be "diversified away" when the investment is included in a well-designed portfolio of investments. Only the remaining nondiversifiable risk affects the cost of capital, and its amount is typically measured by its beta.
>
> The portion of the risk that can be eliminated does not affect the cost of capital because capital markets do not reward investors for risks that can be avoided. Nonetheless, diversifiable risk should not be ignored by investors or policy makers. The price investors are willing to pay for an investment depends upon both types of risk. *Unique events, good or bad, will affect a company's stock price, but they do not affect its cost of capital*.[213]

Q. How does MPT apply to the Utilities' ROEs?

A. MPT is relevant to the calculation of the Utilities' ROEs in two ways. First, MPT is the theoretical foundation for the CAPM, the most well-known and widely used COC model.[214] I and all three of the Utilities' witnesses use it; we all accept the validity of MPT.

Second, in explaining their upward adjustments, the witnesses refer to various risks that are unique or specific to their utility. For example, SCE witness Villadsen refers to "unique factors" and "specific circumstances"[215] and SCG/SDG&E witness Nowak to "factors

[213] Michael J. Vilbert, Joseph B. Wharton, Shirley Zhang, and James Hall, *Effect on the Cost of Capital of Ratemaking that Relaxes the Linkage between Revenue and kWh Sales An Updated Empirical Investigation of the Electric Industry* (The Brattle Group: November, 2016), p. 18-19 (emphasis added), available at https://www.brattle.com/wp-content/uploads/2017/10/5711_effect_on_the_cost_of_capital_of_ratemaking_that_relaxes_the_linkage_between_revenue_and_kwh_sales.pdf.

[214] *See, e.g.,* Richard A. Brealey, Stewart C. Myers, Franklin Allen, *Principles of Corporate Finance*, 10th ed. (New York: McGraw-Hill/Irwin: 2011), p. 185-199, available at https://www.govinfo.gov/content/pkg/FR-2008-08-14/pdf/E8-18865.pdf.

[215] SCE-02 (Villadsen), p. 11, 62.

specific" to SDG&E's and SCG's risk profiles[216] in adjusting their ROE recommendations. Similarly, PG&E Witness Bulkley's adjustment is predicated on PG&E's "regulatory, business, and financial risk relative to the proxy group."[217] These are precisely the types of risk that MPT tells us are diversifiable and therefore do *not* affect the cost of capital. The Utilities' rationales for their risk adjustments – company-specific risk factors – are contradicted by the very theory they use to estimate their respective COEs.

Q. Do any of the Utilities attempt to address the contradiction between MPT and their proposed adjustments to their ROEs for diversifiable risks?

A. SCE does. SCE witness Villadsen states that, because wildfire risk is "asymmetric," the results of standard COE models do not reflect it.[218] She provides no academic research or empirical analysis to support this claim.

Her assertion is flawed on its face. Standard COE models like the CAPM and DCF do not require risks to be symmetric to retain their validity. Financial risk is almost universally asymmetric – equity in particular, where losses bottom out at -100%, but gains are unlimited.

SCE witness Villadsen conflates asymmetry with systematicity, a distinction fundamental to modern finance. There is no support in the literature or practice for her claim that the CAPM and DCF fail to appropriately account for asymmetric risk simply because of its shape.

XI. UTILITIES' COC EXPERTS' FLAWED EXPLANATIONS FOR M/B RATIOS GREATER THAN 1.0.

Q. Have utilities' cost of capital experts objected to using market-to-book ratios as a "guide to regulators"?

A. Yes. COC experts from The Brattle Group, in their book *Risk and Return for Regulated Industries*, widely cited utility cost of capital expert Roger Morin, in his book *New Regulatory Finance*, and Witness Nowak's former Concentric colleague Ann Bulkley, now

[216] SDG&E-03 (Nowak), p. JCN-38; SCG-03 (Nowak), p. JCN-37.
[217] PG&E-02 (Bulkley), p. 2-40.
[218] SCE-02 (Villadsen), p. 6.

with Brattle, have attempted to refute the argument that utility market-to-book ratios indicate ROEs exceed their costs of equity.

A. SCE Witness Villadsen and Her Brattle Group Colleagues Incorrectly Interpret Research on Decision-Making Irrationality to Try to Explain Elevated M/B Ratios.

Q. Please describe the flaws in the argument made in The Brattle Group book.

A. In *Risk and Return for Regulated Industries*, whose coauthors include the very same Kolbe who previously advocated for the use of M/B as a "guide to regulators," refer to Nobel laureate Robert Shiller's prize lecture to argue that market prices do not necessarily reflect investors' expected returns, and therefore M/B ratios greater than 1.0 do not indicate that a utility is expected to earn more than its cost of capital:

> [W]e now know that the market-to-book ratio does *not* signal reliably whether a utility earns more or less than its cost of capital.
> …
> Professor Shiller holds instead that market prices are materially affected by human traits that are not always in accord with pure economic rationality. Among other things, Professor Shiller has shown that the standard present value formula does not explain stock prices, which are too volatile for that model to hold true. If stock prices are nonetheless rationally priced, it is in accord with a formula that we do not yet know.[219]

Yet in that very same address Shiller points out that his research on "human traits" and "economic rationality" applies only to the market overall, not to individual stocks:

> These conclusions about the aggregate stock market, however, do not carry over fully to individual stocks. [Nobel laureate] Paul Samuelson has asserted that:
>
> [The market is] micro efficient but macro inefficient. That is, individual stock price variations are dominated by actual new information about subsequent dividends, but aggregate stock market variations are dominated by bubbles.
> …

[219] Bente Villadsen et al., *Risk and Return for Regulated Industries* (Elsevier: 2017), p. 295-296 (emphasis in original).

> Thus, bubbles and their bursts cannot have more than a minor impact on the returns of individual stocks, and most of the variation in their returns comes from news about the future payouts the firms will make.[220]

Shiller goes on to specifically explain that "ratios" like M/B "reflect real knowledge about future cash flows" and are therefore "useful approximation of reality for individual firms":

> In individual firms there is sometimes a lot of action in the ratios, and the action in fact often reflects real knowledge about future cash flows. That is an example of the kind of idiosyncratic knowledge about individual firms that makes the efficient markets model a useful approximation of reality for individual firms.[221]

The Brattle Group authors misinterpret Shiller's research by applying his findings about the aggregate market to individual stocks, which Shiller expressly warns against. Shiller establishes that the market-to-book ratio reveals important information about the value of individual stocks like utilities, and does, in fact, "signal reliably whether a utility earns more or less than its cost of capital."

B. Roger Morin's Explanations for M/B>1.0 1.0 Are All Deeply Flawed.

Q. Does Morin acknowledge the relationship between M/B ratio and ROE?

A. Yes. Morin acknowledges the fundamental relationship between market-to-book ratio and ROE:

> [I]f regulators set the allowed rate of return equal to the cost of capital, the utility's earnings will be just sufficient to cover the claims of the bondholders and shareholders. No wealth transfer between ratepayers and shareholders will occur.
> The direct financial consequence of setting the allowed return on equity, r, equal to the cost of equity capital, K, is that share price is driven toward book value per share, at least in theory under ideal conditions. Intuitively, if r > K, and is expected to remain so, then market price will exceed book value per

[220] Robert J. Shiller, *Speculative Asset Prices* (Nobel Prize Lecture: December 2013), p. 476, available at https://www.nobelprize.org/uploads/2018/06/shiller-lecture.pdf.
[221] *Id*. at 478.

> share since shareholders are obtaining a return [on book equity] in excess of their opportunity cost.[222]

Nonetheless, Morin advises regulators *not* to look at the M/B ratio for guidance in determining whether ROE exceeds the cost of equity:

> It is sometimes argued that because current M/B ratios are in excess of 1.0, this indicates that companies are expected by investors to be able to earn more than their cost of capital, and that the regulating authority should lower the authorized return on equity, so that the stock price will decline to book value. It is therefore plausible, under this argument, that stock prices drop from the current M/B value to the desired M/B range of 1.0 times book.
>
> There are several reasons why this view of the role of M/B ratios in regulation should be avoided.[223]

Morin provides four reasons to ignore M/B ratios in assessing ROEs. All four are flawed; some lack any reasonable foundation.

Q. Please describe the flaw in Morin's first reason for his claim that regulators should avoid using M/B ratios as a guide in setting authorized ROEs.

A. The flaw in Morin's first reason is that it rests on an unrealistic assumption. He assumes investors would invest expecting the M/B to be higher than 1.0 even in the full knowledge that the regulator intends to set the ROE such that M/B will be 1.0. This is not a realistic assumption about investor behavior.

Morin maintains that setting the ROE such that M/B equals 1.0 *requires* investors to be irrational, investing with full knowledge they will incur a loss:

> The view that regulation should set an allowed rate of return so as to produce an M/B of 1.0 *presumes that investors are irrational*. They commit capital to a utility with an M/B in excess of 1.0, knowing full well that they will be inflicted a capital loss by regulators. For example, assume a utility company with an M/B ratio of 1.5. If investors expect the regulator to authorize a return on book value equal to the DCF cost of equity, the utility stock price would decline to book value, inflicting a capital loss of some 30%. The notion that

[222] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc.: 2006), p. 359.
[223] *Id*. at 376.

> investors are willing to pay a price of 1.5 times book value only to see the market value of their investment drop by 30% is irrational.[224]

This argument begs the question – or assumes what must be proven. Morin's unstated assumption is that investors are willing to pay 1.5 times book value for the utility's shares *with full knowledge that regulators will reduce the authorized ROE to the COE*. The only reason investors would be willing to pay 1.5 times book value, though, is precisely because they *do not* "expect the regulator to authorize a return on book value equal to the DCF cost of equity." If they did expect regulators to reduce the ROE to the COE, the M/B ratio would not be 1.5 but much closer to 1.0, as Morin suggests ("the utility stock price would decline to book value, inflicting a capital loss of some 30%"). Morin's hypothetical – "assume a utility company with an M/B ratio of 1.5" – is accepted as "rational" only because regulators in nearly every state have a decades-long track record of authorizing ROEs far in excess of actual COEs and, so far, have given no indication that they will not continue to do so.

Q. Please describe the flaw in Morin's second reason for his claim that regulators should avoid using M/B ratios as a guide in setting authorized ROEs.

A. Morin's second reason is flawed because it does not actually provide any reason to reject the M/B=1.0 standard. It merely restates the basic relationship between M/B, ROE, and COE:

> The condition that the M/B ratio will gravitate toward 1.0 if regulators set the allowed return equal to capital costs will be met only if the actual return expected to be earned by investors is at least equal to the cost of capital on a consistent long-term basis and absent inflation. The cost of capital of a company refers to the expected long-run earnings level of other firms with similar risk. If investors expect a utility to earn an ROE equal to its cost of equity in each period, then its M/B ratio would be approximately 1.0 or higher …[225]

Morin provides no reason in this passage for regulators not to set the COE such that the M/B equals 1.0.

[224] *Id*. at 376 (emphasis added).
[225] *Id*.

It should be noted that Morin's qualification regarding inflation is not warranted. Expected inflation is reflected in the cost of both debt and equity capital. For example, interest rates rose in 2022 and 2023 as actual and expected inflation increased. To the extent ROE is based on the actual cost of equity, it will necessarily incorporate expected inflation. There is no need for the economy to be "absent inflation" for the basic relationship between M/B ratio, ROE, and COE to hold.

Q. Please describe the flaw in Morin's third reason for his claim that regulators should avoid using M/B ratios as a guide in setting authorized ROEs.

A. Morin's third reason is flawed because it assumes (1) regulators must allow utilities to over-earn in future periods to compensate for any past under-earning; and (2) that M/B ratio is what determines a company's ability to attract capital. Neither of these assumptions is true. Morin's third reason entails several different arguments.

Morin's first argument is that M/B ratios greater than 1.0 are necessary because regulators must compensate utilities for periods when their M/B ratios were less than 1.0:

> The achievement of a 1.0 M/B ratio is appropriate, but only in a long-run sense. For utilities to exhibit a long-run M/B ratio of 1.0, it is clear that during economic upturns and more favorable capital market conditions, the M/B ratio must exceed its long-run average of 1.0 to compensate for the periods during which the M/B ratio is less than its long-run average under less favorable economic and capital market conditions.
>
> Historically, the M/B ratio for utilities has fluctuated above and below 1.0. It has been consistently above 1.0 from the 1980s to the mid-2000s [and since then, as well]. This indicates that earnings below capital costs and M/B ratios below 1.0 during less favorable economic and capital market conditions *must necessarily* be accompanied with earnings in excess of capital costs and M/B ratios above 1.00 during more favorable economic and capital market conditions.[226]

Going back to 1925, the average M/B ratio for utilities has been 1.4; regardless of the calculation starting point, the historical average has never been lower than 1.37 (from 1932 through 2024).[227] Mathematically, ROEs could be set at a level to keep M/B ratios at 1.0 into

[226] *Id*. at 377 (emphasis added).
[227] M. Ellis analysis of FDL data: Fama and French, "Data Library" [last accessed June 7, 2025].

perpetuity without the average dropping below 1.0. The facts flatly contradict Morin's claim that "[f]or utilities to exhibit a long-run M/B ratio of 1.0, it is clear that during economic upturns and more favorable capital market conditions, the M/B ratio must exceed its long-run average of 1.0 to compensate for the periods during which the M/B ratio is less than its long-run average under less favorable economic and capital market conditions."

More importantly, contrary to Morin's above assertion that "earnings below capital costs and M/B ratios below 1.0 during less favorable economic and capital market conditions *must necessarily* be accompanied with earnings in excess of capital costs and M/B ratios above 1.00 during more favorable economic and capital market conditions," there is no regulatory principle requiring rates to be set so as to compensate current and future shareholders for past earnings shortfalls, especially shortfalls that were last experienced by shareholders in the 1980s. Morin has fabricated this argument out of whole cloth.

Morin's third reason includes a second argument, that an M/B less than 1.0 would prohibit a utility from attracting capital:

> M/B ratios are determined in the marketplace, and utilities cannot be expected to compete for and attract capital in an environment where industrials [and other industries] are commanding M/B ratios well in excess of 1.0 while regulation reduces their M/B ratios toward 1.0. Moreover, if regulators were to currently set rates so as to produce an M/B of 1.0, not only would the long-run target M/B ratio of 1.0 be violated, but more importantly, the inevitable consequence would be to inflict severe capital losses on shareholders. Investors have not committed capital to utilities with the expectation of incurring capital losses from a misguided regulatory process.[228]

The implication of Morin's claim that "utilities cannot be expected to compete for and attract capital in an environment where industrials [and other companies] are commanding M/B ratios well in excess of 1.0 while regulation reduces [utilities'] M/B ratios toward 1.0" is that investors will invest only in the companies with the highest M/B ratios. A moment's reflection reveals this simply cannot be true. Investors buy the shares of companies spanning a range of M/B ratios, including those with M/B ratios less than 1.0, like General Motors,

[228] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc.: 2006), p. 377 (emphasis added).

with an M/B ratio of 0.71 as of June 7, 2025.[229] And, as just explained above, rates could be set "so as to produce an M/B of 1.0" into perpetuity without "violating" Morin's fictitious regulatory "long-run target M/B ratio of 1.0."

Morin acknowledges that even *utilities* with M/B ratios less than 1.0 can "compete for and attract capital in an environment where industrials [and other industries] are commanding M/B ratios well in excess of 1.0":

> The above example [illustrating the adverse consequences for existing shareholders of selling stock below book value] does not imply that utilities cannot, in fact, raise capital when share prices are below book value, but that they can only do so at the expense of existing shareholders.[230]

It is important to recognize that *Hope* established that regulators are not obligated to maintain utility stock market valuations, and that such an obligation would make a nonsense of regulators' consumer protection mandate:

> Ratemaking is indeed but one species of price-fixing.[] The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. *But the fact that the value is reduced does not mean that the regulation is invalid.*[] It does, however, indicate that "fair value" is the end product of the process of ratemaking, not the starting point, as the Circuit Court of Appeals held. The heart of the matter is that rates cannot be made to depend upon "fair value" when the value of the going enterprise depends on earnings under whatever rates may be anticipated.[231]

The impact on existing shareholders of reducing ROEs to a level that brings M/B ratios to the *Hope* and NARUC standard of 1.0 should not factor at all into regulators' determination of the appropriate rate of return.

[229] Yahoo! Finance, *Statistics*, available at https://finance.yahoo.com/quote/GM/key-statistics/ [last accessed June 7, 2025].
[230] Roger A. Morin, *New Regulatory Finance* (Public Utilities Reports, Inc.: 2006), p. 364.
[231] *Federal Power Commission v. Hope Natural Gas Co.* (1944) 320 U.S. 591, 601 (emphasis added).

Q. Please describe the flaw in Morin's fourth reason for his claim that regulators should avoid using M/B ratios as a guide in setting authorized ROEs.

A. Morin's fourth reason is that the M/B=1.0 would set utilities' market value equal to book value, but regulators are required to set returns such that utilities' market values equal replacement cost. This reason is flawed because there is no such regulatory standard.

Morin asserts that regulators must set the rate of return such that the value of the utility is equal to the replacement cost of its assets:

> Rate of return regulation is fundamentally a surrogate for competition. The fundamental goal of regulation should be to set the expected economic profit for a public utility equal to the level of profits expected to be earned by firms of comparable risk, in short, to emulate the competitive result. For unregulated firms, the natural forces of competition will ensure that in the long run, the ratio of the market value of these firms' securities equals the replacement cost of their assets. Competitive industrials of comparable risk to utilities have consistently been able to maintain the real value of their assets in excess of book value, consistent with the notion that, under competition, the Q-ratio will tend to 1.00 and not the M/B ratio. This suggests that a fair and reasonable price for a public utility's common stock is one that produces equality between the market price of its common equity and the replacement cost of its physical assets. The latter circumstance will not necessarily occur when the M/B ratio is 1.0.[232]

Morin is correct that "[r]ate of return regulation is fundamentally a surrogate for competition." But the "competitive result" is different for utilities than for competitive industrials. As Kahn observed, "returns in industry generally contain some monopoly component" and the risk profiles of nonregulated industries are not comparable to utilities.[233] In addition:

> [I]f utility stocks are compared with those of non-utility corporations …, utilities which are protected from many forms of competition will be compared with the winners in other areas with no such … protection. Somehow, in strict logic, the shadow losses of long defunct automobile companies would have to be subtracted from the profits of General Motors,

[232] Roger A. Morin, *New Regulatory Finance*, (Public Utilities Reports, Inc.: 2006), p. 377 (emphasis added).
[233] SC/PCF-7, Kahn, *The Economics of Regulation*, p. 52-53.

> after these in turn had been adjusted downward for the hypothetical competition.[234]

This is why neither Morin nor any other cost of capital expert uses or even evaluates Q-ratios in their cost of capital analyses. Morin's invocation of the Q-ratio is a rhetorical red herring; it has no relevance whatsoever to a utility's cost of capital. Rather, as Kahn observed more than 50 years ago, for utilities the competitive result is revealed by an M/B ratio of 1.0.

A simple thought experiment reveals why. It is a basic financial truism that paying more for a given stream of cash flows entails a lower return. For example, if I pay $100 for an asset that returns $5 per year for 20 years plus my initial $100 investment at the end of year 20, my rate of return will be 5%. If I pay $150 for the same stream of cash flows (including the return of only $100 in year 20), my rate of return is reduced to 2%.

Similarly, when investors buy a utility stock earning a 10% ROE at more than book value, their expected return, i.e., their cost of equity, *must* be less than 10%. The "competitive result" is the lower return that investors are willing to accept. By itself, the M/B ratio cannot reveal that required rate of return. But it can tell us if the authorized ROE is higher or lower than the required return, the cost of equity; an M/B ratio of 1.0 tells us that the authorized ROE is equal to the COE, i.e., the "competitive result" in the market for capital investment.

C. Upon Investigation, PG&E Witness Bulkley's Explanations for M/B>1.0 Prove the Exact Opposite of What She Claims.

Q. What other explanations have been put forward to explain M/B ratios greater than 1.0, other than excessive ROEs?

A. In recent testimony, PG&E witness Bulkley offered three potential explanations for M/B ratios greater than 1.0:

> As I discussed in Minnesota Power's last rate proceeding [citing her rebuttal testimony], there are several reasons why market-to-book ratios exceed 1.0, for example: 1) the operations are not 100 percent regulated, 2) the regulatory

[234] *Id*. at 53, fn. 81 (citing William G. Shepherd & Thomas George Gies, *Utility Regulation: New Directions in Theory and Policy* (Random House: 1966), p. 35-45).

system includes lag in the adjustment of the allowed ROE to the market COE, and 3) the utility's rate base may not be identical to its GAAP book value.[235]

The cited testimony is not in the proceeding docket, and witness Bulkley did not produce it when requested. When asked to substantiate her proffered explanations, Bulkley conceded she "does not have any research, analysis or third party [*sic*] that demonstrates that these three factors account for all of the difference between market and book value."

In fact, these three factors do not account for *any* of the difference between market and book value.

Q. Is there evidence that *any* of the three reasons provided by Bulkley support her argument?

A. Upon examination, none of the three reasons provided supports her argument.

The effect of the latter two proposed reasons – regulatory lag and differences between rate base and GAAP book value – both tend to reduce, not increase, M/B ratios, contradicting Bulkley's argument. The validity of the first reason can be assessed by looking at the M/B ratios of utilities whose operations are close to 100%, removing any potential effect of non-utility operations. Among those companies, M/B ratios far exceed 1.0. In combination with the findings on the effects of regulatory lag and differences between rate base and GAAP book value, "pure play" M/B ratios significantly greater than 1.0 unequivocally refute Bulkley's contention that utility market M/B ratios can be explained by non-utility operations.

Q. How does regulatory lag affect M/B?

A. As S&P explains, "'Regulatory lag' occurs when a utility's commission-approved revenue requirement does not reflect its true cost of providing service and can compromise the company's ability to earn its authorized ROE."[236] A lower ROE would tend to reduce

[235] Minnesota Pub. Util. Commission Docket No. E015/PA-24-198, Ann E. Bulkley Rebuttal Testimony: Cost of Capital Development for Private Companies, (March 4, 2025), p. 18, available at https://www.edockets.state.mn.us/documents/%7BF0F16695-0000-C47D-8D73-8F1FE5D1E722%7D/download?contentSequence=0&rowIndex=321.

[236] Russell Ernst, Monica Hlinka, *Focusing on common questions can shed light on utility regulatory practices* (S&P Global: August 10, 2023), available at https://www.spglobal.com/market-

utility profits and therefore decrease utility market values and M/B ratios – the exact opposite of the effect Bulkley claims.

Q. How do differences between rate base and GAAP book value affect M/B?

A. Bulkley is correct that the rate base generally differs from GAAP book value. As S&P explains in a recent report on the calculation of rate base,[237] common additions, which would increase rate base relative to GAAP book value, can include equipment inventories, cash working capital, and regulatory assets like construction work in progress (CWIP). Common deductions include customer deposits, contributions in aid of construction, and accumulated deferred income taxes (ADIT), which are considered cost-free capital for the utility.

Typically, the deduction for ADIT is larger than all additions combined. Consequently, rate base tends to be lower than GAAP book value. In the three "real world examples" provided in S&P's report, for example, rate base ranges from 74% to 87% of net utility plant, and ADIT accounts for 65% to 114% of net deductions.[238]

If rate base value is less than book value, an authorized ROE=COE would result in an expected realized return below the market-based COE,[239] causing the market value to drop below book value, i.e., M/B would be less than 1.0. Differences between rate base and GAAP book value tend to reduce, not increase, M/B – again, the exact opposite of Bulkley's claim.

Q. What is the M/B of "pure play" utilities?

A. In this proceeding, Witness Nowak's proxy group was selected to resemble, as closely as possible, a pure-play utility like DEV:

> The screening criteria results [*sic*] in a group of electric utilities that are comparable (but not identical) to the financial and operational characteristics of DEV. The screening criterion requiring an investment grade credit rating ensures that the proxy companies, like DEV, are in sound financial condition.

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intelligence/en/news-insights/research/focusing-on-common-questions-can-shed-light-on-utility-regulatory-practices.

[237] Russell Ernst, Monica Hlinka, *Rate base: It's more complicated than it sounds* (S&P Global: July 8, 2024).

[238] *Id*.

[239] COE x rate base equity value < COE x equity book value.

> Additionally, the criterion screening on the percent of net operating income from regulated electric operations distinguishes between electric utilities that are subject to regulation and those with substantial unregulated operations and are exposed to higher risks. In my opinion, these screens collectively reflect key risk factors that investors consider in making investments in electric utilities.[240]

As of May 2025, the average M/B ratio of the DEV proxy group is 1.99. Their M/B ratios in excess of 1.0 therefore cannot be explained by non-utility operations.[241]

Q. What is your conclusion regarding these arguments against the reliability of the utilities' M/B ratios as an indicator of excessive ROEs?

A. The concept of net present value upon which the M/B=1.0 standard is based is first among the "seven most important ideas in finance" identified in the popular textbook *Principles of Corporate Finance*.[242] I find it surprising that any financial professional would argue that utility M/B ratios do *not* provide insight into ROEs.

XII. CONCLUSION

Q. Do you have any concluding thoughts about your review of the Utilities' cost of capital analysis and testimony?

A. Each of the Utilities' analysis and testimony contains numerous fundamental analytical errors and untenable assumptions. Their cost of equity estimates are not only inconsistent with established financial principles but also contradict independent benchmarks, historical evidence, and the observed behavior of financial markets. Their continued reliance on discredited models like the risk premium and expected earnings analyses – transparently unsuitable models soundly rejected by FERC and several state commissions – suggests a willful attempt to mislead. Their CG DCFs are economically impossible, and their CAPMs manipulated. Their blatant disregard of compelling contradictory arguments and evidence betrays a disturbing lack of intellectual curiosity and professional integrity. No reasonable

[240] SCG -03 (Nowak), p. 22.
[241] S&P GMI data, available at https://www.spglobal.com/marketintelligence/en/ [last accessed June 7, 2025].
[242] Richard A. Brealey, Stewart C. Myers, Franklin Allen, *Principles of Corporate Finance*, 10th ed. (McGraw-Hill/Irwin: 2011), p. 866.

observer, examining the Utilities' testimony in full, would conclude that they are good-faith efforts to estimate the cost of capital.

This is not just a matter of flawed analysis; it reflects the deeper reality of the Utilities' institutional incentives. As Commissioner Houck noted, utility executives have a fiduciary duty to maximize profits, a duty that drives them to seek ever-higher returns, regardless of whether those returns are justified by economic fundamentals or consistent with the law. The systematic distortions in their testimony – cherry-picked assumptions, circular logic, discredited methodologies, and refusal to engage with credible counterevidence – must be understood not as isolated missteps, but as the predictable output of a profit-maximizing enterprise. The Utilities' witnesses are not independent experts offering impartial analysis; they are agents of firms that benefit directly from regulatory miscalibration. The Utilities' and their witnesses' conduct in this proceeding raises serious questions about the credibility of their claims and the sincerity of their commitment to the public interest.

Q. Does this conclude your testimony?

A. Yes. Thank you for the opportunity to testify before the Commission.

MARK E. ELLIS

La Jolla, CA | mark.edward.ellis@gmail.com | 619-507-8892 | https://www.linkedin.com/in/mark-edward-ellis

Mark Ellis is a former utility executive who now works as an independent consultant and testifying expert in finance and economics in utility regulatory proceedings. He is Senior Fellow for Utilities at the American Economic Liberties Project, an anti-monopoly research and advocacy organization.

Mr. Ellis has over 30 years of experience in strategy, finance, and risk-management roles across the energy sector, including 15 years as Chief of Corporate Strategy and Chief Economist at Sempra. Among his responsibilities at Sempra, he developed, implemented, and led the company's enterprise-wide cost-of-capital function. His unique utility insider's perspective distinguishes his expertise from that of other consultants. His work has been featured in the *Los Angeles Times*, *San Francisco Chronicle*, *Politico*, *New York Daily News*, *Inside Climate News*, *More Perfect Union*, and other media.

Earlier in his career, Mr. Ellis worked as a consultant in McKinsey & Company's energy practice, in international project development at ExxonMobil, and in industrial demand-side management at Southern California Edison. He holds an M.S. from MIT's Technology and Policy Program, where he focused on utility policy and conducted research at the MIT Energy Laboratory, and a B.S. in mechanical engineering from Harvard University.

EXPERT WITNESS TESTIMONY

Client	State	Utility	Description	Docket	Date
Sierra Club and The Protect Our Communities Foundation	CA	Pacific Gas & Electric, Southern California Edison, Southern California Gas, San Diego Gas & Electric,	Cost of capital	A.25-03-010 et seq.	7/25-ongoing
Clean Virginia	VA	irginia Electric and Power Company	Cost of Capital	PUR-2025-00058	7/25-ongoing
CURE Minnesota	MN	Minnesota Power	Private equity acquisition review (direct, surrebuttal)	E0/15PA-24-198	1/25-ongoing
Utah Office of Consumer Services	UT	Rocky Mountain Power	Wildfire liability self-insurance (testimony, white paper)	24-035-04	8/24-ongoing
The Protect Our Communities Foundation	CA	San Diego Gas & Electric, Southern California Gas	Cost of capital (direct, rebuttal), COC policy (direct, rebuttal)	A.22-04-008 et seq.	4/22-10/24
The Protect Our Communities Foundation	CA	Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison	Cost of capital	A.21-08-013 et seq.	11/21-11/23
North Carolina Justice Center et al.	NC	Duke Energy Carolinas	Cost of capital	E-7, Sub 1276	1/23-1/24
The Utility Reform Network (TURN)	CA	Pacific Gas & Electric	Wildfire liability self-insurance	A.21-06-021	11/21-8/23
North Carolina Justice Center et al.	NC	Duke Energy Progress	Cost of capital	E-2, Sub 1300	1-8/23

Georgia Interfaith Power & Light	GA	Georgia Power	Cost of capital	44280	8-12/22
Clean Wisconsin	WI	Wisconsin Electric Power, Wisconsin Gas	Cost of capital	5-UR-110	8-12/22
New Hampshire Department of Energy	NH	Aquarion Water Company of New Hampshire	Cost of capital	DW 20-184	6/21-2/22
The Utility Reform Network (TURN)	CA	Pacific Gas & Electric	$7.5-billion wildfire cost securitization	A.20-04-023	6/20-2/21

MARK E. ELLIS

Independent consultant and testifying expert in utility finance and economics

EMPLOYMENT

Company	Title	Location	Date
American Economic Liberties Project	Senior Fellow for Utilities	Washington, DC	2024-present
Self-employed	Independent consultant and testifying expert	La Jolla, CA	2019-present
Sempra Energy	Chief of Corporate Strategy	San Diego, CA	2004-19
McKinsey & Company	Engagement Manager	Houston, TX	2000-03
ExxonMobil	Venture Development Advisor	Houston, TX	1996-2000
MIT Energy Laboratory	Research Assistant	Cambridge, MA	1994-96
Southern California Edison	Staff Engineer	Irwindale, CA	1994
Sanyo Electric Company	Research Engineer	Osaka, Japan	1992-93
Los Angeles Department of Water & Power	Seasonal Waterworks Laborer	Chatsworth, CA	1988

START-UP

Organization	Title	Description	Date
Gridware	Advisor	Y Combinator graduate developing wildfire prevention technology for electric utilities	2021-present
GATEMatrices	CEO & Founder	Created iOS app to prepare elementary-school children for gifted-and-talented education program admission tests	2013-22
Apertur	CEO & Founder	Created a technology-enabled professional development platform of workshops, assessments, toolkit, and apps to help organizations improve their culture and decision-making by reducing cognitive bias	2013-21
Climate Policy Initiative	Power Program Director	Climate change policy advisory non-profit funded by George Soros	2010-13

NON-PROFIT BOARD

Organization	Date	Organization	Date
Harvard Club of San Diego	2015-17	Chabad Hebrew Academy	2007-14
Congregation Adat Yeshurun	2005-12	San Diego Agency for Jewish Education	2005-07

EDUCATION

Institution	Degree	Date
Massachusetts Institute of Technology	M.S., Technology and Policy	1996
Harvard University	B.S., *magna cum laude,* Mechanical and Materials Sciences and Engineering	1992