STATE OF CONNECTICUT

PUBLIC UTILITIES REGULATORY AUTHORITY

Docket No. 26-05-10

APPLICATION OF THE CONNECTICUT LIGHT AND POWER COMPANY D/B/A EVERSOURCE ENERGY TO AMEND ITS RATE SCHEDULES

DIRECT TESTIMONY OF

David J. Garrett

Rate of Return and Depreciation

Exhibit OCC-DJG-1

On Behalf of

The Office of Consumer Counsel

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I. INTRODUCTION

Q. State your name and occupation.

A. My name is David J. Garrett. I am a consultant specializing in public utility regulation. I am the managing member of Resolve Utility Consulting PLLC.

Q. Summarize your educational background and professional experience.

A. I received a B.B.A. with a major in Finance, an M.B.A., and a Juris Doctor from the University of Oklahoma. I worked in private legal practice for several years before accepting a position as assistant general counsel at the Oklahoma Corporation Commission in 2011. At the commission, I worked in the Office of General Counsel in regulatory proceedings. In 2012, I began working for the Public Utility Division as a regulatory analyst providing testimony in regulatory proceedings. After leaving the commission, I formed Resolve Utility Consulting PLLC, where I have represented various consumer groups and state agencies in utility regulatory proceedings, primarily in the areas of cost of capital and depreciation. I am a Certified Depreciation Professional with the Society of Depreciation Professionals. I am also a Certified Rate of Return Analyst with the Society of Utility and Regulatory Financial Analysts. A more complete description of my qualifications and regulatory experience is included in my curriculum vitae.[1]

Q. Describe the purpose and scope of your testimony in this proceeding.

A. I am testifying on behalf of the Office of Consumer Counsel ("OCC"). My testimony addresses the proposed rate of return of The Connecticut Light & Power Company d/b/a

[1] Exhibit DJG-1.

Eversource Energy ("Eversource" or the "Company"), which is based on the cost of capital analysis and recommendations of Company witness Ann E. Bulkley. I also address Eversource's depreciation study and proposed depreciation rates in response to the direct testimony of Company witness Ned Allis.

II. EXECUTIVE SUMMARY

A. Rate of Return Summary

Q. Describe Eversource's proposed return on equity in this case.

A. Ms. Bulkley concludes that a reasonable range for the Company's authorized ROE is 10.25% - 11.25%, based on her cost of equity analysis for Eversource. Based on this analysis, she concludes the Company's requested ROE of 10.25% in this proceeding is reasonable. Ms. Bulkley relies on the Discounted Cash Flow Model ("DCF Model"), the Capital Asset Pricing Model ("CAPM"), and other models in her cost of equity analysis.[2]

Q. Please summarize your analyses and conclusions regarding Eversource's cost of equity.

A. The Company's authorized ROE should be based on an objective estimate of its market-based cost of equity. To analyze Eversource's cost of equity, I analyzed a proxy group of utility companies with relatively similar risk profiles using the two most widely used and widely accepted financial models for calculating cost of equity in utility rate proceedings: the CAPM and DCF Model. I conducted two variations of both the CAPM and DCF Model. The results are shown in the figure below.

[2] Exhibit CLP-ROE-1 (Bulkley Direct), pp. 6-7.

Figure 1:
Cost of Equity Model Summary

Model	Cost of Equity
CAPM (at Proxy Debt Ratio)	8.7%
Hamada CAPM (at Company-Proposed Debt Ratio)	7.9%
DCF Model (Analyst Growth)	8.5%
DCF Model (Sustainable Growth)	7.6%
Recommended ROE	**8.7%**

As shown in this figure, the results of my modeling range from 7.6% - 8.7%. I recommend an authorized ROE of 8.7% for Eversource, which is at the top of my model results. The other three model results are below 8.7%, and the 8.7% CAPM result itself relies on Value Line adjusted betas, which may overstate the market risk of low-risk utility stocks. Thus, my 8.7% recommendation gives the Company the benefit of the upper end of my market-based results while remaining consistent with the evidence in this case. My 8.7% recommendation reflects the market-based cost-of-equity analysis presented in this testimony and does not incorporate any separate performance-related penalties or other firm-specific ratemaking adjustments that PURA may consider.

Q. Are you proposing an adjustment to Eversource's proposed ratemaking capital structure in this case?

A. Yes. In order to determine a fair rate of return, PURA should not only determine a fair ROE but also a fair capital structure, which is another key component of the rate of return. Eversource's proposed capital structure for ratemaking purposes contains less total debt than the average capital structure of the proxy group. In order for the indicated cost of

equity results under the CAPM to be accurate, any discrepancy between Eversource's capital structure and the average capital structure of the proxy group should be rectified by either adjusting the Company's ratemaking capital structure to be equal to the proxy group, or by adjusting the results of the CAPM (and ultimately, the authorized ROE) to reflect the fact Eversource has less financial risk (i.e., debt) than the proxy group average. Thus, I recommend PURA impute a capital structure for ratemaking purposes consisting of 58.1% total debt, which is equal to the proxy group average.

Q. Based on your ROE and capital structure adjustments, what is your authorized rate of return recommendation for Eversource?

A. My recommendations are summarized in the following table.

Figure 2:
Awarded Rate of Return Recommendation

Capital Component	Proposed Ratio	Cost Rate	Weighted Cost
Long-Term Debt	58.1%	4.81%	2.79%
Preferred Stock	0.9%	4.75%	0.04%
Common Equity	41.0%	8.70%	3.57%
Total	100.0%		6.40%

As shown in this figure, adopting my proposed adjustments would result in a weighted average authorized rate of return of 6.40% for the Company.[3]

[3] *See* Exhibit DJG-16.

B. Depreciation Summary

Q. Please summarize your testimony regarding depreciation issues.

A. In this case, Eversource is proposing a significant increase in its annual depreciation accrual in the amount of approximately $90 million, which represents an increase of 35%. I analyzed the same plant, retirement, and salvage data used to conduct the depreciation study. Mr. Allis proposes to recover net salvage through an approach sometimes referred to as the "traditional method." This method considers historical net salvage experience to estimate the net salvage percentage ultimately applied to the original cost of plant. My proposed depreciation rates also use the traditional method, but I recommend adjustments to several net salvage rates based on gradualism and recent historical experience. In addition, I propose service life adjustments to several accounts based on my analysis of the Company's historical retirement data and other relevant factors. Compared with current depreciation expense, adopting my proposed rates would still increase the Company's annual depreciation accrual by approximately $18.9 million, or about 7%. The following figure presents a summary of the proposed depreciation rates and accrual amounts in this case, based on plant at December 31, 2025.[4][5]

[4] *See* Exhibit DJG-17.

[5] *See* Exhibit DJG-17; *see also* Exhibits DJG-19 and DJG-20 for detailed calculations.

Figure 3:
Summary Rate and Accrual Adjustment

Plant Function	Company Proposed Rate	Company Proposed Accrual	OCC Proposed Rate	OCC Proposed Accrual	OCC Adjustment Rate	OCC Adjustment Adjustment
Distribution Plant	3.87%	$ 320,287,974	3.02%	$ 250,048,577	-0.85%	$ (70,239,397)
General Plant	4.40%	24,012,938	4.25%	23,191,930	-0.15%	(821,008)
Reserve Adjustment	0.00%	(260,369)	0.00%	(260,369)	0.00%	-
Total Depreciable Plant	**3.90%**	**$ 344,040,543**	**3.10%**	**$ 272,980,137**	**-0.81%**	**$ (71,060,406)**

As shown in this figure, adopting my proposed depreciation rates would reduce Eversource's proposed depreciation accrual by approximately $71 million. My adjustments address service life and net salvage parameters for a number of accounts. For Account 370.48 – Meters, I retain the Company's proposed Iowa curves and net salvage rates, but I remove the December 2030 probable retirement date used in the Company's life-span calculation and instead calculate remaining lives under the mass-property approach. The following figure summarizes the parameters for each account in dispute.[6]

[6] *See* Exhibit DJG-18 (adjusted parameters are highlighted). For Account 370.48, the Company applies a December 2030 probable retirement date under the life-span method; OCC does not apply a terminal retirement date and instead treats the meter categories as mass property. Thus, there is no adjustment to the Iowa curve or net salvage parameters, but the depreciation rates for these accounts are in dispute. Please see Exhibits DJG-19 and DJG-20 for detailed calculations.

Figure 4:
Depreciation Parameter Comparison

Account No.	Description	Company Position Iowa Curve	Company Position Salvage Rate	OCC Position Iowa Curve	OCC Position Salvage Rate
	DISTRIBUTION PLANT				
362.00	STATION EQUIPMENT	R1 - 60	-55%	R1 - 60	-53%
364.00	POLES, TOWERS AND FIXTURES	R0.5 - 48	-100%	L0 - 53	-95%
365.00	OVERHEAD CONDUCTORS AND DEVICES	R0.5 - 46	-30%	R0.5 - 52	-19%
366.00	UNDERGROUND CONDUIT	R1.5 - 75	-30%	R1.5 - 82	-23%
367.00	UNDERGROUND CONDUCTORS AND DEVICES	R0.5 - 50	-40%	L0 - 55	-38%
368.00	LINE TRANSFORMERS	R0.5 - 45	-15%	R0.5 - 45	-14%
369.00	SERVICES	R1.5 - 60	-100%	R1.5 - 60	-57%
370.48	METERS				
	AMR	S0 - 20	5%	S0 - 20	5%
	BRIDGE	S2 - 15	5%	S2 - 15	5%
	DEMAND METER	S0 - 20	5%	S0 - 20	5%
	NET METER	S0 - 20	5%	S0 - 20	5%
	TIME OF USE METER	S0 - 20	5%	S0 - 20	5%
371.00	INSTALLATIONS ON CUSTOMERS' PREMISES	L0 - 20	-30%	L0 - 20	-28%
373.00	STREET LIGHTING AND SIGNAL SYSTEMS	L0 - 18	-25%	O3 - 25	-25%
	GENERAL PLANT				
390.10	STRUCTURES AND IMPROVEMENTS	R1.5 - 50	-15%	R1.5 - 50	-10%
392.10	TRANS EQUIP - CLASS 1 (CARS)	L3 - 8	15%	L3 - 8	18%
392.11	TRANS EQUIP - CLASS 2 (LIGHT TRUCKS)	S2 - 12	15%	S2 - 12	18%
392.12	TRANS EQUIP - CLASS 3 (MEDIUM TRUCKS)	S2.5 - 13	15%	S2.5 - 13	18%
392.13	TRANS EQUIP - CLASS 4 (HEAVY TRUCKS)	S0.5 - 13	15%	S0.5 - 13	18%

These issues are discussed in more detail in the depreciation section of my testimony.

Q. Please describe the estimated impacts your service life and net salvage adjustments have on your overall depreciation adjustment.

A. Of the $71 million proposed depreciation accrual adjustment, approximately $55 million is attributable to service life and approximately $16 million is attributable to net salvage.

PART ONE: RATE OF RETURN

III. REGULATORY STANDARDS

Q. Discuss the legal standards governing the awarded rate of return on capital investments for regulated utilities.

A. Connecticut statutes provide general guidance to the Authority when setting a rate of return for a utility. First, General Statutes § 16-19e(a) provides guidance for setting rates. Second, General Statutes § 16-19gg requires the Authority to "consider the following factors in determining a reasonable rate of return: (1) Macroeconomic conditions at the time the rate amendment is pending before the authority; (2) the company's compliance with state law, regulations and the decisions and policies of the authority and the Department of Energy and Environmental Protection; (3) the burden of the public service company's costs on residential ratepayers, measured as a percentage of household income, under the current and proposed rate; (4) trends in the company's accrual of bad debt; (5) the rate impact on all residential and nonresidential customers; and (6) any other issue deemed relevant by the authority."

In addition to Connecticut-specific guidance, the U.S. Supreme Court has addressed rates of return for utilities. In *Wilcox v. Consolidated Gas Co. of New York*,[7] the Supreme Court first addressed the meaning of a fair rate of return for public utilities. The Court found that "the amount of risk in the business is a most important factor" in determining the appropriate allowed rate of return.[8] Later, in two landmark cases, the Court set forth the

[7] *Wilcox v. Consolidated Gas Co. of New York*, 212 U.S. 19 (1909).

[8] *Id*. at 48.

standards by which utilities are allowed to earn a return on capital investments. In *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*,[9] the Court held:

> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public . . . but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[10]

In *Federal Power Commission v. Hope Natural Gas Company*,[11] the Court expanded on the guidelines set forth in *Bluefield* and stated:

> From the investor or company point of view it is important that there be enough revenue not only for operating expenses *but also for the capital costs of the business*. These include service on the debt and dividends on the stock. By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.[12]

The cost of capital models I have employed in this case are in accordance with the foregoing legal standards.

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[9] *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*, 262 U.S. 679 (1923).

[10] *Id.* at 692-93.

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

[12] *Id.* at 603 (emphasis added).

Q. Is it important that the awarded rate of return be based on the Company's actual cost of capital?

A. Yes. The *Hope* Court makes it clear that the allowed return should be based on the actual cost of capital. Under the rate base rate of return model, a utility should be allowed to recover all its reasonable expenses, its capital investments through depreciation, and a return on its capital investments sufficient to satisfy the required return of its investors. The "required return" from the investors' perspective is synonymous with the "cost of capital" from the utility's perspective. Scholars agree that the allowed rate of return should be based on the actual cost of capital:

> Since by definition the cost of capital of a regulated firm represents precisely the expected return that investors could anticipate from other investments while bearing no more or less risk, and since investors will not provide capital unless the investment is expected to yield its opportunity cost of capital, the correspondence of the definition of the cost of capital with the court's definition of legally required earnings appears clear.[13]

The models I have employed in this case closely estimate the Company's market-based cost of equity. If PURA sets the awarded return based on my lower, and more reasonable, rate of return, it will comply with the U.S. Supreme Court's standards, allow the Company to maintain its financial integrity, and satisfy the claims of its investors. On the other hand, if PURA sets the allowed rate of return *higher* than the market-based cost of capital, it provides the Company a return above what is required under the U.S. Supreme Court's standards.

[13] A. Lawrence Kolbe, James A. Read, Jr. & George R. Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities*, p. 21 (The MIT Press 1984).

It is important to understand that the *awarded* return and the *cost* of capital are different but related concepts. The two concepts are related in that the legal and technical standards encompassing this issue require that the awarded return reflect the market-based cost of capital. On the other hand, the two concepts are different in that the legal standards do not mandate that awarded returns exactly match the cost of capital. Awarded returns are set through the regulatory process and may be influenced by factors other than objective market drivers. The cost of capital, on the other hand, should be evaluated objectively and be closely tied to economic realities. In other words, the cost of capital is driven by stock prices, dividends, growth rates, and — most importantly — it is driven by risk. The cost of capital can be estimated by financial models used by firms, investors, and academics around the world for decades. The problem is, with respect to regulated utilities, there has been a trend in which awarded returns fail to closely track with actual market-based cost of capital as further discussed below. To the extent this occurs, the results are detrimental to ratepayers and the state's economy, because they result in the transfer of wealth from ratepayers in excess of that required for the regulated utility to recover its actual cost of capital.

Q. Describe the economic impact that occurs when the awarded return strays too far from the U.S. Supreme Court's cost of equity standard.

A. As discussed further in the sections below, Ms. Bulkley's recommended awarded ROE is much higher than the Company's actual cost of capital based on objective market data. When the awarded ROE is set far above the *cost* of equity, it runs the risk of violating the U.S. Supreme Court's standards that the awarded return should be *based on the cost of capital*. If PURA were to adopt the Company's position in this case, it would be permitting

an excess transfer of wealth from customers to Company shareholders. Moreover, establishing an awarded return that far exceeds the market-based cost of capital effectively prevents the awarded returns from changing along with economic conditions. This is especially true given the fact that regulators tend to be influenced by the awarded returns in other jurisdictions, regardless of the various unknown factors influencing those awarded returns. This is yet another reason why it is crucial for regulators to focus on the target utility's actual *cost* of equity, rather than awarded returns from other jurisdictions. Awarded returns may be influenced by settlements and other political factors not based on market conditions. In contrast, the market-based cost of equity as estimated through objective models is not influenced by these factors but is instead driven by market-based factors. If regulators rely too heavily on the awarded returns from other jurisdictions, it can create a cycle over time that bears little relation to the market-based cost of equity, and it is at odds with the fundamental principles set forth in *Bluefield* and *Hope.*

IV. GENERAL CONCEPTS AND METHODOLOGY

Q. Discuss your approach to estimating the cost of equity in this case.

A. While a competitive firm must estimate its own cost of capital to assess the profitability of competing capital projects, regulators determine a utility's cost of capital to establish a fair rate of return. The legal standards set forth above do not include specific guidelines regarding the models that must be used to estimate the cost of equity. Over the years, however, regulatory commissions have consistently relied on several models. The models I have employed in this case have been the two most widely used and accepted in regulatory

proceedings for many years. These models are the DCF Model and the CAPM. The specific inputs and calculations for these models are described in more detail below.

Q. Please explain why multiple models are used to estimate the cost of equity.

A. The models used to estimate the cost of equity attempt to measure the return on equity required by investors by estimating several different inputs. It is preferable to use multiple models because the results of any one model may contain a degree of imprecision, especially depending on the reliability of the inputs used at the time of conducting the model. By using multiple models, the analyst can compare the results of the models and look for outlying results and inconsistencies. Likewise, if multiple models produce a similar result, it may indicate a narrower range for the cost of equity estimate.

Q. Please discuss the benefits of choosing a proxy group of companies in conducting cost of capital analyses.

A. The cost of equity models in this case can be used to estimate the cost of capital of any individual, publicly-traded company. There are advantages, however, to conducting cost of capital analyses on a "proxy group" of companies that are comparable to the target company. First, it is better to assess the financial soundness of a utility by comparing it to a group of other financially sound utilities. Second, using a proxy group provides more reliability and confidence in the overall results because there is a larger sample size. Finally, the use of a proxy group is often a pure necessity when the target company is a subsidiary that is not publicly traded. This is because the financial models used to estimate the cost of equity require information from publicly-traded firms, such as stock prices and dividends.

Q. Describe the proxy group you selected in this case.

A. In this case, I chose to use the same proxy group of electric utilities that Ms. Bulkley used for her analyses. There could be reasonable arguments made for the inclusion or exclusion of a particular company in a proxy group; however, the cost of equity results are influenced far more by the underlying assumptions and inputs to the various financial models than the composition of the proxy groups. By using the same utility proxy group, we can remove a relatively insignificant variable from the equation and focus on the primary factors driving the Company's cost of equity estimate in this case.[14]

V. RISK AND RETURN CONCEPTS

Q. Discuss the general relationship between risk and return.

A. As discussed above, risk is the most important factor for PURA to consider when determining the allowed return. There is a direct relationship between risk and return: the more (or less) risk an investor assumes, the larger (or smaller) return the investor will demand. There are two primary types of risk: firm-specific risk and market risk. Firm-specific risk affects individual companies, while market risk affects all companies in the market to varying degrees.

Q. Discuss the differences between firm-specific risk and market risk.

A. Firm-specific risk affects individual companies, rather than the entire market. For example, a competitive firm might overestimate customer demand for a new product, resulting in

[14] *See* Exhibit DJG-2.

reduced sales revenue. This is an example of a firm-specific risk called "project risk."[15] There are several other types of firm-specific risks, including: (1) "financial risk" — the risk that equity investors of leveraged firms face as residual claimants on earnings; (2) "default risk" — the risk that a firm will default on its debt securities; and (3) "business risk" — which encompasses all other operating and managerial factors that may result in investors realizing less than their expected return in that particular company. While firm-specific risk affects individual companies, market risk affects all companies in the market to varying degrees. Examples of market risk include interest rate risk, inflation risk, and the risk of major socio-economic events. When there are changes in these risk factors, they affect all firms in the market to some extent.[16]

Q. Can investors minimize firm-specific risk through portfolio diversification?

A. Yes. A fundamental concept in finance is that firm-specific risk can be minimized through diversification.[17] If someone irrationally invested all their funds in one firm (such as Enron), they would be exposed to all the firm-specific risk *and* the market risk inherent in that single firm. Rational investors, however, are risk-averse and seek to eliminate risk they can control. Investors can essentially eliminate firm-specific risk by adding more stocks to their portfolio through a process called "diversification."

There are two reasons why diversification eliminates firm-specific risk. First, each stock in a diversified portfolio represents a much smaller percentage of the overall portfolio

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[15] Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, pp. 62-63 (3rd ed., John Wiley & Sons, Inc. 2012).

[16] *See* Zvi Bodie, Alex Kane & Alan J. Marcus, *Essentials of Investments*, p. 149 (9th ed., McGraw-Hill/Irwin 2013).

[17] *See* John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, pp. 179-80 (3rd ed., South Western Cengage Learning 2010).

than it would in a portfolio of just one or a few stocks. Thus, any firm-specific action that changes the stock price of one stock in the diversified portfolio will have only a small impact on the entire portfolio.[18]

The second reason why diversification eliminates firm-specific risk is that the effects of firm-specific actions on stock prices can be either positive or negative for each stock. Thus, in large, diversified portfolios, the net effect of these positive and negative firm-specific risk factors will be essentially zero and will not affect the value of the overall portfolio.[19] Firm-specific risk is also called "diversifiable risk" because it can be easily eliminated through diversification.

Q. Do investors expect an additional return for assuming firm-specific risks?

A. No. Because investors eliminate firm-specific risk through diversification, they know they cannot expect a higher return for assuming the firm-specific risk in any one company. Thus, the risks associated with an individual firm's operations are not rewarded by the market. In fact, firm-specific risk is also called "unrewarded" risk for this reason. Market risk, on the other hand, cannot be eliminated through diversification. Because market risk cannot be eliminated through diversification, investors expect a return for assuming this type of risk. Market risk is also called "systematic risk." Scholars recognize the fact that market risk, or "systematic risk," is the only type of risk for which investors expect a return for bearing:

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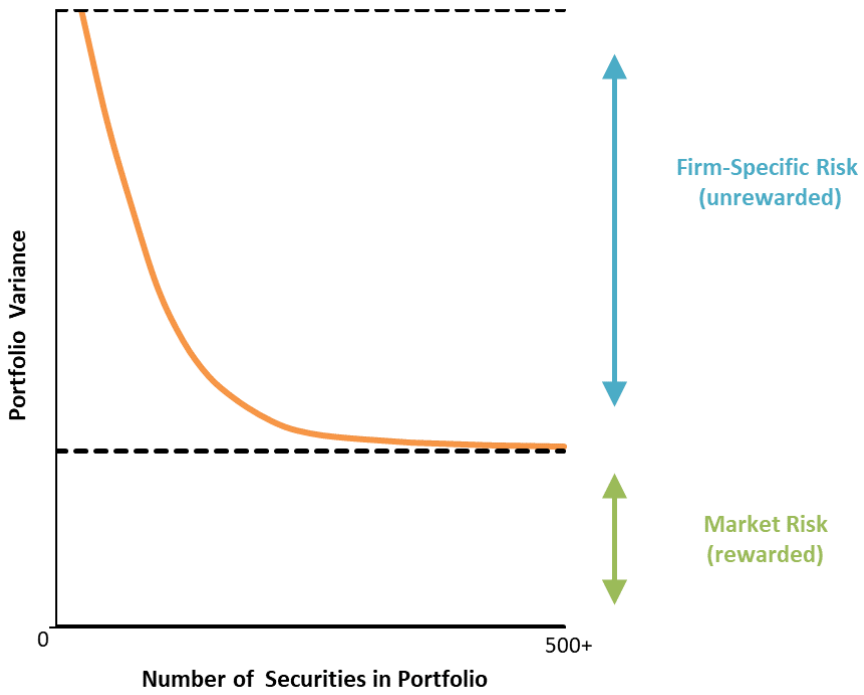
[18] *See* Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, p. 64 (3rd ed., John Wiley & Sons, Inc. 2012).

[19] *Id*.

> If investors can cheaply eliminate some risks through diversification, then we should not expect a security to earn higher returns for risks that can be eliminated through diversification. Investors can expect compensation *only* for bearing systematic risk (i.e., risk that cannot be diversified away).[20]

These important concepts are illustrated in the figure below. Some form of this figure is found in many financial textbooks.

Figure 5:
Effects of Portfolio Diversification



This figure shows that as stocks are added to a portfolio, the amount of firm-specific risk is reduced until it is essentially eliminated. No matter how many stocks are added, however, there remains a certain level of fixed market risk. The level of market risk will

[20] *See* John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, p. 180 (3rd ed., South Western Cengage Learning 2010).

vary from firm to firm. Market risk is the only type of risk that is rewarded by the market and is thus the primary type of risk PURA should consider when determining the allowed return for the utilities it regulates.

Q. Describe how market risk is measured.

A. Investors who want to eliminate firm-specific risk must hold a fully diversified portfolio. To determine the amount of risk that a single stock adds to the overall market portfolio, investors measure the covariance between a single stock and the market portfolio. The result of this calculation is called "beta."[21] Beta represents the sensitivity of a given security to the market as a whole. The market portfolio of all stocks has a beta equal to one. Stocks with betas greater than one are relatively more sensitive to market risk than the average stock. For example, if the market increases (decreases) by 1.0%, a stock with a beta of 1.5 will, on average, increase (decrease) by 1.5%. In contrast, stocks with betas of less than one are less sensitive to market risk, such that if the market increases (decreases) by 1.0%, a stock with a beta of 0.5 will, on average, only increase (decrease) by 0.5%. Thus, stocks with low betas are relatively insulated from market conditions. The beta term is used in the CAPM to estimate the cost of equity, which is discussed in more detail later.[22]

[21] *Id*. at 180-81.

[22]Though it will be discussed in more detail later, Exhibit DJG-8 shows that the average beta of the proxy group was less than 1.0. This confirms the well-known concept that utilities are relatively low-risk firms.

Q. Are public utilities characterized as defensive firms that have low betas, low market risk, and are relatively insulated from overall market conditions?

A. Yes. Although market risk affects all firms in the market, it affects different firms to varying degrees. Firms with high betas are affected more than firms with low betas, which is why firms with high betas are riskier. Stocks with betas greater than one are generally known as "cyclical stocks." Firms in cyclical industries are sensitive to recurring patterns of recession and recovery known as the "business cycle."[23] Thus, cyclical firms are exposed to a greater level of market risk. Securities with betas less than one, on the other hand, are known as "defensive stocks." Companies in defensive industries, such as public utility companies, "will have low betas and performance that is comparatively unaffected by overall market conditions."[24] In fact, financial textbooks often use utility companies as prime examples of low-risk, defensive firms. The figure below compares the betas of several industries and illustrates that the utility industry is one of the least risky industries in the U.S. market.[25]

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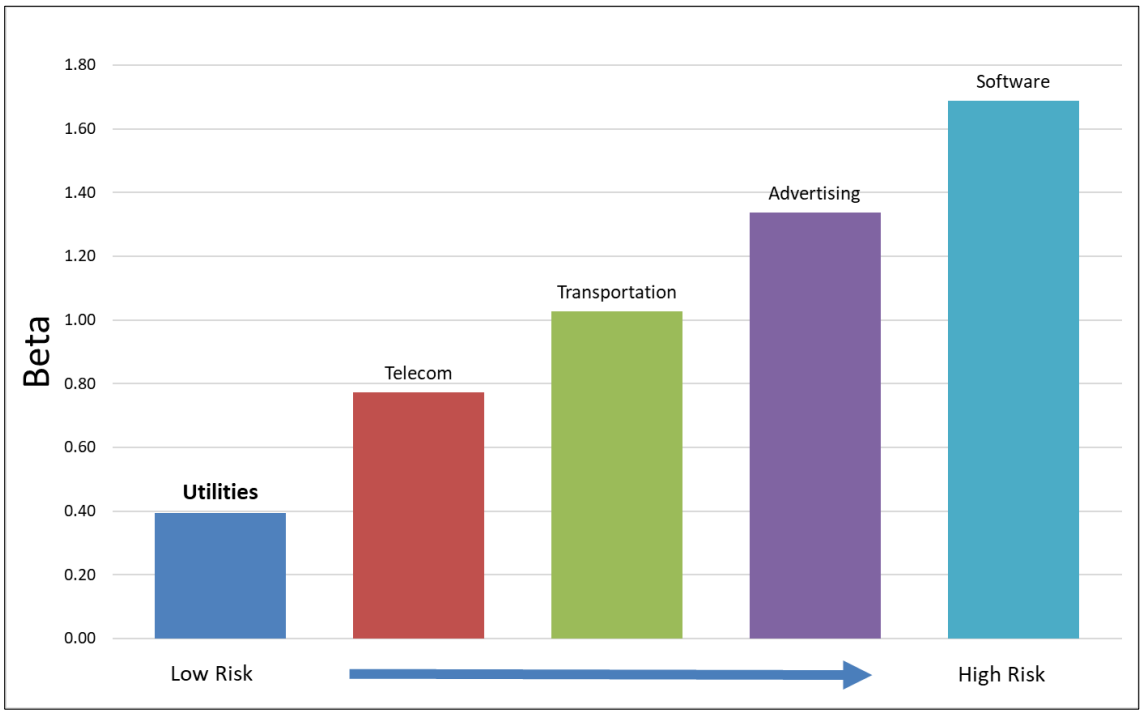
[23] *See* Zvi Bodie, Alex Kane & Alan J. Marcus, *Essentials of Investments*, p. 382 (9th ed., McGraw-Hill/Irwin 2013).

[24] *Id*. at 383.

[25] *See* Betas by Sector (US) available at http://pages.stern.nyu.edu/~adamodar/ (2018). (After clicking the link, click "Data" then "Current Data" then "Risk / Discount Rate" from the drop down menu, then "Total Beta by Industry Sector"). The exact beta calculations are not as important as illustrating the well-known fact that utilities are very low-risk companies. The fact that the utility industry is one of the lowest risk industries in the country should not change from year to year.

Figure 6:
Beta by Industry



The low risk of utilities, including Eversource, should be properly reflected in the authorized ROE.

VI. DISCOUNTED CASH FLOW ANALYSIS

Q. Describe the DCF Model.

A. The DCF Model is based on a fundamental financial model called the "dividend discount model," which maintains that the value of a security is equal to the present value of the future cash flows it generates.[26] Cash flows from common stock are paid to investors in

[26] Present value (PV) is the current value of a future sum of money or stream of cash flows given a specified rate of return. Present value takes the future value and applies a discount rate or the interest rate that could be earned if invested.

the form of dividends. There are several variations of the DCF Model. These versions, along with other formulas and theories related to the DCF Model, are discussed in more detail in Appendix A.

Q. Describe the inputs to the DCF Model.

A. There are three primary inputs in the DCF Model: (1) stock price; (2) dividend; and (3) the long-term growth rate. The stock prices and dividends are known inputs based on recorded data, while the growth rate projection must be estimated. I discuss each of these inputs separately below.

A. Stock Price

Q. How did you determine the stock price input of the DCF Model?

A. For the stock price (P_0), I used a 30-day average of stock prices for each company in the proxy group.[27] Analysts sometimes rely on average stock prices for longer periods (*e.g.*, 60, 90, or 180 days). According to the efficient market hypothesis, however, markets reflect all relevant information available at a particular time, and prices adjust instantaneously to the arrival of new information.[28] Past stock prices, in essence, reflect outdated information. The DCF Model used in utility rate cases is a derivation of the dividend discount model, which is used to determine the current value of an asset. Thus, according to the dividend discount model and the efficient market hypothesis, the value for

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[27] Exhibit DJG-3.

[28] *See* Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, Vol. 25, No. 2 The Journal of Finance, p. 383 (1970); *see also* John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, p. 357 (3rd ed., South Western Cengage Learning 2010). The efficient market hypothesis was formally presented by Eugene Fama in 1970 and is a cornerstone of modern financial theory and practice.

the "P_0" term in the DCF Model should technically be the current stock price, rather than an average.

Q. Why did you use a 30-day average for the current stock price input?

A. Using a short-term average of stock prices for the current stock price input adheres to market efficiency principles while avoiding any irregularities that may arise from using a single current stock price. In the context of a utility rate proceeding, there is a significant length of time between when an application is filed and when testimony is due. Choosing a current stock price for one particular day could raise a separate issue concerning which day was chosen to be used in the analysis. In addition, a single stock price on a particular day may be unusually high or low. It is arguably ill-advised to use a single stock price in a model that is ultimately used to set rates for several years, especially if a stock is experiencing some volatility. Thus, it is preferable to use a short-term average of stock prices, which represents a good balance between adhering to well-established principles of market efficiency while avoiding any unnecessary contentions that may arise from using a single stock price on a given day. The stock prices I used in my DCF analysis are based on 30-day averages of adjusted closing stock prices for each company in the proxy group.[29]

[29] Exhibit DJG-3. Adjusted closing prices, rather than actual closing prices, are ideal for analyzing historical stock prices. The adjusted price provides an accurate representation of the firm's equity value beyond the mere market price because it accounts for stock splits and dividends.

B. Dividend

Q. Describe how you determined the dividend input of the DCF Model.

A. The dividend term in the DCF Model represents dividends per share (d_0). I used forward-looking annualized dividends published by Yahoo! Finance for the dividend input to my constant growth DCF Model.[30] Dividing these dividends by the stock prices for each proxy company results in the dividend yield for each company.[31]

Q. Are the stock price and dividend inputs for each proxy company a significant issue in this case?

A. No. Although my stock price and dividend inputs are more recent than those used by Ms. Bulkley, there is not a statistically significant difference between them because utility stock prices and dividends are generally quite stable. This is another reason that cost of capital models such as the CAPM and the DCF Model are well-suited to be conducted on utilities. The differences between my DCF Model and Ms. Bulkley's DCF Model are primarily driven by differences in our growth rate estimates, which are further discussed below.

C. Growth Rate

Q. Summarize the growth rate input in the DCF Model.

A. The most critical input in the DCF Model is the growth rate. Unlike the stock price and dividend inputs, the growth rate input (g) must be estimated. As a result, the growth rate is often the most contentious issue related to DCF Model inputs in utility rate cases. The DCF Model I used in this case is based on the sustainable growth valuation model. Under

[30] Exhibit DJG-4.

[31] *Id.*

this model, a stock is valued by the present value of its future cash flows in the form of dividends. Before future cash flows are discounted by the cost of equity, however, they must be "grown" into the future by a sustainable growth rate. As stated above, one of the inherent assumptions of this model is that these cash flows in the form of dividends grow at a sustainable rate forever. For young, high-growth firms, estimating the growth rate to be used in the model can be especially difficult, and may require the use of multi-stage growth models. For mature, low-growth firms such as utilities, however, estimating the sustainable growth rate is more transparent. The growth term of the DCF Model is one of the most important, yet least understood, aspects of cost of equity estimations in utility regulatory proceedings. Thus, I will provide a more detailed explanation on the various determinants of growth below.

Q. Describe the various determinants of growth that can be considered for the growth rate input in the DCF Model.

A. Although the DCF Model directly considers the growth of dividends, there are a variety of growth determinants that could be considered when estimating growth rates. For utility companies, it is necessary to focus primarily on a long-term growth rate in dividends. This is also known as a "sustainable" growth rate since this is the growth rate assumed for the company's dividends in perpetuity.

1. Historical Growth

Looking at a firm's actual historical experience may theoretically provide a good starting point for estimating short-term growth. However, past growth is not always a good

indicator of future growth.[32] Some metrics that might be considered here are historical growth in revenues, operating income, and net income. Since dividends are paid from earnings, estimating historical earnings growth may provide an indication of future earnings and dividend growth. In general, however, revenue growth tends to be more consistent and predictable than earnings growth because it is less likely to be influenced by accounting adjustments.[33]

2. Analyst Growth Rates

Analyst growth rates refer to short-term projections of earnings growth published by institutional research analysts such as Value Line and Bloomberg. Analyst growth rates, including the limitations with using them in the DCF Model to estimate utility cost of equity, are discussed in more detail below. These are the growth rates I considered in the analyst growth variation of my DCF Model, despite the noted drawbacks to this approach.

3. Sustainable Growth Rates

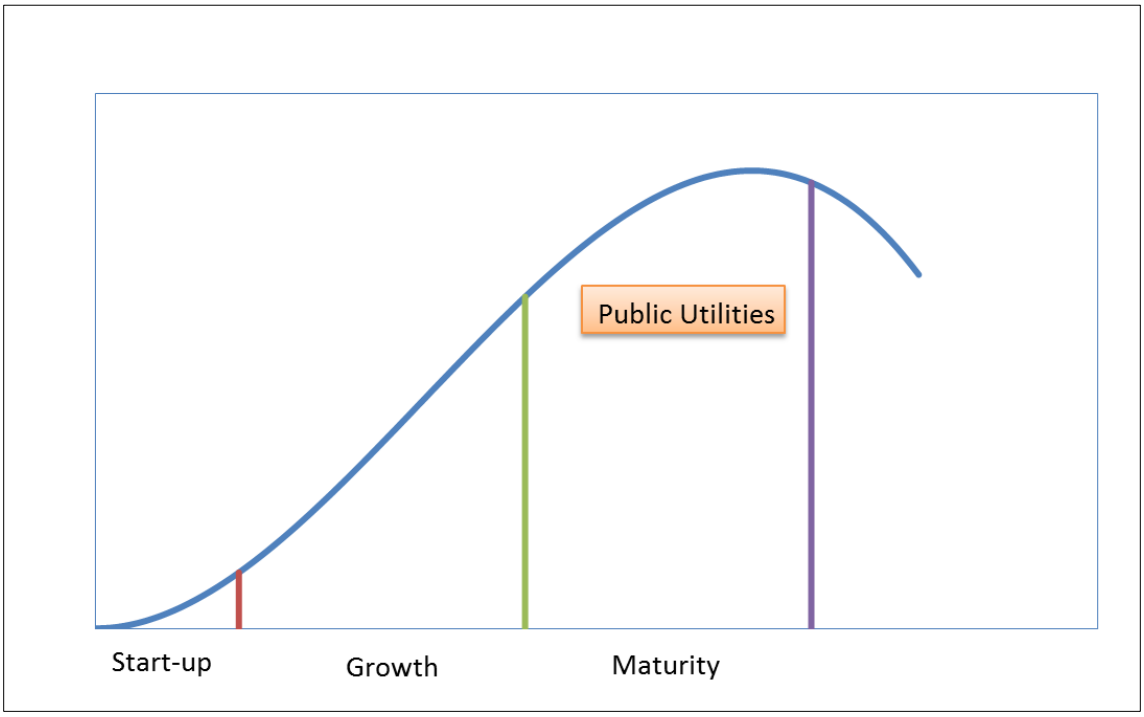
To make the DCF Model a viable, practical model, an infinite stream of future cash flows must be estimated and then discounted back to the present. Otherwise, each annual cash flow would have to be estimated separately. Some analysts use "multi-stage" DCF Models to estimate the value of high-growth firms through two or more stages of growth, with the final stage of growth being sustainable. However, it is not necessary to use multi-

[32] This fact is required on all advertisements for investments in stock or bond funds, i.e., "*Past performance is no guarantee of future results*. Investment return and principal value of an investment will fluctuate; therefore, you may have a gain or loss when you sell your shares. Current performance may be higher or lower than the performance stated."

[33] *See* Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, p. 279 (3rd ed., John Wiley & Sons, Inc. 2012).

stage DCF Models to analyze the cost of equity of regulated utility companies because regulated utilities have already reached their "sustainable," low growth stage. Unlike most competitive firms, the growth of regulated utilities is constrained by physical service territories and limited primarily by ratepayer and load growth within those territories. The figure below illustrates the well-known business/industry life-cycle pattern.

Figure 7:
Industry Life Cycle



In an industry's early stages, there are ample opportunities for growth and profitable reinvestment. In the maturity stage however, growth opportunities diminish, and firms choose to pay out a larger portion of their earnings in the form of dividends instead of reinvesting them in operations to pursue further growth opportunities. Once a firm is in the maturity stage, it is not necessary to consider higher short-term growth metrics in multi-

stage DCF Models; rather, it is sufficient to analyze the cost of equity using a stable growth DCF Model with one sustainable growth rate.

Q. Should the annual sustainable growth rate used in the DCF Model exceed the annual growth rate of the aggregate economy?

A. From a technical standpoint, the long-term growth rate input used in the DCF Model should not exceed long-term estimates for the annual growth rate of the aggregate economy in which the company is operating. A fundamental concept in finance is that no firm can grow forever at a rate higher than the growth rate of the economy in which it operates. Thus, the sustainable growth rate used in the DCF Model should not exceed the aggregate economic growth rate. However, it is a common practice in utility regulatory proceedings for the DCF Model to be conducted in this manner. As stated by Dr. Damodaran: "[i]f a firm is a purely domestic company, either because of internal constraints . . . or external constraints (such as those imposed by a government), the growth rate in the domestic economy will be the limiting value." According to the Congressional Budget Office's 2026 Long-Term Budget Outlook, the long-term forecast for nominal U.S. GDP growth is 3.8%.[34][35][36]

Q. Did you also consider Company-specific growth indicators as part of your analysis?

A. Yes. Focusing on purely quantitative metrics when assessing a reasonable growth input in the DCF Model when applied to public utilities for the purpose of setting an authorized ROE has an inherent circular reference problem. That is, the authorized ROE can directly impact dividends and earnings, which are then inputs used in the DCF Model and can affect

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[34] *See id.* at p. 306.

[35] *Id.*

[36] Congressional Budget Office, The 2026 Long-Term Budget Outlook (2026-2056).

the indicated cost of equity produced by the DCF. Using GDP growth as a limiting factor to the terminal growth rate input avoids this circular reference problem. In addition, other growth indicators, such as customer growth and consumption growth, confirm that the Company's fundamental growth rate is quite low. These growth determinants provide additional support for using GDP growth as a limiting factor for the perpetual annual growth rate when applying the DCF Model to a public utility. The following figure shows the growth rate determinants I considered in my DCF analysis in this case.[37]

Figure 8:
Sustainable Growth Rate Determinants

DCF Annual Growth Rate Indicators	Rate
Nominal GDP (2026-2056)	3.8%
Real GDP	1.7%
Company Load Growth (CAGR 2016-2025)	-1.0%
Company Customer Growth (CAGR 2016-2025)	0.6%
Long-Term Growth Ceiling	**3.8%**

Q. Please describe the growth rates you used in your DCF Models.

A. For my "sustainable growth" variation of the DCF Model, I used the projected long-term GDP growth rate of 3.8%. As discussed above, it is reasonable to conclude that the long-term growth of a domestic firm cannot outpace the growth rate of the aggregate economy in which it operates (as measured by U.S. GDP in this case). For the "analyst growth"

[37] *See also* Exhibit DJG-5.

variation of the DCF Model, I considered projected short-term dividend growth rate estimates published by Value Line.[38]

Q. What are the final results of your DCF Models?

A. For my DCF Models, I considered two variations: one using analysts' growth rates and one using a sustainable growth rate. These DCF Models produced indicated costs of equity of 8.5% and 7.6%, respectively.[39]

Q. Please explain how the analyst growth variation of the DCF Model can run the risk of overstating the cost of equity estimate.

A. The analyst-growth variation produces a higher result than the sustainable-growth variation in this case, although both results remain below the Company's requested ROE. From a technical standpoint, the analyst-growth variation can overstate the cost of equity depending on the particular market environment. To understand why analyst growth rates can inflate cost of equity estimates in the DCF Model, it is important to understand the difference between "quantitative" and "qualitative" growth determinants. Assessing quantitative growth simply involves mathematically calculating a historical metric for growth, such as revenues or earnings, or calculating various fundamental growth determinants using figures from a firm's financial statements, such as ROE and the retention ratio. However, any thorough assessment of company growth should also include a qualitative analysis of the strategies management can actually implement to achieve sustainable growth in earnings. Therefore, it is important to begin the analysis of Eversource's growth rate with this simple qualitative question: how is this regulated utility

[38] Exhibit DJG-5.

[39] Exhibit DJG-6.

going to achieve sustained growth in earnings? If this question were asked of a competitive firm, there could be several answers depending on the business model, such as launching a new product line, franchising, rebranding to target a new demographic, or expanding into a developing market. Regulated utilities, however, cannot typically engage in these potential growth opportunities.

Q. Why is it important to emphasize real, qualitative growth determinants when analyzing the growth rates of regulated utilities?

A. While qualitative growth analysis is important regardless of the entity being analyzed, it is especially important in the context of utility ratemaking. This is because the "return on rate base" model inherently possesses two factors that can contribute to distorted views of utility growth when considered exclusively from a quantitative perspective. These two factors are (1) rate base, and (2) the awarded ROE.

Q. How does rate base distort growth projections for utilities?

A. Under the return on rate base model, a utility's rate base is multiplied by its awarded rate of return to produce the required level of operating income. Therefore, increases to rate base generally result in increased earnings. Thus, utilities have a natural financial incentive to increase rate base regardless of whether such increases are driven by a corresponding increase in demand.

In other words, utilities can "grow" their earnings by simply retiring old assets and replacing them with new assets. If the tail of a flatworm is removed and regenerated, it does not mean the flatworm actually grew. Likewise, if a competitive, unregulated firm announced plans to close production plants and replace them with new plants, it would not be considered a real determinant of growth unless analysts believed this decision would

directly result in increased market share for the company and a real opportunity for sustained increases in revenues and earnings. In the case of utilities, the mere replacement of old plant with new plant does not increase market share, attract new customers, create franchising opportunities, or allow utilities to penetrate developing markets, but may result in short-term, quantitative earnings growth. Measuring rate of return based on this rate base growth would inappropriately reward the company's shareholders at the expense of ratepayers, without any corresponding benefit to ratepayers. Using the flatworm analogy, ratepayers would have paid an increased rate base simply to have the same flatworm they started with. This growth in earnings would be the quantitative byproduct of the return-on-rate-base model, not an indication of real or sustainable growth. Of course, utilities may add new plant to meet modest growth in customer demand. However, as the foregoing discussion demonstrates, it is more appropriate to consider load growth projections and other qualitative indicators, rather than mere increases to rate base or earnings, to attain a fair assessment of growth.

D. Response to Ms. Bulkley's DCF Model

Q. Please summarize the results of Ms. Bulkley's DCF analyses.

A. Ms. Bulkley's application of the DCF Model produced results ranging as high as 11.83%.[40]

Q. Do you believe the result of Ms. Bulkley's DCF model indicates a reasonable estimate for Eversource's cost of equity?

A. No. The primary reason Ms. Bulkley's application of the DCF Model overstates Eversource's cost of equity is her use of unsustainably high terminal growth rates.

[40] Direct Testimony of Ann E. Bulkley, p. 31, Fig. 6.

Q. Please discuss the problems with the growth rates used by Ms. Bulkley in her DCF Model.

A. Ms. Bulkley's DCF Model results are overstated primarily because of the projected earnings growth rates she uses as perpetual growth assumptions. Her DCF analysis uses projected EPS growth rates as high as 13.3%, and the average projected EPS growth rate for every company in her proxy group exceeds the 3.8% long-term nominal GDP growth rate I use as a sustainable-growth ceiling. These analyst projections are short-term estimates over several years. For example, a Zacks projection that Entergy's earnings may grow by 13.3% annually over the next several years does not mean Entergy can grow at 13.3% every year in perpetuity. It is Ms. Bulkley's constant-growth DCF application that effectively makes that extrapolation. Because these growth assumptions exceed sustainable long-term economic growth, they cause her DCF Model to overstate Eversource's cost of equity.[41]

VII. CAPITAL ASSET PRICING MODEL ANALYSIS

Q. Please describe the Capital Asset Pricing Model.

A. The Capital Asset Pricing Model ("CAPM") is a market-based model founded on the principle that investors expect higher returns for incurring additional risk.[42] The CAPM estimates this expected return. The various assumptions, theories, and equations involved in the CAPM are discussed further in Appendix B. Using the CAPM to estimate the cost

[41] Exhibit CLP-ROE-4.

[42] William F. Sharpe, *A Simplified Model for Portfolio Analysis*, pp. 277-93 (Management Science IX 1963); *see also* John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, p. 208 (3rd ed., South-Western Cengage Learning 2010).

of equity of a regulated utility is consistent with the legal standards governing the fair rate of return. The U.S. Supreme Court has recognized that "the amount of *risk* in the business is a most important factor" in determining the allowed rate of return,[43] and that "the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding *risks*."[44] The CAPM is a useful model because it directly considers the amount of risk inherent in a business and directly measures the most important component of a fair rate of return analysis: Risk.

Q. Describe the inputs for the CAPM.

A. The basic CAPM equation requires only three inputs to estimate the cost of equity: (1) the risk-free rate; (2) the beta coefficient; and (3) the equity risk premium. Each input is discussed separately below.

A. The Risk-Free Rate

Q. Explain the risk-free rate.

A. The first term in the CAPM is the risk-free rate (R_F). The risk-free rate is simply the level of return investors can achieve without assuming any risk. The risk-free rate represents the bare minimum return that any investor would require on a risky asset. Even though no investment is technically devoid of risk, investors often use U.S. Treasury securities to represent the risk-free rate because they accept that those securities essentially contain no default risk. The Treasury issues securities with different maturities, including short-term Treasury Bills, intermediate-term Treasury Notes, and long-term Treasury Bonds.

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[43] *Wilcox*, 212 U.S. at 48 (emphasis added).

[44] *Hope Natural Gas Co*., 320 U.S. at 603 (emphasis added).

Q. Please describe how you estimated the risk-free rate for your application of the CAPM.

A. To estimate the current risk-free rate, I calculated a recent 30-day average of daily spot yield rates on 10-year U.S. Treasury notes. Using 10-year Treasury notes is a standard and widely accepted practice for estimating the risk-free rate. All else held constant, using a longer or shorter term would lead to higher and lower CAPM results, respectively. Analysts generally prefer 10-year notes to 30-year bonds for several reasons. First, 10-year notes are more actively traded than 30-year bonds, which provides a more accurate indication of investors' market expectations. Second, a 10-year time frame more closely aligns with actual investment timeframes compared with a 30-year time frame. Finally, the lower yield of the 10-year notes relative to the 30-year bond represents a less risky investment. If Treasury bonds are to represent the rate on a true riskless investment, then the less risky (*i.e.*, lower yield) security should be preferred for that reason. The longer maturity of 30-year bonds means its price is more sensitive to changes in interest rates. In addition, the default risk (albeit low under both securities) would be higher for a 30-year bond relative to a 10-year bond. In that regard, a 10-year term represents a less risky investment than a longer term while avoiding the more volatile reinvestment risk and relatively short time horizons of short-term Treasury bills. For my CAPM application in this case, I used a 4.94% risk-free rate based on a recent 30-day average of 10-year Treasury note yields.[45]

[45] Exhibit DJG-7

B. The Beta Coefficient

Q. How is the beta coefficient used in this model?

A. As discussed above, beta represents the sensitivity of a given security to movements in the overall market. The CAPM states that in efficient capital markets, the expected risk premium on each investment is proportional to its beta. Recall that a security with a beta greater than 1.0 is riskier than the market portfolio. Conversely, a security with a beta less than one is less risky than the market portfolio. An index such as the S&P 500 Index is used as a proxy for the market portfolio. The historical betas for publicly traded firms are published by various institutional analysts. Beta may also be calculated through a linear regression analysis, which provides additional statistical information about the relationship between a single stock and the market portfolio. The market portfolio of all stocks has a beta equal to one. Stocks with betas greater than one are relatively more sensitive to market risk than the average stock. In contrast, stocks with betas of less than one are less sensitive to market risk.

Q. Describe the source for the betas you used in your CAPM analysis.

A. I used betas recently published by Value Line Investment Survey. The beta for each proxy company is less than 1.0, and the average beta for the total proxy group is only 0.74. Thus, we have an objective measure confirming the well-known concept that utility stocks are less risky than the average stock in the market. While there is evidence suggesting that betas published by sources such as Value Line may actually overestimate the risk of

utilities, and thus overestimate the CAPM, I used the Value Line betas in the interest of reasonableness.[4647]

C. The Equity Risk Premium

Q. Describe the equity risk premium.

A. The final term of the CAPM is the equity risk premium ("ERP"), which is the required return on the market portfolio less the risk-free rate ($R_M - R_F$). In other words, the ERP is the level of return investors expect above the risk-free rate in exchange for investing in risky securities. Many experts agree that "the single most important variable for making investment decisions is the equity risk premium."[48] Likewise, the ERP is arguably the single most important factor in estimating the cost of capital in this matter. There are three basic methods that can be used to estimate the ERP: (1) calculating a historical average; (2) taking a survey of experts; and (3) calculating the implied ERP. I will discuss each method in turn, noting advantages and disadvantages of these methods.

1. Historical Average

Q. Describe the historical equity risk premium.

A. The historical ERP may be calculated by simply taking the difference between returns on stocks and returns on government bonds over a certain period of time. Many practitioners

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[46] Exhibit DJG-8.

[47] *See* Appendix B for a more detailed discussion of raw beta calculations and adjustments.

[48] Elroy Dimson, Paul Marsh & Mike Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns*, p. 4 (Princeton University Press 2002).

rely on the historical ERP as an estimate for the forward-looking ERP because it is easy to obtain. However, there are disadvantages to relying on the historical ERP.

Q. What are the limitations of relying solely on a historical average to estimate the current or forward-looking ERP?

A. As I mentioned, many investors use the historic ERP because it is convenient and easy to calculate. But what matters in the CAPM model is the current and forward-looking risk premium.[49] Some investors may think that a historic ERP provides some indication of what the prospective risk premium is; however, there is empirical evidence to suggest the prospective, forward-looking ERP is actually *lower* than the historical ERP. In a landmark publication on risk premiums around the world, *Triumph of the Optimists*, the authors suggest through extensive empirical research that the prospective ERP is lower than the historical ERP.[50] This is due in large part to what is known as "survivorship bias" or "success bias" — a tendency for failed companies to be excluded from historical indices.[51] From their extensive analysis, the authors make the following conclusion regarding the prospective ERP:

[49] John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, p. 330 (3rd ed., South-Western Cengage Learning 2010).

[50] Elroy Dimson, Paul Marsh & Mike Staunton, Triumph of the Optimists: 101 Years of Global Investment Returns, p. 34 (Princeton University Press 2002).

[51] *Id*. at 194.

> The result is a forward-looking, geometric mean risk premium for the United States . . . of around 2½ to 4 percent and an arithmetic mean risk premium . . . that falls within a range from a little below 4 to a little above 5 percent.[52]

Indeed, these results are lower than many reported historical risk premiums. Other noted experts agree:

> The historical risk premium obtained by looking at U.S. data is biased upwards because of survivor bias. . . . The true premium, it is argued, is much lower. This view is backed up by a study of large equity markets over the twentieth century (*Triumph of the Optimists*), which concluded that the historical risk premium is closer to 4%.[53]

Regardless of the variations in historic ERP estimates, many leading scholars and practitioners agree that simply relying on a historic ERP to estimate the risk premium going forward is not ideal. Fortunately, "a naïve reliance on long-run historical averages is not the only approach for estimating the expected risk premium."[54]

Q. Did you rely on the historical ERP as part of your CAPM analysis in this case?

A. No. Due to the limitations of this approach, I primarily relied on the ERP reported in expert surveys and the implied ERP method discussed below.

2. Expert Surveys

Q. Describe the expert survey approach to estimating the ERP.

A. As its name implies, the expert survey approach to estimating the ERP involves conducting a survey of experts including professors, analysts, chief financial officers, and other

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[52] *Id*.

[53] Aswath Damodaran, *Equity Risk Premiums: Determinants, Estimation and Implications – The 2015 Edition*, p. 17 (New York University 2015).

[54] John R. Graham, Scott B. Smart & William L. Megginson, *Corporate Finance: Linking Theory to What Companies Do*, p. 330 (3rd ed., South Western Cengage Learning 2010).

executives around the country and asking them what they think the ERP is. The IESE Business School conducts such a survey each year. Its 2026 expert survey reported an average ERP of 5.3%.[55]

3. Implied Equity Risk Premium

Q. Describe the implied equity risk premium approach.

A. The third method of estimating the ERP is arguably the best. The implied ERP relies on the stable growth model proposed by Gordon, often called the "Gordon Growth Model," which is a basic stock valuation model that has been widely used in finance for many years. This model is a mathematical derivation of the DCF Model. In fact, the underlying concept in both models is the same: the current value of an asset is equal to the present value of its future cash flows. Instead of using this model to determine the discount rate of one company, we can use it to determine the discount rate for the entire market by substituting market-level inputs. Specifically, instead of using the current stock price (P0), we use the current value of the S&P 500 (V500). Instead of using the dividends of a single firm, we consider distributions by the entire market. Stock buybacks should be considered in addition to paid dividends because buybacks represent another way for firms to return free cash flow to shareholders. The market dividend yield plus the market buyback yield gives us the gross cash yield to use as the cash-flow component of the model. These cash flows

[55]Pablo Fernandez, Amir Habibian & Antonio Fdez. Acín, Survey: Market Risk Premium and Risk-Free Rate used for 97 countries in 2026 (IESE Business School, Apr. 13, 2026), available at https://ssrn.com/abstract=6570342.

are grown into the future and discounted to determine their present value. After solving for the required market return, I subtract the risk-free rate to arrive at the implied ERP.[56]

Q. Discuss the results of your implied ERP calculation.

A. I collected S&P 500 market-value, operating-earnings, dividend, and share-repurchase data for the 2015–2025 period, using the latest trailing-four-quarter observation for 2025 because S&P had not published its normal completed calendar-year buyback dataset. From those data I calculated the annual dividend yield, buyback yield, and gross cash yield, as well as the compound annual growth rate in operating earnings from 2015 to 2025. I used these inputs, together with the risk-free rate and current value of the index, to calculate an implied ERP of approximately 5.4%, corresponding to a total required market return of approximately 10.4%.[57]

Q. Did you also incorporate Dr. Damodaran's estimate using his implied ERP method?

A. Yes. Dr. Damodaran, one of the world's leading experts on the ERP, promotes the implied ERP method discussed above. He calculates monthly and annual implied ERPs with this method and publishes his results. To incorporate these results into my modeling, I selected two of his calculations: the trailing-twelve-month cash-yield ERP and the ten-year-average cash-flow-yield ERP. For the October 2026 publication, the midpoint of these modeling results is 4.7%. Equal weighting of these modeling results balances current distributions against historical normalization. Current payouts can be temporarily unusual, while a historical average can respond slowly to changed conditions.[58]

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[56] Myron J. Gordon and Eli Shapiro, *Capital Equipment Analysis: The Required Rate of Profit* 102-10 (Management Science Vol. 3, No. 1 Oct. 1956).

[57] See Exhibit DJG-9.

[58] *See Monthly ERP Estimates*, Damodaran Online (Oct. 1, 2026), available at https://pages.stern.nyu.edu/~adamodar/.

Q. Did you also consider the ERP estimate published by Kroll?

A. Yes. Kroll (formerly Duff & Phelps) is a multinational financial and risk advisory company. Kroll recently published an ERP estimate of 5.0%.[59]

Q. What are the results of your final ERP estimate?

A. For the final ERP estimate I used in my CAPM analysis, I considered the results of the ERP surveys, the estimated ERP reported by Kroll, the estimated ERP calculated by Dr. Damodaran, and the implied ERP based on my calculations.[60] The results are presented in the following figure:

Figure 9:
Equity Risk Premium Results

IESE Business School Survey	5.3%
Kroll Report	5.0%
Damodaran (midpoint)	4.7%
Garrett	5.4%
Average	**5.1%**

I used the average ERP of 5.1% from these sources in my CAPM.

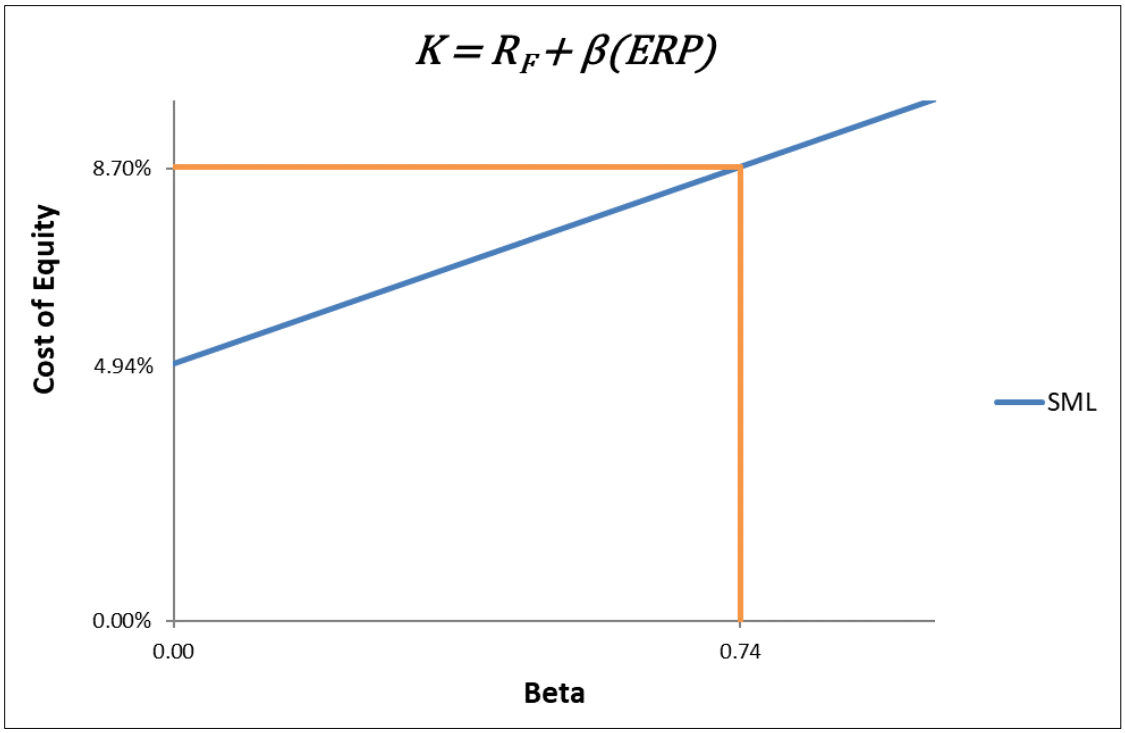
[59] *Kroll Assesses Impact of U.S. Monetary and Fiscal Policy on Treasury Yields*, Kroll (Sept. 2, 2026) (available at https://www.kroll.com/en/publications/valuation/kroll-assesses-effect-us-monetary-fiscal-policies) (reaffirming a 5.0% recommended U.S. equity risk premium).

[60] *See also* Exhibit DJG-10.

Q. Please explain the final results of your CAPM analysis.

A. Using the inputs for the risk-free rate, beta, and equity risk premium discussed above, I estimate that the Company's CAPM cost of equity is 8.7%.[61] The CAPM can be displayed graphically through what is known as the Security Market Line ("SML"). The figure below shows the expected return (cost of equity) on the y-axis, and the average beta for the proxy group on the x-axis. The SML intercepts the y-axis at the level of the risk-free rate. The slope of the SML is the equity risk premium.

Figure 10:
CAPM Graph



[61] Exhibit DJG-11.

The SML provides the rate of return that will compensate investors for the beta risk of that investment. Thus, at an average beta of 0.74 for the proxy group, the estimated CAPM cost of equity for the Company is 8.7%.

D. Response to Ms. Bulkley's CAPM Analysis and Other Issues

Q. Please summarize the results of Ms. Bulkley's CAPM analysis.

A. Ms. Bulkley's traditional CAPM analysis produced results ranging from 11.14% - 11.45%.[62] Ms. Bulkley also conducted another variation of the CAPM called the "empirical CAPM" ("ECAPM"), which produced results ranging from 11.70% - 11.94%.[63] Additionally, Ms. Bulkley conducted another type of risk premium analysis, the "Bond Yield Risk Premium" analysis, which produced results as high as 10.78%.[64]

Q. Do the results of Ms. Bulkley's CAPM and other risk premium analyses indicate a reasonable cost of equity estimate for Eversource?

A. No. The primary factor causing Ms. Bulkley's traditional CAPM results to be unreasonably high is her use of an unreasonably high ERP estimate. I also do not place weight on her ECAPM results. Ms. Bulkley applies the ECAPM to Value Line adjusted betas, which have already been adjusted toward the market beta of 1.0. The ECAPM then applies an additional adjustment that raises the indicated return for betas below 1.0. For a low-beta utility proxy group, in my opinion, using both adjustments compounds the upward bias in the indicated cost of equity. Finally, the separate Bond Yield Plus Risk Premium analysis

[62] Exhibit CLP-ROE-2.
[63] *Id.*
[64] *Id.*

does not independently estimate a market-based cost of equity and should be given little weight.

1. Equity Risk Premium

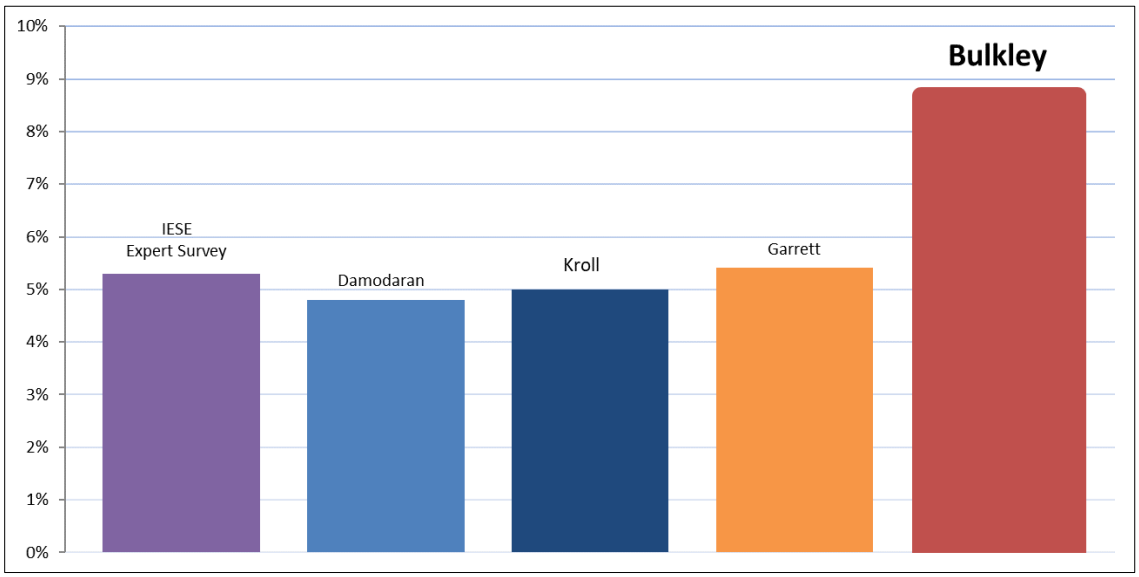
Q. Did Ms. Bulkley rely on a reasonable measure for the ERP?

A. No. The primary factor that causes Ms. Bulkley's CAPM results to be unreasonably high is her use of an unreasonably high market risk premium. Ms. Bulkley's S&P 500 market-return analysis produces an implied market risk premium as high as 8.68%, compared with the 5.1% ERP I use in my CAPM application. Her high market risk premium is driven by an expected S&P 500 market return of 13.38%, which in turn relies on a weighted long-term growth assumption of 12.02%. In a constant-growth market DCF analysis, that growth assumption is effectively treated as perpetual. A perpetual 12.02% growth rate for the broad U.S. equity market is not sustainable relative to long-term nominal U.S. GDP growth of approximately 3.8%. This assumption materially inflates Ms. Bulkley's market return, market risk premium, and ultimately her CAPM results. See Exhibit CLP-ROE-7.

Q. Please discuss and illustrate how Ms. Bulkley's ERP compares with other estimates for the ERP.

A. Ms. Bulkley's implied market risk premium estimate is substantially higher than the other ERP indications I considered. The 2026 IESE Business School survey reports an average U.S. market risk premium of 5.3%. Kroll currently recommends a 5.0% U.S. ERP. The midpoint of the two Damodaran implied-ERP specifications I rely on is 4.7%, and my own implied-ERP calculation is approximately 5.4%. The chart in the following figure illustrates the magnitude of this difference.

Figure 11:
Equity Risk Premium Comparison



When compared with other independent sources for the ERP, as well as my estimate, Ms. Bulkley's ERP estimate is clearly too high. This factor contributes to Ms. Bulkley's CAPM results overstating Eversource's cost of equity.

2. Other Risk Premium Analysis

Q. Please describe Ms. Bulkley's other risk premium analysis in addition to the CAPM.

A. In addition to the CAPM, which is a risk premium model, Ms. Bulkley also conducted another type of risk premium model which she calls the "Bond Yield Plus Risk Premium" model. This model produced results ranging from 10.61% – 10.78%.[65]

Q. Does the result of Ms. Bulkley's risk premium model indicate a reasonable cost of equity for Eversource?

A. No. Unlike the CAPM and DCF Model, Ms. Bulkley's Bond Yield Plus Risk Premium model does not independently estimate the market-based cost of equity. Instead, it

[65] *Id.*

estimates an authorized ROE based in part on the historical relationship between Treasury yields and authorized ROEs from other regulatory proceedings, including data dating back to 1980. Authorized ROEs are regulatory outcomes that may be affected by settlements, negotiated compromises, and other case-specific considerations; they are not themselves market-based cost-of-equity inputs. In addition, relying on data extending back several decades is difficult to reconcile with the forward-looking nature of the cost of capital. For these reasons, PURA should place little weight on this model and focus on the more direct market-based evidence from the CAPM and DCF Model.[66][67]

VIII. CAPITAL STRUCTURE

Q. Describe in general the concept of a company's "capital structure."

A. "Capital structure" refers to the way a company finances its overall operations through external financing. The primary sources of long-term, external financing are debt capital and equity capital. Debt capital usually comes in the form of contractual bond issues that require the firm to make payments, while equity capital represents an ownership interest in the form of stock. Because a firm cannot pay dividends on common stock until it satisfies its debt obligations to bondholders, stockholders are referred to as "residual claimants." The fact that stockholders have a lower priority to claims on company assets increases their risk and the required return relative to bondholders. Thus, equity capital has a higher cost than debt capital. Firms can reduce their weighted average cost of capital ("WACC") by

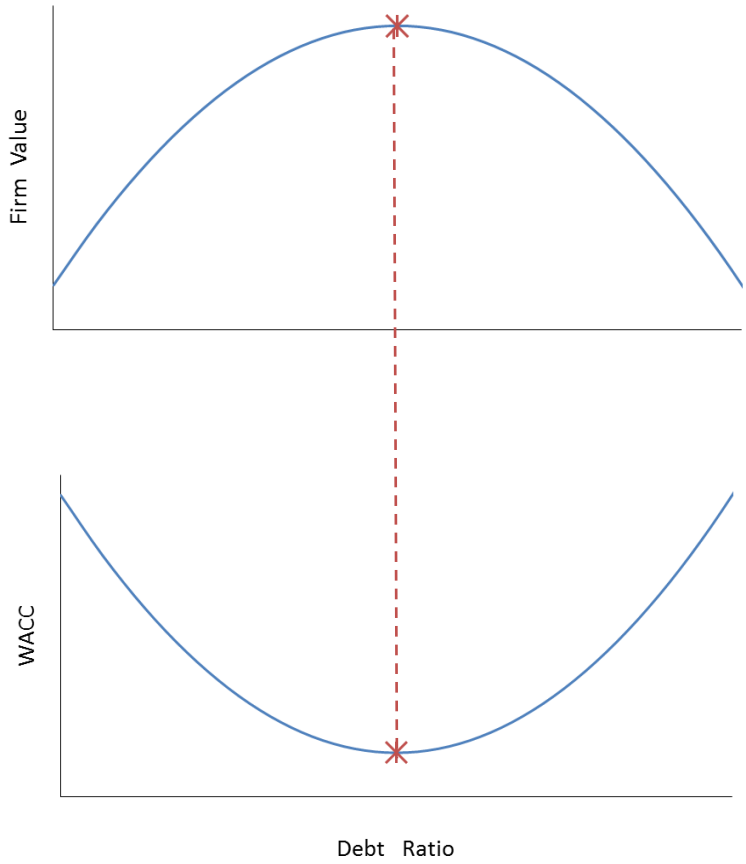
[66] *Id*. at 35:8–9.
[67] *See, e.g.*, Exhibit CLP-ROE-1 (Bulkley Direct), p. 19, line 4.

recapitalizing and increasing their debt financing. In addition, because interest expense is deductible, increasing debt also adds value to the firm by reducing the firm's tax obligation.

Q. Can competitive firms add value by increasing debt to reduce their WACC?

A. Yes. A competitive firm can add value by increasing debt. After a certain point, however, the marginal cost of additional debt outweighs its marginal benefit. This is because the more debt the firm uses, the higher interest expense it must pay, and the likelihood of loss increases. This also increases the risk of non-recovery for both bondholders and shareholders, causing both groups of investors to demand a greater return on their investment. Thus, if debt financing is too high, the firm's WACC will increase instead of decrease. The following figure illustrates these concepts.

Figure 12:
Optimal Debt Ratio



As shown in this figure, a competitive firm's value is maximized when the WACC is minimized. In both graphs, the debt ratio is shown on the x-axis. By increasing its debt ratio, a competitive firm can minimize its WACC and maximize its value. At a certain point, however, the benefits of increasing debt do not outweigh the costs of the additional risks to both bondholders and shareholders, as each type of investor will demand higher returns for the additional risk they have assumed.[68]

[68]See John R. Graham, Scott B. Smart & William L. Megginson, Corporate Finance: Linking Theory to What Companies Do 440-41 (3rd ed., South Western Cengage Learning 2010).

Q. Does the rate base rate of return model effectively incentivize utilities to operate at the optimal capital structure?

A. No. While it is true that competitive firms maximize their value by minimizing their WACC, this is not the case for regulated utilities. Under the rate base rate of return model, a higher WACC results in higher rates, all else held constant. The basic revenue requirement equation is as follows:

Equation 1:
Revenue Requirement for Regulated Utilities

$$RR = O + d + T + \boldsymbol{r}(A - D)$$

where:

RR	=	*revenue requirement*
O	=	*operating expenses*
d	=	*depreciation expense*
T	=	*corporate tax*
$\boldsymbol{r}$	=	***weighted average cost of capital (WACC)***
A	=	*plant investments*
D	=	*accumulated depreciation*

As shown in this equation, utilities can increase their revenue requirement by increasing their WACC, not by minimizing it. Thus, because there is no incentive for a regulated utility to minimize its WACC, a commission standing in the place of competition must ensure that the regulated utility is operating at the lowest reasonable WACC.

Q. Can utilities generally afford to have higher debt levels than other industries?

A. Yes. Because regulated utilities have large amounts of fixed assets, stable earnings, and low risk relative to other industries, they can afford to have relatively higher debt ratios (or "leverage"). As aptly stated by Dr. Damodaran:

> Since financial leverage multiplies the underlying business risk, it stands to reason that firms that have high business risk should be reluctant to take on financial leverage. It also stands to reason that firms that operate in stable businesses should be much more willing to take on financial leverage. Utilities, for instance, have historically had high debt ratios but have not had high betas, mostly because their underlying businesses have been stable and fairly predictable.[69]

Note that the author explicitly contrasts utilities with firms that have high underlying business risk. Because utilities have low levels of risk and operate a stable business, they should generally operate with relatively high levels of debt to achieve their optimal capital structure.

Q. Please describe the approach you used to assess the reasonableness of Eversource's capital structure for ratemaking purposes?

A. To assess a reasonable capital structure for Eversource, I examined the capital structures of the proxy group and Eversource's parent company, Eversource Energy. I also compared Eversource's proposed debt ratio with debt ratios observed in other industries. I discuss each of these approaches in more detail below.

A. Proxy, Parent, and Industry Debt Ratios

Q. Please describe the debt ratios of the proxy group.

A. According to the debt ratios recently reported in Value Line for the utility proxy group (the same proxy group used by Ms. Bulkley), the average debt ratio of the proxy group is 58.1%.[70] This is significantly higher than Eversource's proposed debt ratio of only 45.2%.

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[69] Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset* 196 (3rd ed., John Wiley & Sons, Inc. 2012) (emphasis added).

[70] Exhibit DJG-13.

Q. What is the debt ratio of Eversource's parent company?

A. Eversource's parent company had a debt ratio of 62.4% at the end of 2025.[71]

Q. Why is the parent company's significantly higher debt ratio significant?

A. Eversource Energy's consolidated capital structure is relevant because the Company is a wholly owned subsidiary and its common equity is supplied through the parent. Eversource Energy had a debt ratio of 62.4% at the end of 2025, materially higher than the 45.2% debt ratio the Company proposes for ratemaking. This comparison does not establish that any particular dollar of parent debt can be traced directly to the Company's equity. It does, however, highlight why the subsidiary's proposed equity-rich capital structure should not be accepted without assessing whether it is reasonable. Because equity is more expensive than debt, a lower debt ratio at the regulated subsidiary increases the revenue requirement, all else equal. The parent company comparison, together with the proxy-group evidence, supports a materially higher debt ratio than what the Company proposes.

Q. Does the parent-company financing relationship raise a concern regarding double leverage?

A. Yes. Double leverage generally refers to a situation in which a parent company uses debt financing at the parent level while providing equity capital to a regulated subsidiary. Because the Company is wholly owned by Eversource Energy and receives its common equity through the parent, Eversource Energy's substantially higher debt ratio is relevant to whether the Company's proposed debt ratio is reasonable. Effectively, the "equity" on the Company's balance sheet includes debt from the parent company. If that lower cost

[71] Value Line Investment Survey, Eversource Report.

debt were accounted for, the cost of the Company's "equity" would be lower. Double leverage is an additional reason to evaluate the subsidiary's proposed capital structure together with the parent-company and proxy-group evidence.

Q. Please describe the debt ratios recently observed in competitive U.S. industries.

A. There are more than 2,000 companies in the U.S. with average debt ratios of at least 50%.[72] The following figure shows a sample of these industries.

[72] Exhibit DJG-14.

Figure 13:
Industries Debt Ratio Sample

Industry	# Firms	Debt Ratio
Retail (Building Supply)	14	97%
Restaurant/Dining	64	95%
Hotel/Gaming	63	82%
Brokerage & Investment Banking	32	79%
Retail (Automotive)	34	77%
Hospitals/Healthcare Facilities	31	76%
Rubber& Tires	3	74%
Bank (Money Center)	15	73%
Recreation	49	72%
Air Transport	23	71%
Food Wholesalers	13	69%
Retail (Grocery and Food)	15	67%
Chemical (Diversified)	4	66%
Cable TV	9	65%
Telecom (Wireless)	12	65%
Advertising	52	64%
Transportation	19	64%
R.E.I.T.	190	63%
Power	46	63%
Oil/Gas Distribution	23	63%
Transportation (Railroads)	4	62%
Computers/Peripherals	36	61%
Telecom. Services	39	61%
Broadcasting	24	61%
Auto & Truck	33	60%
Retail (Special Lines)	94	60%
Software (Internet)	29	60%
Green & Renewable Energy	15	59%
Environmental & Waste Services	53	58%
Office Equipment & Services	14	58%
Utility (General)	14	58%
Beverage (Soft)	27	57%
Apparel	35	56%
Information Services	15	56%
Total / Average	**1,143**	**67%**

Many of the industries shown here, like public utilities, are generally well-established industries with large amounts of capital assets. The shareholders of these industries generally prefer these higher debt ratios in order to maximize their profits. There are

several notable industries that are relatively comparable to public utilities. For example, the Cable TV, Telecom, and Power industries have debt ratios of at least 60%.

Q. Please summarize the results of your capital structure analyses and your recommendation regarding capital structure.

A. The results of my analyses are summarized in the following table:

Figure 14:
Capital Structure Analysis – Summary of Results

Source	Debt Ratio
Cable TV	65%
Power	63%
Telecom Services	61%
Parent Company (ES)	62.4%
Proxy Group of Utilities	**58.1%**
Company Proposed	**45.2%**

As shown in this figure, Eversource's proposed debt ratio is clearly too low. This results in excessively high capital costs and utility rates. My analysis indicates that Eversource's debt ratio for ratemaking should be at least 58.1% for ratemaking purposes. Thus, I recommend PURA adopt a capital structure for Eversource consisting of 58.1% debt.

B. The Hamada Model: Capital Structure's Effect on ROE

Q. Have you considered the impact that your capital structure recommendation could have on the company's indicated cost of equity?

A. Yes. I assessed the impact of my capital structure proposal on the Company's cost of equity estimate by using the Hamada model.

Q. What is the premise of the Hamada model?

A. The Hamada formula can be used to analyze changes in a firm's cost of capital as it adds or reduces financial leverage, or debt, in its capital structure by starting with an "unlevered" beta and then "relevering" the beta at different debt ratios. As leverage increases, equity investors bear increasing amounts of risk, leading to higher betas. Before the effects of financial leverage can be accounted for, however, the effects of leverage must first be removed, which is accomplished through the Hamada formula. The Hamada formula for unlevering beta is stated as follows:[73]

Equation 4:
Hamada Formula

$$\beta_U = \frac{\beta_L}{\left[1 + (1 - T_c)\left(\frac{D}{E}\right)\right]}$$

where: β_U = *unlevered beta (or "asset" beta)*
β_L = *average levered beta of proxy group*
T_C = *corporate tax rate*
D = *book value of debt*
E = *book value of equity*

Using this equation, the beta for the firm can be unlevered, and then "relevered" based on various debt ratios (by rearranging this equation to solve for β_L).

Q. Please summarize the results of the Hamada formula based on your proposed capital structure for the company.

A. The average capital structure of the proxy group consists of 58.1% debt. Because Eversource's proposed debt ratio is substantially lower than that of the proxy group, when we "relever" Eversource relative to the proxy group, it results in a lower indicated ROE

[73]Damodaran, supra note 69, at 197. This formula was originally developed by Hamada in 1972.

than if Eversource were operating with a capital structure equal to that of the proxy group. This makes sense because Eversource has less financial risk than the proxy group due to the lower amount of debt in its proposed capital structure. The results of my Hamada model are presented in the following figure.

Figure 15:
Hamada Model ROE

Unlevering Beta	
Proxy Debt Ratio	58.1%
Proxy Equity Ratio	41.9%
Proxy Debt / Equity Ratio	1.4
Tax Rate	21%
Equity Risk Premium	5.1%
Risk-free Rate	4.9%
Proxy Group Beta	0.74
Unlevered Beta	0.36

Relevered Betas and Cost of Equity Estimates

Debt Ratio	D/E Ratio	Levered Beta	Cost of Equity
0%	0.0	0.36	6.8%
20%	0.3	0.43	7.1%
25%	0.3	0.45	7.2%
30%	0.4	0.48	7.4%
45.2%	0.8	0.59	7.9%
58.1%	1.4	0.74	8.7%
60%	1.5	0.78	8.9%

According to the results of the Hamada model, if PURA were to adopt Eversource's proposed capital structure, the Company's indicated cost of equity estimate would be 7.9%.[74]

Q. Have there been any recent regulatory developments relevant to your ROE and capital structure recommendations?

A. Yes. On October 16, 2026, a recommended decision was issued in the UGI Utilities, Inc. – Electric Division base rate case. I testified in that proceeding on behalf of the Pennsylvania Office of Consumer Advocate and recommended an 8.70% ROE and a hypothetical capital structure consisting of 42% common equity and 58% debt. The ALJs recommended adopting both recommendations, resulting in a 6.68% overall rate of return. The Recommended Decision is not a final order, but it provides recent regulatory support for several of the analytical principles I apply in this case.

Q. What aspects of the Recommended Decision are particularly relevant to your ROE analysis?

A. The ALJs recommended an 8.70% ROE based on my DCF and CAPM analyses. They found the company's DCF result overstated due to unsustainably high growth rates and concluded that my reliance on expert surveys for the equity risk premium and a 3.8% perpetual growth rate was reasonable and supported by the record. Those findings are relevant here because I use the same general approaches in evaluating Ms. Bulkley's DCF growth rates and equity risk premium assumptions.[75]

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[74] *See also* Exhibit DJG-15.

[75] *See* Pa. PUC v. UGI Utilities, Inc.-Electric Division, Docket No. R-2025-3059430, Recommended Decision (Oct. 16, 2026), pp. 135-136

Q. What aspects of the Recommended Decision are particularly relevant to your capital structure analysis?

A. The ALJs acknowledged Commission precedent favoring actual capital structures when reasonable, but nevertheless recommended a hypothetical capital structure of 42% common equity and 58% debt after considering the cost of an equity-rich capital structure, the parent company's higher debt ratio, proxy-group and industry comparisons, and double leverage. They also noted that the electric-utility industry barometer group had an average capital structure of approximately 41.87% equity and 58.13% debt.[76] Those considerations closely parallel the parent-company and proxy-group comparisons I use here.

PART TWO: DEPRECIATION

IX. REGULATORY STANDARDS

Q. Please discuss the standard by which regulated utilities are allowed to recover depreciation expense.

A. In *Lindheimer v. Illinois Bell Telephone Co.*, the U.S. Supreme Court stated "depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy, and obsolescence."[77] The *Lindheimer* Court also recognized that the original

[76] *See id*. at 101-102.

[77] *Lindheimer v. Illinois Bell Tel. Co.*, 292 U.S. 151, 167 (1934).

cost of plant assets, rather than present value or some other measure, is the proper basis for calculating depreciation expense.[78] Moreover, the *Lindheimer* Court found:

> [T]he company has the burden of making a convincing showing that the amounts it has charged to operating expenses for depreciation have not been excessive. That burden is not sustained by proof that its general accounting system has been correct. The calculations are mathematical, but the predictions underlying them are essentially matters of opinion.[79]

Thus, PURA must ultimately determine if Eversource has met its burden of proof by making a convincing showing that its proposed depreciation rates are not excessive.

X. NET SALVAGE ANALYSIS

Q. Please summarize the net salvage rates proposed in the depreciation study.

A. In this case, the Company is proposing to incorporate net salvage recovery into depreciation rates through an approach sometimes referred to as the "traditional method." Based on my experience, the traditional method is the one most commonly adopted by regulatory commissions. The traditional method inherently incorporates the concept of future net salvage recovery into current depreciation rates. Similar to the service life component, which considers the future, remaining life of plant, the traditional net salvage method also considers future net salvage costs and allocates those costs over the service life of the asset. Under the traditional net salvage method, current and historical net salvage

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[78] *Id*. (Referring to the straight-line method, the *Lindheimer* Court stated that "[a]ccording to the principle of this accounting practice, the loss is computed upon the actual cost of the property as entered upon the books, less the expected salvage, and the amount charged each year is one year's pro rata share of the total amount."). The original cost standard was reaffirmed by the Court in *Federal Power Commission v. Hope Natural Gas Co.*, 320 U.S. 591, 606 (1944). The *Hope* Court stated: "Moreover, this Court recognized in [*Lindheimer*], supra, the propriety of basing annual depreciation on cost. By such a procedure the utility is made whole and the integrity of its investment maintained. No more is required."

[79] *Id*. at 169.

costs are still considered and used as part of the net salvage analysis, but the way in which the net salvage rate is incorporated into the overall depreciation rate is inherently forward-looking. Under the traditional method, the ratio of historical net salvage costs to the cost of historical retirements is used to express a net salvage rate percentage that is applied to the original cost of plant and incorporated into the overall depreciation rate.

Q. Is the traditional method used by the majority of regulatory jurisdictions?

A. Based on my own experience and reviewing this issue in other cases, it is my understanding that the traditional method is used by the vast majority of regulatory commissions.

Q. Do your proposed depreciation rates in this case include a net salvage component that is also based on an application of the traditional net salvage method?

A. Yes.

Q. How does the traditional method differ from the historical cost method previously used by PURA?

A. In several recent cases before PURA, the Authority has used the "historical cost method," which is based on the idea that net salvage accruals should be based on recent net salvage costs.[80] In contrast to the traditional method, the historical cost method is primarily focused on recent, incurred net salvage costs rather than future, expected net salvage costs. Based on my involvement and review of prior cases before PURA in which the historical cost method was proposed, professional judgment was still used in the process such that proposed net salvage rates under this method were not based on strict mathematical

[80] In his direct testimony, Mr. Allis uses the term "Historical Cost Method" to describe the unique net salvage previously adopted by PURA in several cases, and I use the same description in my testimony.

calculations of recently incurred net salvage costs, but also included an additional amount to increase the depreciation reserve (i.e., higher depreciation rates), than what would have otherwise resulted from a stricter mathematical application of the historical cost method. In the Decision issued by the Authority in Docket No. 23-11-02 pertaining to Connecticut Natural Gas Corporation (CNG) and Southern Connecticut Gas Company (SCG), PURA found as follows:

> Net salvage rates must take into consideration the totality of the evidence and circumstances presented in each case, with a net salvage method employed to arrive at just and reasonable rates. The Authority will continue to evaluate the reasonableness of proposed net salvage methods on a case-by-case basis to ensure systematic and rational cost recovery for the utility and fairness to customers. Here, the net salvage rates calculated by OCC's witness take into account the large discrepancy between the Company's recent actual incurred net salvage costs and the Company's proposed net salvage recovery. See Dunkel PFT, p. 21. In addition, those rates provide adequate funds to increase the reserve and insulate future ratepayers from unfair rate increases. See Dunkel Surrebuttal, pp. 19–20. Accordingly, the Authority finds that the depreciation rates calculated by OCC's witness reflect a more reasonable net salvage value and, as such, will employ the depreciation rates in determining the Company's depreciation expense. Dunkel PFT, p. 36."[81]

Q. How do your proposed depreciation rates using the traditional method of net salvage bridge the gap between the historical cost method and recent PURA decision adopting that method?

A. My proposed rates under the traditional method reflect the principle that net salvage estimates should be primarily forward-looking, consistent with service life analysis and depreciation analysis generally. At the same time, OCC's concerns in prior PURA cases remain relevant: current customers should not be required to absorb abrupt increases in net salvage recovery that are far above the Company's recent actual net salvage costs. Under

[81]Decision regarding SCG dated November 18, 2024, Docket No. 23-11-02, p. 169.

the historical cost method, recently incurred net salvage costs were the starting point and professional judgment was then used to provide additional reserve funding. Under my proposed application of the traditional method, the analysis begins with forward-looking net salvage estimates, but PURA can apply gradualism and other judgment to moderate the timing of recovery. This approach reduces the disparity between recent actual costs and proposed recovery while still providing additional funds to build the reserve and protect future customers. In my opinion, it produces a more balanced result than simply adopting all of Mr. Allis's proposed net salvage rates.

Q. Will continued application of the traditional net salvage method inevitably result in large or sudden rate increases for customers?

A. No. The traditional method does not require PURA to adopt the full amount of every proposed increase in negative net salvage immediately. PURA retains discretion to select reasonable net salvage rates based on the totality of the evidence. My proposed adjustments illustrate this point: for accounts in which the Company proposes a more negative net salvage rate, I generally apply gradualism to moderate the increase, while also considering recent actual experience when it provides particularly relevant evidence. Under either method, professional judgment remains necessary to ensure that the resulting depreciation rates are reasonable for both current and future customers.

Q. Have other utility commissions applied gradualism to net salvage rate increases to address concerns over increasing negative net salvage rates?

A. Yes. In Pacific Gas and Electric Company's ("PG&E") 2014 rate case, the California commission stated: "We remain concerned with the growing cost burden associated with

increasing cost trends for negative net salvage."[82] The California commission also expressed an interest in the ratemaking concept of gradualism:

> In evaluating whether a proposed increase reflects gradualism, however, we believe the more appropriate measure is how the change affects customers' retail rates. The fact that PG&E previously proposed higher removal costs than adopted has no bearing on how a proposed change would impact current ratepayers. Accordingly, we apply the principle of gradualism based on how a proposed change in estimate compares to adopted costs reflected in current rates, irrespective of what PG&E may have forecasted in an earlier depreciation study.[83]

In PG&E's 2014 rate case, the California Office of Ratepayer Advocates proposed a 25% cap on increased net salvage rates to mitigate sudden increases in net salvage and instead provide for more gradual levels of increases.[84] The California commission ultimately found: "As a general approach, we adopt no more than 25% of PG&E's estimated increases in the accrual provision for removal costs. This limitation tempers the impacts on current ratepayers[.]"[85]

Q. Please summarize your proposed net salvage rate adjustments in this case.

A. I generally applied gradualism by limiting increases in negative net salvage to approximately 50% of the Company's proposed increase. I did not apply that approach mechanically to every account. For Accounts 365 and 369, recent historical net salvage experience supports rates of negative 19% and negative 57%, respectively, and I use those account-specific estimates instead. The resulting rates are shown in Exhibit DJG-18. This

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[82] Decision Authorizing Pacific Gas and Electric Company's General Rate Case Revenue Requirement for 2014-2016, D.14-08-032, p. 597.

[83] *Id*. at 598.

[84] *Id*. at 592-93.

[85] *Id*. at 602.

approach illustrates why net salvage should be evaluated account by account using the traditional method, historical experience, and professional judgment. Even if my proposed depreciation rates are adopted, the Company's total annual depreciation accrual would still increase relative to current levels.[86]

Q. Would you advise that the net salvage issues continue to be considered on a case-by-case basis?

A. Yes. As stated by the Authority in prior decisions, I would recommend the proposed net salvage rates and methods be continually evaluated on a case-by-case basis to ensure fairness and reasonableness.

XI. SERVICE LIFE ANALYSIS

Q. Describe the methodology used to estimate the service lives of grouped depreciable assets.

A. The study of retirement patterns of industrial property is derived from the same actuarial process used to study human mortality. Just as actuarial analysts study historical human mortality data to predict how long a group of people will live, depreciation analysts study historical plant data to estimate the average lives of property groups. The most common actuarial method used by depreciation analysts is called the "retirement rate method." In the retirement rate method, original property data, including additions, retirements, transfers, and other transactions, are organized by vintage and transaction year.[87] The

[86]See Exhibit DJG-18.

[87] The "vintage" year refers to the year that a group of property was placed in service (aka "placement" year). The "transaction" year refers to the accounting year in which a property transaction occurred, such as an addition, retirement, or transfer (aka "experience" year).

retirement rate method is ultimately used to develop an "observed life table," ("OLT") which shows the percentage of property surviving at each age interval. This pattern of property retirement is described as a "survivor curve." The survivor curve derived from the OLT, however, must be fitted and smoothed with a complete curve in order to determine the ultimate average life of the group.[88] The most widely used survivor curves for this curve fitting process were developed at Iowa State University in the early 1900s and are commonly known as the "Iowa curves."[89] An OLT curve by itself, however, is rarely a smooth curve, and is often not a "complete" curve (i.e., it does not end at zero percent surviving). To calculate average life (the area under a curve), a complete survivor curve is required. The Iowa curves are empirically-derived curves based on the extensive studies of the actual mortality patterns of many different types of industrial property. The curve fitting process involves selecting the best Iowa curve to fit the OLT curve. This can be accomplished through a combination of visual and mathematical curve fitting techniques, as well as professional judgment. Ultimately, the selected Iowa curve is used to calculate the proposed remaining life for each account at issue.

Q. Do you always select the mathematically best-fitting curve?

A. No. While mathematical fitting is an important part of the curve fitting process, because it promotes objective, unbiased results, it may not always yield the optimum result. For example, if there is insufficient historical data in a particular account and the OLT curve

[88]See Appendix E for a more detailed discussion of the actuarial analysis used to determine the average lives of grouped industrial property.

[89]See Appendices D and E for a more detailed discussion of the Iowa curves and how they are used in service life analysis.

derived from that data is relatively short and flat, the mathematically "best" curve may be one with a very long average life. However, when there are sufficient data available, mathematical curve fitting can be an important component of an objective service life analysis.

Q. Should every portion of the OLT curve be given equal weight?

A. No. Many analysts have observed that the points comprising the tail end of the OLT curve may often have less analytical value than other portions of the curve. In fact, "[p]oints at the end of the curve are often based on fewer exposures and may be given less weight than points based on larger samples. The weight placed on those points will depend on the size of the exposures."[90] In accordance with this standard, an analyst may decide to "truncate" the tail end of the OLT curve at a certain percent of initial exposures, such as one percent. In my analysis, I considered both the entire and truncated portions of the OLT curve as part of a comprehensive process involving visual curve fitting, mathematical curve fitting, and professional judgment in order to recommend the most reasonable service lives. The accounts in dispute are further discussed below.

A. Account 364.00 – Poles, Towers and Fixtures

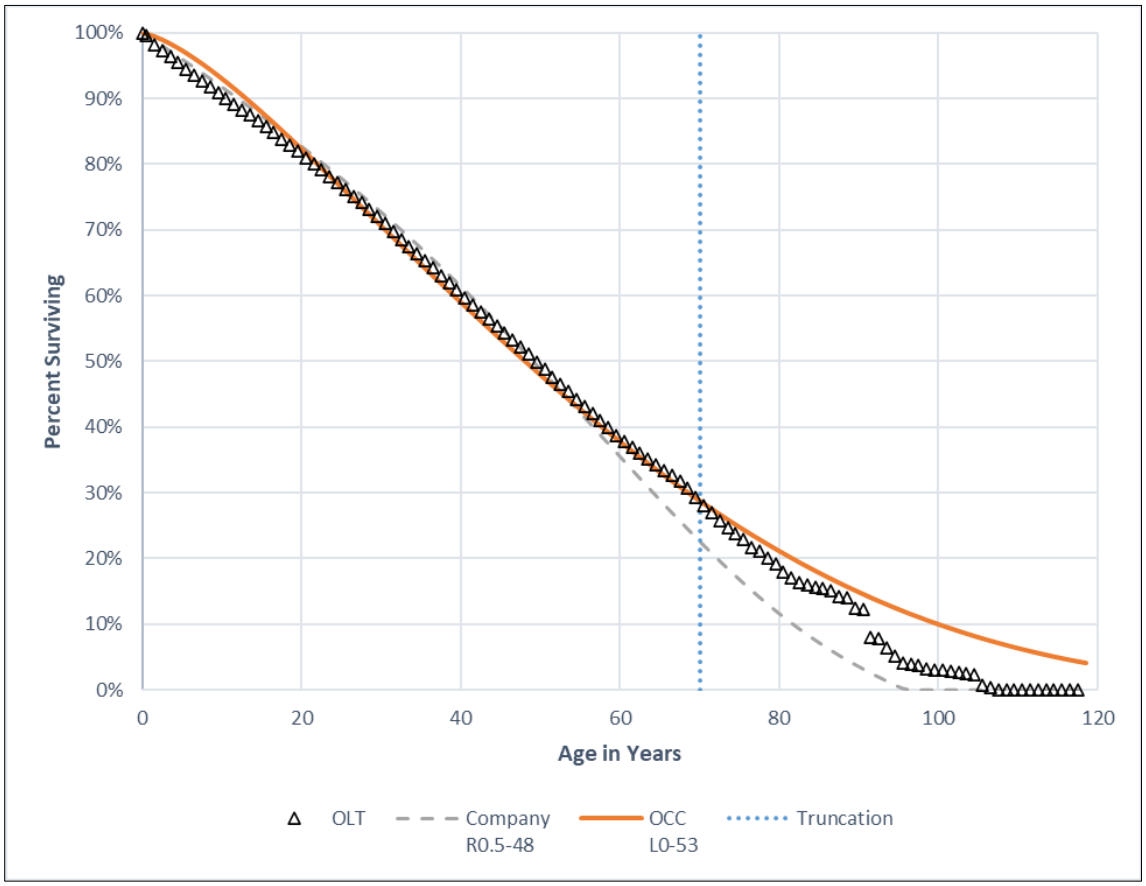
Q. Please describe your service life estimate for this account and compare it with the Company's estimate.

A. The OLT curve for this account is shown in the graph below. The graph also shows the Iowa curves that Mr. Allis and I selected to estimate the average life for this account. The average life is determined by calculating the area under the Iowa curves. Thus, a longer

[90] *See* Frank K. Wolf & W. Chester Fitch, Depreciation Systems 46.

curve will produce a longer average life, and it will also result in a lower depreciation rate. For this account, Mr. Allis selected the R0.5-48 Iowa curve, and I selected the L0-53 Iowa curve. The average lives resulting from each curve are indicated by the numbers after the dashes (48 and 53 years, respectively). Both Iowa curves are shown with the OLT curve in the following graph. The Company's current curve for this account is R0.5-53, so my L0-53 selection retains the current 53-year average life while changing the curve shape based on the observed retirement data.[91]

Figure 16:
Account 364.00 – Poles, Towers and Fixtures



[91] *See* Company Responses to OCC-222 and OCC-223.

The vertical dotted line in the graph represents a potential truncation point in which the data points on the OLT curve associated with dollars less than 1% of the total dollars exposed to retirement at age zero are considered statistically irrelevant. Regardless of whether this truncation point is considered, the Iowa curve proposed by Mr. Allis does not appear to give enough consideration to relevant data points between ages 60 – 70. While the R0.5-48 curve is not necessarily outside a reasonable range of potential Iowa curves for this account, in consideration of the excessive increase to depreciation expense proposed by the Company in this case, it is reasonable for PURA to consider a more reasonable curve selection, especially when that curve results in a closer fit to the observed data. Mathematical curve fitting techniques can also be used to further assess the results, as discussed below.

Q. Does that Iowa curve you selected provide a better mathematical fit to the OLT curve for this account?

A. Yes. While visual curve fitting techniques help identify the most statistically relevant portions of the OLT curve for this account, mathematical curve fitting techniques can also aid in determining which of the two Iowa curves provides the better fit. Mathematical curve fitting essentially involves measuring the distance between the OLT curve and the selected Iowa curve. The best mathematically-fitted curve is the one that minimizes the distance between the OLT curve and the Iowa curve, thus providing the closest fit. The distance between the curves is calculated using the "sum-of-squared differences" ("SSD") technique. For this account, the SSD between the truncated OLT curve and the Company's curve is 0.0329, and the SSD between the truncated OLT curve and the L0-53 Iowa curve

I selected is only 0.0130, which means it results in the closer fit.[92] Based on the statistical analysis, the Iowa curve I propose for this account results in a more reasonable and accurate depreciation rate.

B. Account 365.00 – Overhead Conductors and Devices

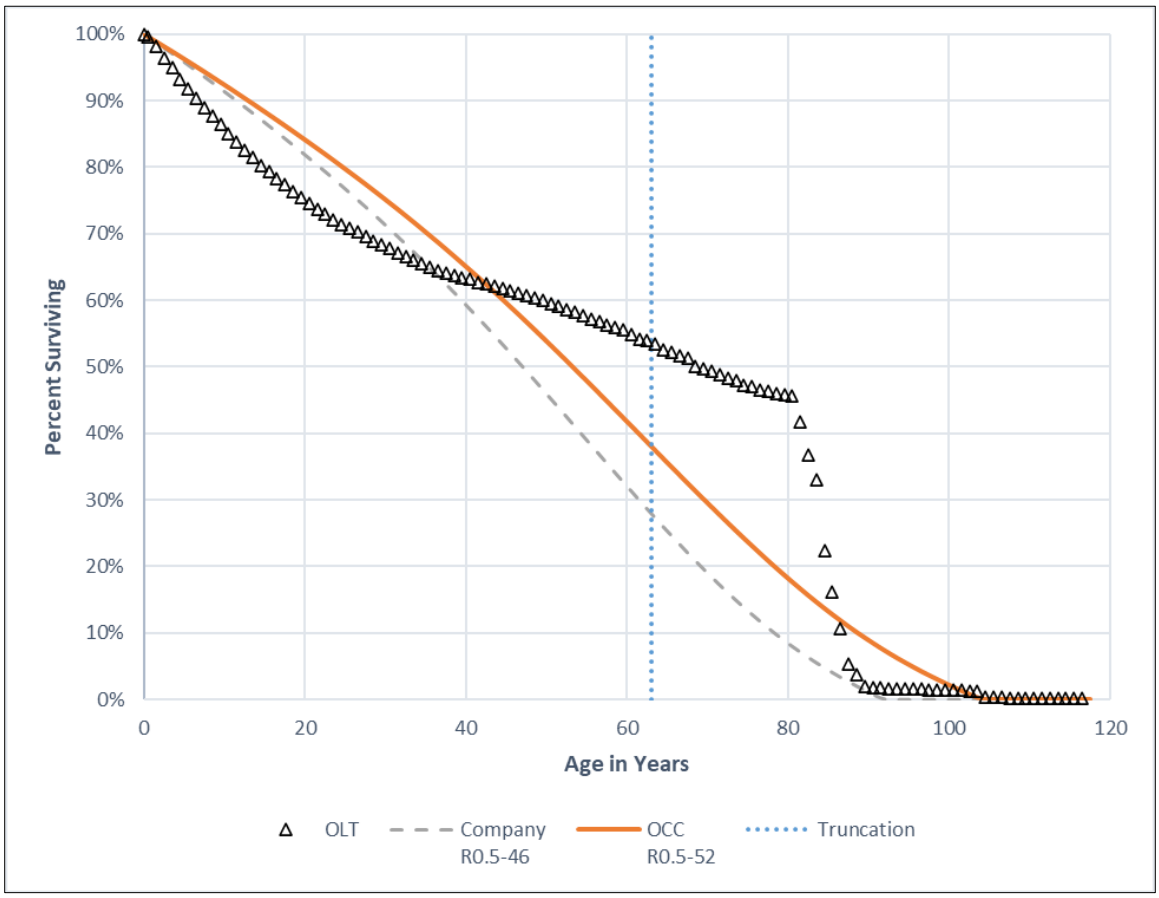
Q. Please describe your service life estimate for this account and compare it with the Company's estimate.

A. For this account, Mr. Allis selected the R0.5-46 curve, and I selected the R0.5-52 curve. Both of these Iowa curves are shown with the OLT curve in the following graph. Notably, the Company's current curve for Account 365 is R0.5-52, the same curve I selected.[93]

[92] Exhibit DJG-21.

[93] *See* Company Response to OCC-229.

Figure 17:
Account 365.00 – Overhead Conductors and Devices



Although this OLT curve is unconventional such that it is not possible to find an Iowa curve that closely fits through all portions of the curve, this is nonetheless the most meaningful evidence provided by the Company to support its proposed service life for this account. The Iowa curve selected by Mr. Allis does not give enough consideration to relevant data points between ages 40 – 60 in my opinion. In contrast, the R0.5-52 curve I selected results in a closer fit to these data points while still giving appropriate consideration to the early portion of the OLT curve. Mathematical curve fitting can be used to further assess the results.

Q. Does that Iowa curve you selected provide a better mathematical fit to the OLT curve for this account?

A. Yes. Regardless of whether the entire OLT curve or truncated OLT curve is measured, the Iowa curve I selected results in a better fit. Specifically, the SSD between the truncated OLT curve and the Company's curve is 0.7033, and the SSD between the truncated OLT curve and the R0.5-52 Iowa curve I selected is 0.3539, which means my curve results in the closer fit.[94]

C. Account 366.00 – Underground Conduit

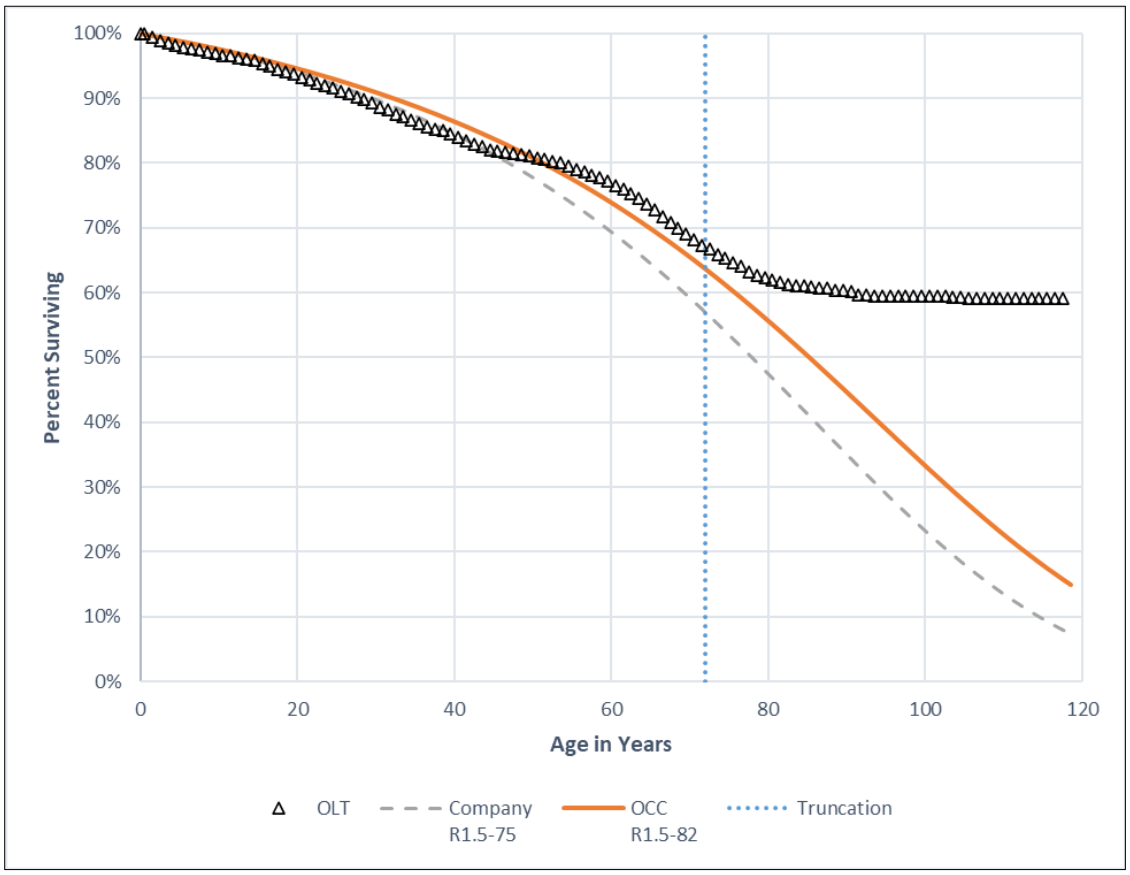
Q. Please describe your service life estimate for this account and compare it with the Company's estimate.

A. For this account, Mr. Allis selected the R1.5-75 Iowa curve, and I selected the R1.5-82 Iowa curve. Thus, while Mr. Allis and I selected the same Iowa curve shape, my analysis indicates that a longer average service life provides a better fit to the Company's observed retirement experience. Both Iowa curves are shown with the OLT curve in the following graph. The Company's current curve for this account is R2-75. Thus, the Company proposes retaining the current 75-year average life while changing the curve shape from R2 to R1.5. My analysis supports the same R1.5 shape but a longer 82-year average life.[95]

[94] Exhibit DJG-22.

[95] OCC-230.

Figure 18:
Account 366 – Underground Conduit



As shown in the graph, the Company's R1.5-75 curve begins to fall below the observed retirement data through a significant portion of the later ages. In particular, the R1.5-82 curve more closely tracks the observed data through much of ages 48 – 70. These data represent substantial exposures and should be given meaningful weight in estimating the average service life for this account. Based on my review of the observed retirement experience, the longer 82-year average life provides a more reasonable estimate for Account 366.

Q. Does the Iowa curve you selected provide a better mathematical fit to the OLT curve for this account?

A. Yes. The mathematical curve-fitting results support the visual analysis. The SSD between the truncated OLT curve and the Company's R1.5-75 curve is 0.1284, while the SSD between the truncated OLT curve and the R1.5-82 curve I selected is only 0.0277. The R1.5-82 curve therefore provides a substantially closer mathematical fit to the statistically relevant portion of the observed retirement data. The results based on the entire OLT curve similarly favor the curve I selected. Based on the visual and mathematical analyses, I recommend the R1.5-82 Iowa curve for this account.[96]

D. Account 367.00 – Underground Conductors and Devices

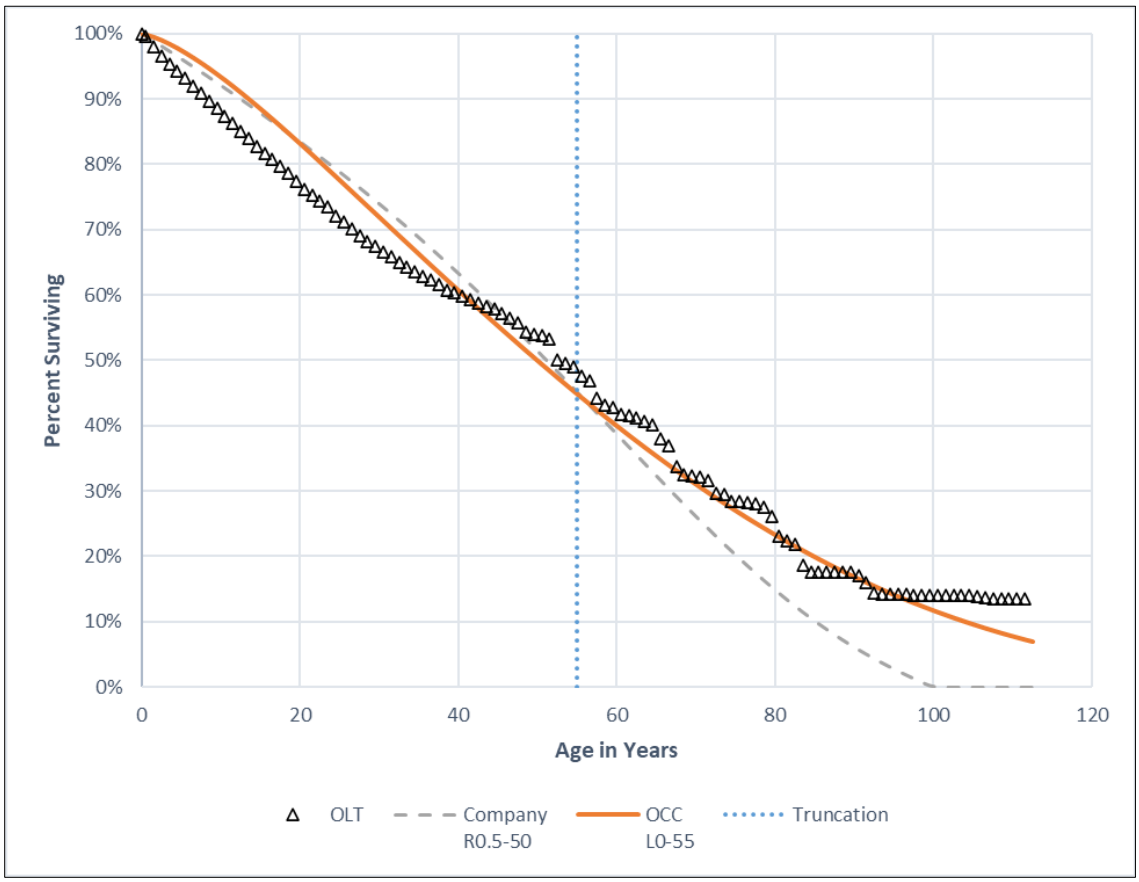
Q. Please describe your service life estimate for this account and compare it with the Company's estimate.

A. For this account, Mr. Allis selected the R0.5-50 Iowa curve, and I selected the L0-55 Iowa curve. Both Iowa curves are shown with the OLT curve in the following graph. The Company's current curve for this account is R0.5-53. Thus, my proposed 55-year average life is only two years longer than the current life, while the Company proposes shortening the average life to 50 years.[97]

[96] Exhibit DJG-23.

[97] *See* Company Response to OCC-231.

Figure 19:
Account 367 – Underground Conductors and Devices



Mr. Allis specifically uses Account 367 as an example in his direct testimony to explain the retirement-rate analysis underlying the depreciation study. He explains that aged plant accounting data extending from 1908 through 2025 were analyzed, including both the overall experience band and a more recent experience band. Thus, the Company has a significant amount of historical retirement information available for this account. The observed retirement pattern is somewhat irregular and no single Iowa curve will perfectly match every portion of the OLT curve. Nevertheless, my L0-55 curve provides a better overall representation of the observed retirement experience than the R0.5-50 curve selected by Mr. Allis. The longer 55-year average life also gives appropriate consideration

to the significant amounts of property that have remained in service beyond the ages implied by the Company's selected curve.

Q. Does the Iowa curve you selected provide a better mathematical fit to the OLT curve for this account?

A. Yes. The mathematical results support my selection, although the difference is smaller when only the truncated portion of the curve is considered. For the truncated OLT curve, the SSD produced by the Company's R0.5-50 curve is 0.1236, compared with 0.1074 for my L0-55 curve. When the entire OLT curve is considered, the difference is substantially greater: the Company's curve produces an SSD of 0.6852, compared with only 0.1529 for the L0-55 curve. Thus, the curve I selected provides the better mathematical fit under both measurements and a substantially better fit to the complete retirement experience. Based on the visual and mathematical analyses, I recommend the L0-55 Iowa curve for this account.[98]

E. Account 373.00 – Street Lighting and Signal Systems

Q. Please describe your service life estimate for this account and compare it with the Company's estimate.

A. For this account, Mr. Allis selected the L0-18 Iowa curve, and I selected the O3-25 Iowa curve. Both Iowa curves are shown with the OLT curve in the following graph. The Company's current curve is L0-25. Thus, my O3-25 selection retains the current 25-year average life while changing the curve shape to better reflect the observed retirement data; the Company, by contrast, proposes shortening the average life to 18 years.[99]

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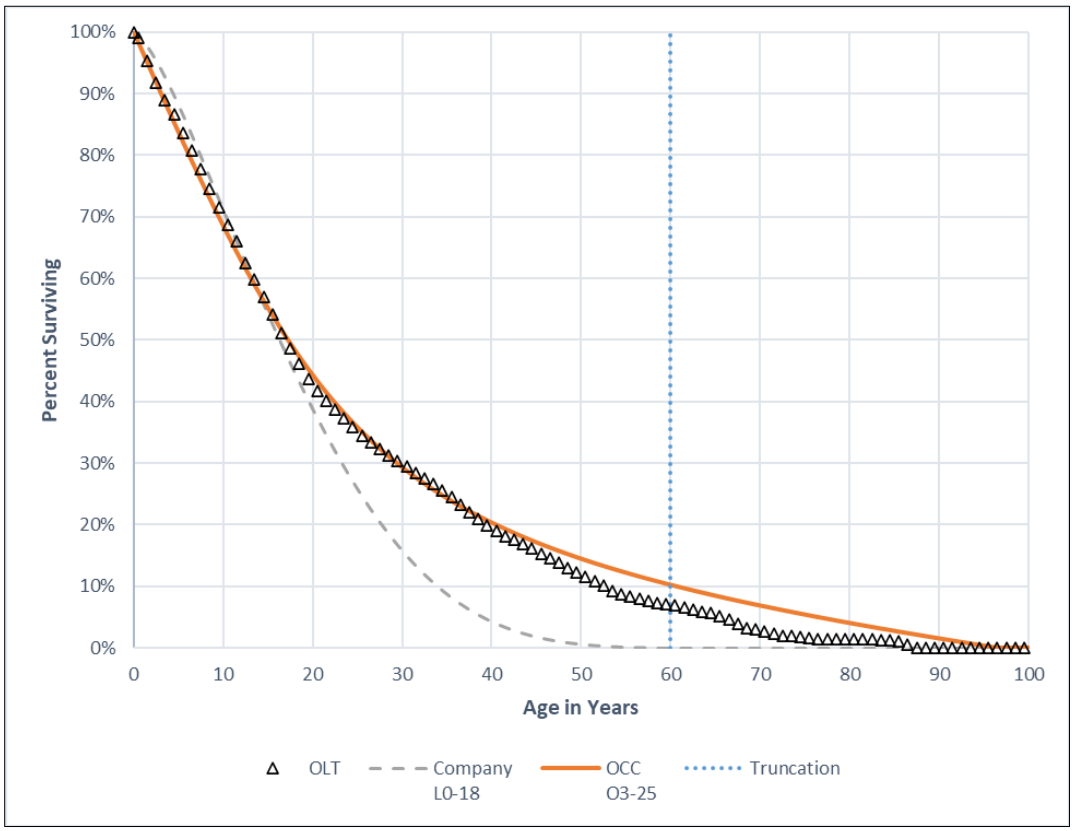
[98] Exhibit DJG-24.

[99] *See* Company Response to OCC-236.

Figure 20:
Account 373 – Street Lighting and Signal Systems



The observed retirement data provide particularly strong support for a longer service life than the 18-year life proposed by the Company. As shown in the graph, the L0-18 curve declines significantly faster than the OLT curve through much of the observed retirement experience. In contrast, the O3-25 curve closely tracks the OLT curve through the statistically relevant portion of the data. The Company's proposed 18-year life therefore does not give sufficient consideration to the actual retirement experience reflected in its property records. Based on these data, a 25-year average service life is considerably more reasonable.

Q. Does the Iowa curve you selected provide a better mathematical fit to the OLT curve for this account?

A. Yes. The mathematical curve-fitting results strongly support the O3-25 curve. The SSD between the truncated OLT curve and the Company's L0-18 curve is 0.6078, compared with only 0.0181 for the O3-25 curve I selected. The same conclusion results when the entire OLT curve is measured, with SSD results of 0.6404 for the Company's curve and only 0.0465 for my curve. Thus, under either measurement, my selected Iowa curve provides a substantially closer fit to the Company's actual observed retirement experience. Based on the visual and mathematical analyses, I recommend the O3-25 Iowa curve for this account.[100]

F. Account 370.48 – Meters

Q. Please describe the Company's proposed depreciation treatment for Account 370.48 – Meters and your adjustment.

A. For Account 370.48, the Company applies the life-span method and assumes a probable retirement date of December 2030 for all existing meter categories, based on the planned conversion to advanced metering infrastructure ("AMI").[101] The Company also selects interim Iowa curves for the individual meter groups: S0-20 for AMR, demand, net, and time-of-use meters, and S2-15 for bridge meters. I do not dispute those Iowa-curve selections or the Company's proposed positive 5% net salvage rate. My adjustment is limited to removing the December 2030 terminal retirement date and calculating remaining lives under the normal mass-property approach using those same Iowa curves.

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[100] Exhibit DJG-25.

[101] *See* Company Response to OCC-502

Q. Why do you believe the mass-property treatment is more reasonable for these meter assets?

A. Meters are a large group of similar assets for which retirement dispersion can be estimated using survivor curves, which is the basic purpose of mass-property depreciation analysis. In fact, the Company's currently approved treatment for these meter categories uses a 23-L1 mass-property curve rather than a common terminal retirement date. The Iowa curves proposed in this case already provide a mechanism for estimating the pattern of future retirements. By superimposing a December 2030 probable retirement date on those curves, the Company effectively converts the account to life-span property and compresses the remaining lives of the entire existing meter population into a relatively short period. In my opinion, that approach accelerates depreciation recovery beyond what is supported by the normal mass-property analysis.

Q. Does your adjustment ignore the Company's planned AMI conversion or assume that no meters will be replaced by the end of 2030?

A. No. I recognize that the Company currently plans to replace its existing meters with AMI meters by the end of 2030, and that this program could increase meter retirements during the implementation period. My disagreement concerns the depreciation assumption that every dollar of existing meter plant should be treated as though it has a common terminal retirement date with certainty. Depreciation estimates can be updated as the AMI program progresses and actual retirement experience develops. If implementation materially shortens the remaining lives of the meter population, PURA can recognize that experience in a future depreciation study or rate proceeding. My adjustment therefore does not deny recovery of the meter investment; it avoids accelerating that recovery today based on a forecasted common retirement date.

Q. What is the impact of your Account 370.48 adjustment on depreciation expense?

A. The Company's life-span treatment produces a composite remaining life of approximately 4.3 years and annual depreciation accrual of approximately $36.2 million for Account 370.48. Using the same Iowa curves and net salvage assumptions without the December 2030 terminal retirement date produces a composite remaining life of approximately 9.2 years and annual depreciation accrual of approximately $16.9 million. Thus, my adjustment reduces the Company's proposed annual depreciation accrual for Account 370.48 by approximately $19.3 million.[102]

Q. Does this conclude your testimony?

A. Yes.

[102] *See* Exhibits DJG-19 and DJG-20.