

**EXHIBIT NO. ___(RAM-1T)
DOCKETS UE-17___/UG-17___
2017 PSE GENERAL RATE CASE
WITNESS: DR. ROGER A. MORIN**

**BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

**WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,**

Complainant,

v.

PUGET SOUND ENERGY,

Respondent.

Docket UE-17___

Docket UG-17___

PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF

DR. ROGER A. MORIN

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 13, 2017

PUGET SOUND ENERGY

**PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF
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1 **PUGET SOUND ENERGY**

2 **PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF**
3 **DR. ROGER A. MORIN**

4 **I. INTRODUCTION**

5 **Q. Please state your name, business address, and occupation.**

6 A. My name is Dr. Roger A. Morin. My business address is Georgia State
7 University, Robinson College of Business, University Plaza, Atlanta, Georgia,
8 30303. I am Emeritus Professor of Finance at the Robinson College of Business,
9 Georgia State University and Professor of Finance for Regulated Industry at the
10 Center for the Study of Regulated Industry at Georgia State University. I am also
11 a principal in Utility Research International, an enterprise engaged in regulatory
12 finance and economics consulting to business and government. I am testifying on
13 behalf of Puget Sound Energy (“PSE”).

14 **Q. Please describe your educational background.**

15 A. I hold a Bachelor of Engineering degree and an MBA in Finance from McGill
16 University, Montreal, Canada. I received my Ph.D. in Finance and Econometrics
17 at the Wharton School of Finance, University of Pennsylvania.

18 **Q. Please summarize your academic and business career.**

19 A. I have taught at the Wharton School of Finance, University of Pennsylvania,
20 Amos Tuck School of Business at Dartmouth College, Drexel University,
21 University of Montreal, McGill University, and Georgia State University. I was a

1 faculty member of Advanced Management Research International, and I am
2 currently a faculty member of The Management Exchange Inc. and SNL Center
3 for Financial Education LLC (now S&P Global Market Intelligence), where I
4 continue to conduct frequent national executive-level education seminars
5 throughout the United States and Canada. In the last 30 years, I have conducted
6 numerous national seminars on “Utility Finance,” “Utility Cost of Capital,”
7 “Alternative Regulatory Frameworks,” and “Utility Capital Allocation,” which I
8 have developed on behalf of The Management Exchange Inc. and S&P Global
9 Market Intelligence.

10 I have authored or co-authored several books, monographs, and articles in
11 academic scientific journals on the subject of finance. They have appeared in a
12 variety of journals, including The Journal of Finance, The Journal of Business
13 Administration, International Management Review, and Public Utilities
14 Fortnightly. I published a widely-used treatise on regulatory finance, Utilities’
15 Cost of Capital, Public Utilities Reports, Inc., Arlington, Va. 1984. In late 1994,
16 the same publisher released my book, Regulatory Finance, a voluminous treatise
17 on the application of finance to regulated utilities. A revised and expanded edition
18 of this book, The New Regulatory Finance, was published in 2006. I have been
19 engaged in extensive consulting activities on behalf of numerous corporations,
20 legal firms, and regulatory bodies in matters of financial management and
21 corporate litigation.

22 Please see Exhibit No. ___(RAM-2) for my professional qualifications.

1 **Q. Have you previously testified on cost of capital before utility regulatory**
2 **commissions?**

3 A. Yes, I have been a cost of capital witness before nearly 50 regulatory bodies in
4 North America, including the Washington Utilities and Transportation
5 Commission (the “Commission”), Federal Energy Regulatory Commission, and
6 the Federal Communications Commission. I have also testified before the
7 following state, provincial, and other local regulatory commissions:

Alabama	Florida	Missouri	Oklahoma
Alaska	Georgia	Montana	Ontario
Alberta	Hawaii	Nebraska	Oregon
Arizona	Illinois	Nevada	Pennsylvania
Arkansas	Indiana	New Brunswick	Quebec
British Columbia	Iowa	New Hampshire	South Carolina
California	Kentucky	New Jersey	South Dakota
City of New Orleans	Louisiana	New Mexico	Tennessee
Colorado	Maine	New York	Texas
CRTC	Manitoba	Newfoundland	Utah
Delaware	Maryland	North Carolina	Vermont
District of Columbia	Michigan	North Dakota	Virginia
FCC	Minnesota	Nova Scotia	Washington
FERC	Mississippi	Ohio	West Virginia
			Wisconsin

8 The details of my participation in regulatory proceedings are also provided in
9 Exhibit No. ____ (RAM-2).

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

2 A. I have been asked by PSE to determine whether the rate of return on common
3 equity (ROE) of 9.8% requested by PSE, which was authorized by the
4 Commission in PSE's last rate case,¹ remains fair and reasonable under current
5 capital market conditions. Based upon this determination, I have formed my
6 professional judgment as to whether such a return would still:

- 7 (1) be fair to ratepayers;
- 8 (2) allow PSE to attract the capital needed for infrastructure
9 and reliability investments on reasonable terms;
- 10 (3) maintain PSE's financial integrity; and
- 11 (4) be comparable to returns offered on comparable risk
12 investments.

13 I will testify in this proceeding as to that opinion.

14 **Q. Please briefly identify the exhibits and appendices accompanying your**
15 **testimony.**

16 A. I have attached to my testimony Exhibit No. ___(RAM-2) through Exhibit
17 No. ___(RAM-11). These exhibits relate directly to points in my testimony and
18 are described in further detail in connection with the discussion of those points in
19 my testimony.

¹ *WUTC v. Puget Sound Energy, Inc.*, Dockets UE-111048 & UG-111049 (consolidated), Order 08 (Rejecting Tariff Sheets; Authorizing and Requiring Compliance Filing) at ¶ 89 (May 7, 2012).

1 **Q. Please summarize your findings concerning PSE’s cost of common equity.**

2 A. Based on the results of various methodologies, current capital market conditions,
3 and current economic industry conditions, I conclude that a minimum ROE of
4 9.8% for PSE is required to: (i) attract capital on reasonable terms, (ii) maintain
5 its financial integrity, and (iii) earn a return commensurate with returns on
6 comparable risk investments. I consider PSE’s requested ROE of 9.8% to be
7 “barebones” in view of PSE’s very high external capital requirements over the
8 next five years, its lower than average common equity ratio, and its relative small
9 size.

10 My ROE estimates are derived from cost of capital studies that I performed using
11 the financial models available to me and from the application of my professional
12 judgment to the results. I applied various cost of capital methodologies—
13 including Discounted Cash Flow (“DCF”), Capital Asset Pricing Model
14 (“CAPM”), and Risk Premium methodologies—to a group of investment-grade
15 dividend-paying combination gas and electric utilities which are covered in Value
16 Line’s Electric Utility Composite. The companies were also required to have the
17 majority of their revenues from regulated utility operations.

18 My recommended rate of return reflects the application of my professional
19 judgment to the results in light of the indicated returns from my DCF, CAPM, and
20 Risk Premium analyses.

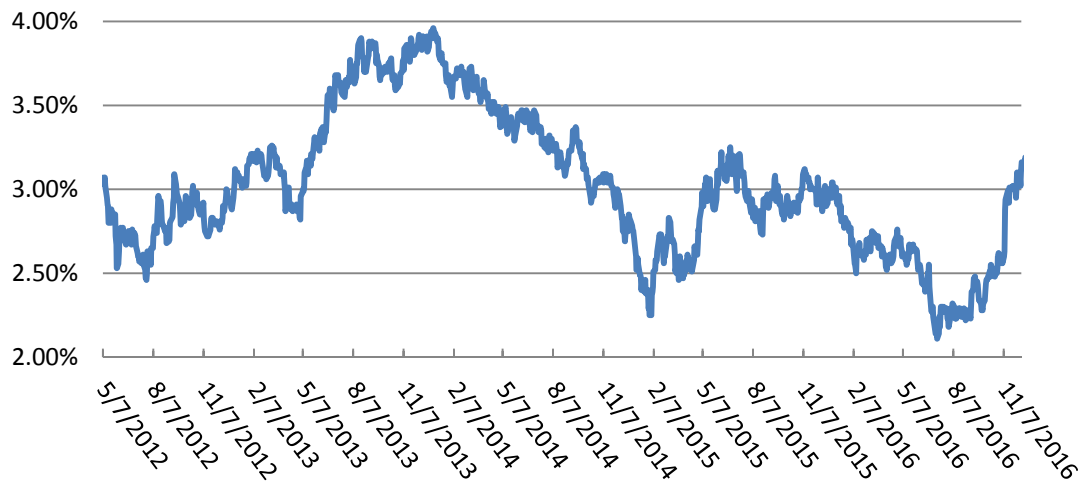
1 **Q. Would it be in the best interests of ratepayers for the Commission to approve**
2 **the ROE of 9.8% authorized in PSE’s last rate case?**

3 A. Yes. My analysis shows that a minimum ROE of 9.8% is required to fairly
4 compensate investors, to maintain PSE’s credit strength, and to attract the capital
5 needed for utility infrastructure and reliability capital investments. Adopting a
6 lower ROE would increase costs for ratepayers.

7 **Q. What was the yield on 30-year Treasury bonds when the Commission**
8 **approved the ROE of 9.8% authorized in PSE’s last rate case?**

9 A. The yield on 30-year Treasury bonds on May 7, 2012 (i.e., the date on which the
10 Commission issued its order authorizing an ROE of 9.8% for PSE) was 3.07%.
11 The yield on 30-year Treasury bonds on January 4, 2017, was a nearly identical
12 3.05%. During the intervening period, the yield on 30-year Treasury bonds today
13 has fluctuated between 2.0% and 4.0%, and there has been an upward trend in the
14 yield since its low of 2.11% on July 8, 2016:

15 **Chart 1. Yields on 30-Year Treasury Bonds**
16 **(May 7, 2012, to January 4, 2017)**



17

1 Thus, yields on 30-year Treasury bonds are virtually identical now as they were
2 when the Commission authorized an ROE of 9.80% for PSE, and the current trend
3 is increasing yields on 30-year Treasury bonds.

4 **Q. Please explain how low allowed ROEs can increase both the future cost of**
5 **equity and debt financing.**

6 A. If a utility is authorized a ROE below the level required by equity investors, the
7 utility or its parent will find it difficult to access equity capital. Investors will not
8 provide equity capital at the current market price if the earnable return on equity
9 is below the level they require given the risks of an equity investment in the
10 utility. The equity market corrects this by generating a stock price in equilibrium
11 that reflects the valuation of the potential earnings stream from an equity
12 investment at the risk-adjusted return equity investors require. In the case of a
13 utility that has been authorized a return below the level investors believe is
14 appropriate for the risk they bear, the result is a decrease in the utility's market
15 price per share of common stock. This reduces the financial viability of equity
16 financing in two ways. First, because the utility's price per share of common
17 stock decreases, the net proceeds from issuing common stock are reduced.
18 Second, since the utility's market to book ratio decreases with the decrease in the
19 share price of common stock, the potential risk from dilution of equity
20 investments reduces investors' inclination to purchase new issues of common
21 stock. The ultimate effect is the utility will have to rely more on debt financing to
22 meet its capital needs.

1 As a company relies more on debt financing, its capital structure becomes more
2 leveraged. Because debt payments are a fixed financial obligation to the utility,
3 and income available to common equity is subordinate to fixed charges, this
4 decreases the operating income available for dividend and earnings growth.
5 Consequently, equity investors face greater uncertainty about future dividends and
6 earnings from the firm. As a result, the firm's equity becomes a riskier
7 investment. The risk of default on a company's bonds also increases, making the
8 utility's debt a riskier investment. This increases the cost to the utility from both
9 debt and equity financing and increases the possibility a company will not have
10 access to the capital markets for its outside financing needs. Ultimately, to ensure
11 that PSE has access to capital markets for its capital needs, a fair and reasonable
12 authorized ROE of 9.8% is required.

13 PSE must secure outside funds from capital markets to finance required utility
14 plant and equipment investments irrespective of capital market conditions, interest
15 rate conditions and the quality consciousness of market participants. Thus, rate
16 relief requirements and supportive regulatory treatment, including approval of my
17 recommended ROE, are essential requirements.

18 **II. REGULATORY FRAMEWORK AND RATE OF RETURN**

19 **Q. Please explain how a regulated company's rates should be set under**
20 **traditional cost of service regulation.**

21 A. Under the traditional regulatory process, a regulated company's rates should be
22 set so that the company recovers its costs, including taxes and depreciation, plus a

1 fair and reasonable return on its invested capital. The allowed rate of return must
2 necessarily reflect the cost of the funds obtained, that is, investors' return
3 requirements. In determining a company's required rate of return, the starting
4 point is investors' return requirements in financial markets. A rate of return can
5 then be set at a level sufficient to enable a company to earn a return
6 commensurate with the cost of those funds.

7 Funds can be obtained in two general forms, debt capital and equity capital. The
8 cost of debt funds can be easily ascertained from an examination of the
9 contractual interest payments. The cost of common equity funds (i.e., investors'
10 required rate of return) is more difficult to estimate. It is the purpose of the next
11 section of my testimony to estimate fair and reasonable ROE ranges for PSE's
12 cost of common equity capital.

13 **Q. What fundamental principles underlie the determination of a fair and**
14 **reasonable ROE?**

15 A. The heart of utility regulation is the setting of just and reasonable rates by way of
16 a fair and reasonable return. There are two landmark United States Supreme Court
17 cases that define the legal principles underlying the regulation of a public utility's
18 rate of return and provide the foundations for the notion of a fair return:

- 19 1. *Bluefield Water Works & Improvement Co. v. Public*
20 *Service Commission of West Virginia*, 262 U.S. 679 (1923);
21 and
- 22 2. *Federal Power Commission v. Hope Natural Gas Co.*,
23 320 U.S. 591 (1944).

1 The *Bluefield* case set the standard against which just and reasonable rates of
2 return are measured:

3 A public utility is entitled to such rates as will permit it to earn a
4 return on the value of the property which it employs for the
5 convenience of the public equal to that generally being made at the
6 same time and in the same general part of the country on
7 investments in other business undertakings which are attended by
8 corresponding risks and uncertainties ... The return should be
9 reasonable, sufficient to assure confidence in the financial
10 soundness of the utility, and should be adequate, under efficient
11 and economical management, to maintain and support its credit
12 and enable it to raise money necessary for the proper discharge of
13 its public duties.

14 *Bluefield Water Works & Improvement Co.*, 262 U.S. at 692 (emphasis added).

15 The *Hope* case expanded on the guidelines to be used to assess the reasonableness
16 of the allowed return. The Court reemphasized its statements in the *Bluefield* case
17 and recognized that revenues must cover “capital costs.” The Court stated:

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

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

28 The United States Supreme Court reiterated the criteria set forth in *Hope* in
29 *Federal Power Commission v. Memphis Light, Gas & Water Division*, 411 U.S.
30 458 (1973); in *Permian Basin Rate Cases*, 390 U.S. 747 (1968); and, most
31 recently, in *Duquesne Light Co. v. Barasch*, 488 U.S. 299 (1989). In the *Permian*

1 *Basin Rate Cases*, the Supreme Court stressed that a regulatory agency's rate of
2 return order should

3 reasonably be expected to maintain financial integrity, attract
4 necessary capital, and fairly compensate investors for the risks they
5 have assumed.

6 *Permian Basin Rate Cases*, 390 U.S. at 792.

7 Therefore, the "end result" of this Commission's decision should be to allow PSE
8 the opportunity to earn a return on equity that is:

- 9 (i) commensurate with returns on investments in other firms
10 having corresponding risks;
- 11 (ii) sufficient to assure confidence in PSE's financial integrity;
12 and
- 13 (iii) sufficient to maintain PSE's creditworthiness and ability to
14 attract capital on reasonable terms.

15 **Q. How is the fair rate of return determined?**

16 A. The aggregate return required by investors is called the "cost of capital." The cost
17 of capital is the opportunity cost, expressed in percentage terms, of the total pool
18 of capital employed by the utility. It is the composite weighted cost of the various
19 classes of capital (e.g., bonds, preferred stock, common stock) used by the utility,
20 with the weights reflecting the proportions of the total capital that each class of
21 capital represents. The fair return in dollars is obtained by multiplying the rate of
22 return set by the regulator by the utility's "rate base." The rate base is essentially
23 the net book value of the utility's plant and other assets used to provide utility
24 service in a particular jurisdiction.

1 Although utilities like PSE enjoy varying degrees of monopoly in the sale of
2 public utility services, they (or their parent companies) must compete with
3 everyone else in the free, open market for the input factors of production, whether
4 labor, materials, machines, or capital, including the capital investments required
5 to support the utility infrastructure. The prices of these inputs are set in the
6 competitive marketplace by supply and demand, and it is these input prices that
7 are incorporated in the cost of service computation. This is just as true for capital
8 as for any other factor of production. Since utilities and other investor-owned
9 businesses must go to the open capital market and sell their securities in
10 competition with every other issuer, there is obviously a market price to pay for
11 the capital they require (e.g., the interest on debt capital or the expected return on
12 equity). In order to attract the necessary capital, utilities must compete with
13 alternative uses of capital and offer a return commensurate with the associated
14 risks.

15 **Q. How does the concept of a fair return relate to the concept of opportunity**
16 **cost?**

17 A. The concept of a fair return is intimately related to the economic concept of
18 “opportunity cost.” When investors supply funds to a utility by buying its stocks
19 or bonds, they are not only postponing consumption, giving up the alternative of
20 spending their dollars in some other way, they are also exposing their funds to
21 risk and forgoing returns from investing their money in alternative comparable
22 risk investments. The compensation they require is the price of capital. If there are
23 differences in the risk of the investments, competition among firms for a limited

1 supply of capital will bring different prices. The capital markets translate these
2 differences in risk into differences in required return, in much the same way that
3 differences in the characteristics of commodities are reflected in different prices.

4 The important point is that the required return on capital is set by supply and
5 demand and is influenced by the relationship between the risk and return expected
6 for those securities and the risks expected from the overall menu of available
7 securities.

8 **Q. What economic and financial concepts have guided your assessment of PSE's**
9 **cost of common equity?**

10 A. Two fundamental economic principles underlie the appraisal of PSE's cost of
11 equity, one relating to the supply side of capital markets, the other to the demand
12 side.

13 On the supply side, the first principle asserts that rational investors maximize the
14 performance of their portfolios only if they expect the returns on investments of
15 comparable risk to be the same. If not, rational investors will switch out of those
16 investments yielding lower returns at a given risk level in favor of those
17 investment activities offering higher returns for the same degree of risk. This
18 principle implies that a company will be unable to attract capital funds unless it
19 can offer returns to capital suppliers that are comparable to those achieved on
20 competing investments of similar risk.

21 On the demand side, the second principle asserts that a company will continue to
22 invest in real physical assets if the return on these investments equals, or exceeds,

1 a company's cost of capital. This principle suggests that a regulatory board should
2 set rates at a level sufficient to create equality between the return on physical asset
3 investments and a company's cost of capital.

4 **Q. How does PSE obtain its capital and how is its overall cost of capital**
5 **determined?**

6 A. The funds employed by PSE are obtained in two general forms, debt capital and
7 equity capital. The cost of debt funds can be ascertained easily from an
8 examination of the contractual interest payments. The cost of common equity
9 funds, that is, equity investors' required rate of return, is more difficult to estimate
10 because the dividend payments received from common stock are not contractual
11 or guaranteed in nature. They are uneven and risky, unlike interest payments.
12 Once a cost of common equity estimate has been developed, it can then easily be
13 combined with the embedded cost of debt based on the utility's capital structure,
14 in order to arrive at the overall cost of capital (overall rate of return).

15 **Q. What is the market required rate of return on equity capital?**

16 A. The market required rate of return on common equity, or cost of equity, is the
17 return demanded by the equity investor. Investors establish the price for equity
18 capital through their buying and selling decisions in capital markets. Investors set
19 return requirements according to their perception of the risks inherent in the
20 investment, recognizing the opportunity cost of forgone investments in other
21 companies, and the returns available from other investments of comparable risk.

1 **Q. What must be considered in estimating a fair ROE?**

2 A. The basic premise is that the allowable ROE should be commensurate with
3 returns on investments in other firms having corresponding risks. The allowed
4 return should be sufficient to assure confidence in the financial integrity of the
5 firm, in order to maintain creditworthiness and ability to attract capital on
6 reasonable terms. The “attraction of capital” standard focuses on investors’ return
7 requirements that are generally determined using market value methods, such as
8 the DCF, CAPM, or risk premium methods. These market value tests define “fair
9 return” as the return investors anticipate when they purchase equity shares of
10 comparable risk in the financial marketplace. This is a market rate of return,
11 defined in terms of anticipated dividends and capital gains as determined by
12 expected changes in stock prices, and reflects the opportunity cost of capital. The
13 economic basis for market value tests is that new capital will be attracted to a firm
14 only if the return expected by the suppliers of funds is commensurate with that
15 available from alternative investments of comparable risk.

16 **III. COST OF EQUITY CAPITAL ESTIMATES**

17 **Q. How did you estimate a fair ROE for PSE?**

18 A. To estimate a fair ROE for PSE, I employed three methodologies:

19 (i) DCF methodology;

20 (ii) CAPM methodology; and

21 (iii) Risk Premium methodology.

1 All three methodologies are market-based methodologies designed to estimate the
2 return required by investors on the common equity capital committed to PSE.

3 **Q. Why did you use more than one approach for estimating the cost of equity?**

4 A. No one single method provides the necessary level of precision for determining a
5 fair return, but each method provides useful evidence to facilitate the exercise of
6 an informed judgment. Reliance on any single method or preset formula is
7 inappropriate when dealing with investor expectations because of possible
8 measurement difficulties and vagaries in individual companies' market data.
9 Examples of such vagaries include dividend suspension, insufficient or
10 unrepresentative historical data due to a recent merger, impending merger or
11 acquisition, and a new corporate identity due to restructuring activities. The
12 advantage of using several different approaches is that the results of each one can
13 be used to check the others.

14 As a general proposition, it is extremely dangerous to rely on only one generic
15 methodology to estimate equity costs. The difficulty is compounded when only
16 one variant of that methodology is employed. It is compounded even further when
17 that one methodology is applied to a single company. Hence, several
18 methodologies applied to several comparable risk companies should be employed
19 to estimate the cost of common equity.

20 As I have stated, there are three broad generic methods available to measure the
21 cost of equity: DCF, CAPM, and risk premium. All three of these methods are
22 accepted and used by the financial community and firmly supported in the

1 financial literature. The weight accorded to any one method may vary depending
2 on unusual circumstances in capital market conditions.

3 Each methodology requires the exercise of considerable judgment on the
4 reasonableness of the assumptions underlying the method and on the
5 reasonableness of the proxies used to validate the theory and apply the method.

6 Each method has its own way of examining investor behavior, its own premises,
7 and its own set of simplifications of reality. Investors do not necessarily subscribe
8 to any one method, nor does the stock price reflect the application of any one
9 single method by the price-setting investor. There is no guarantee that a single
10 DCF result is necessarily the ideal predictor of the stock price and of the cost of
11 equity reflected in that price, just as there is no guarantee that a single CAPM or
12 risk premium result constitutes the perfect explanation of a stock's price or the
13 cost of equity.

14 **Q. Are there any practical difficulties in applying cost of capital methodologies**
15 **in environments of volatility in capital markets and economic uncertainty?**

16 A. Yes, there are. The traditional cost of equity estimation methodologies are
17 difficult to implement when you are dealing with the instability and volatility in
18 the capital markets and the highly uncertain economy both in the U.S. and abroad.
19 This is not only because stock prices are volatile at this time, but also because
20 utility company historical data have become less meaningful for an industry
21 experiencing substantial change, for example, the transition to stringent renewable
22 standards and the need to secure vast amounts of external capital over the next
23 decade, regardless of capital market conditions. Past earnings and dividend trends

1 may simply not be indicative of the future. For example, historical growth rates of
2 earnings and dividends have been depressed by eroding margins due to a variety
3 of factors, including the sluggish economy, restructuring, and falling margins. As
4 a result, this historical data may not be representative of the future long-term
5 earning power of these companies. Moreover, historical growth rates may not be
6 necessarily representative of future trends for several electric utilities involved in
7 mergers and acquisitions, as these companies going forward are not the same
8 companies for which historical data are available.

9 In short, given the volatility in capital markets and economic uncertainties, the
10 utilization of multiple methodologies is critical, and reliance on a single
11 methodology is highly hazardous.

12 **A. DCF Estimates**

13 **Q. Please describe the DCF approach to estimating the cost of equity capital.**

14 A. According to DCF theory, the value of any security to an investor is the expected
15 discounted value of the future stream of dividends or other benefits. One widely
16 used method to measure these anticipated benefits in the case of a non-static
17 company is to examine the current dividend plus the increases in future dividend
18 payments expected by investors. This valuation process can be represented by the
19 following formula, which is the traditional DCF model:

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$$K_e = D_1/P_0 + g$$

- where: K_e = investors' expected return on equity
 D_1 = expected dividend at the end of the coming year
 P_0 = current stock price
 g = expected growth rate of dividends, earnings, stock price, and book value

The traditional DCF formula states that under certain assumptions, which are described in the next paragraph, the equity investor's expected return (K_e) can be viewed as the sum of an expected dividend yield (D_1/P_0) plus the expected growth rate of future dividends and stock price (g). The returns anticipated at a given market price are not directly observable and must be estimated from statistical market information. The idea of the market value approach is to infer K_e from the observed share price, the observed dividend, and an estimate of investors' expected future growth.

The assumptions underlying this valuation formulation are well known, and are discussed in detail in Chapter 4 of my reference book, Regulatory Finance, and Chapter 8 of my more recent reference text, The New Regulatory Finance.

The standard DCF model requires the following main assumptions:

- (i) a constant average growth trend for both dividends and earnings;
- (ii) a stable dividend payout policy;
- (iii) a discount rate in excess of the expected growth rate; and
- (iv) a constant price-earnings multiple, which implies that growth in price is synonymous with growth in earnings and dividends.

1 The standard DCF model also assumes that dividends are paid at the end of each
2 year when in fact dividend payments are normally made on a quarterly basis.

3 **Q. How did you estimate PSE's cost of equity with the DCF model?**

4 A. In estimating PSE's cost of equity, I applied the DCF model to a group of
5 investment-grade, dividend-paying, combination gas and electric utilities that are
6 covered in the Value Line database. The companies were required to receive the
7 majority of their revenues from regulated operations.

8 In order to apply the DCF model, two components are required: the expected
9 dividend yield (D_1/P_0), and the expected long-term growth (g). The expected
10 dividend (D_1) in the annual DCF model can be obtained by multiplying the
11 current indicated annual dividend rate by the growth factor ($1 + g$).

12 **Q. How did you estimate the dividend yield component of the DCF model?**

13 A. From a conceptual viewpoint, the stock price to employ in calculating the
14 dividend yield is the then-current price of the security at the time of estimating the
15 cost of equity. This is because the current stock prices provide a better indication
16 of expected future prices than any other price in an efficient market. An efficient
17 market implies that prices adjust rapidly to the arrival of new information.
18 Therefore, current prices reflect the fundamental economic value of a security. A
19 considerable body of empirical evidence indicates that capital markets are
20 efficient with respect to a broad set of information. This implies that observed
21 current prices represent the fundamental value of a security, and that a cost of
22 capital estimate should be based on current prices.

1 In implementing the DCF model, I have used the current dividend yields reported
2 in the Value Line Research Web site. Basing dividend yields on average results
3 from a large group of companies reduces the concern that the vagaries of
4 individual company stock prices will result in an unrepresentative dividend yield.

5 **Q. Why did you multiply the spot dividend yield by $(1 + g)$ rather than by**
6 **$(1 + 0.5g)$?**

7 A. Some analysts multiply the spot dividend yield by one plus one half the expected
8 growth rate $(1 + 0.5g)$ rather than the conventional one plus the expected growth
9 rate $(1 + g)$. This procedure understates the return expected by the investor.

10 The fundamental assumption of the basic annual DCF model is that dividends are
11 received annually at the end of each year and that the first dividend is to be
12 received one year from now. Thus, the appropriate dividend to use in a DCF
13 model is the full prospective dividend to be received at the end of the year. Since
14 the appropriate dividend to use in a DCF model is the prospective dividend one
15 year from now rather than the dividend one-half year from now, multiplying the
16 spot dividend yield by $(1 + 0.5g)$ understates the proper dividend yield.

17 Moreover, the basic annual DCF model ignores the time value of quarterly
18 dividend payments and assumes dividends are paid once a year at the end of the
19 year. Multiplying the spot dividend yield by $(1 + g)$ is actually a conservative
20 attempt to capture the reality of quarterly dividend payments. Use of this method
21 is conservative in the sense that the annual DCF model fully ignores the more
22 frequent compounding of quarterly dividends.

1 **Q. How did you estimate the growth component of the DCF model?**

2 A. The principal difficulty in calculating the required return by the DCF approach is
3 in ascertaining the growth rate that investors currently expect. Since no explicit
4 estimate of expected growth is observable, proxies must be employed.

5 As proxies for expected growth, I examined the consensus growth estimate
6 developed by professional analysts. Projected long-term growth rates actually
7 used by institutional investors to determine the desirability of investing in
8 different securities influence investors' growth anticipations. These forecasts are
9 made by large reputable organizations, and the data are readily available and are
10 representative of the consensus view of investors. Because of the dominance of
11 institutional investors in investment management and security selection, and their
12 influence on individual investment decisions, analysts' growth forecasts influence
13 investor growth expectations and provide a sound basis for estimating the cost of
14 equity with the DCF model.

15 Growth rate forecasts of several analysts are available from published investment
16 newsletters and from systematic compilations of analysts' forecasts, such as those
17 tabulated by Zacks Investment Research Inc. ("Zacks") and Yahoo Finance. I
18 used analysts' long-term growth forecasts reported in Zacks as proxies for
19 investors' growth expectations in applying the DCF model. I also used Value
20 Line's growth forecasts as additional proxies.

1 **Q. Why did you reject the use of historical growth rates in applying the DCF**
2 **model to utilities?**

3 A. I have rejected historical growth rates as proxies for expected growth in the DCF
4 calculation for two reasons. First, historical growth patterns are already
5 incorporated in analysts' growth forecasts that should be used in the DCF model,
6 and are therefore redundant. Second, published studies in the academic literature
7 demonstrate that growth forecasts made by security analysts are reasonable
8 indicators of investor expectations, and that investors rely on analysts' forecasts.
9 This considerable literature is summarized in Chapter 9 of my most recent
10 textbook, The New Regulatory Finance.

11 **Q. Did you consider any other method of estimating expected growth to apply**
12 **the DCF model?**

13 A. Yes, I did. I considered using the so-called "sustainable growth" method, also
14 referred to as the "retention growth" method. According to this method, future
15 growth is estimated by multiplying the fraction of earnings expected to be
16 retained by the company, 'b', by the expected return on book equity, ROE, as
17 follows:

$$g = b \times \text{ROE}$$

19 where: g = expected growth rate in earnings/dividends
20 b = expected retention ratio
21 ROE = expected return on book equity

1 **Q. Do you have any reservations in regards to the sustainable growth method?**

2 A. Yes, I do. First, the sustainable method of predicting growth contains a logic trap:
3 the method requires an estimate of expected return on book equity to be
4 implemented. But if the expected return on book equity input required by the
5 model differs from the recommended return on equity, a fundamental
6 contradiction in logic follows. Second, the empirical finance literature
7 demonstrates that the sustainable growth method of determining growth is not as
8 significantly correlated to measures of value, such as stock prices and
9 price/earnings ratios, as analysts' growth forecasts. I therefore chose not to rely on
10 this method.

11 **Q. Did you consider dividend growth in applying the DCF model?**

12 A. No, not at this time. The reason is that as a practical matter, while there is an
13 abundance of earnings growth forecasts, there are very few forecasts of dividend
14 growth. Moreover, it is widely expected that some utilities will continue to lower
15 their dividend payout ratios over the next several years in response to heightened
16 business risk and the need to fund construction programs over the next decade.
17 Dividend growth has remained largely stagnant in past years as utilities are
18 increasingly conserving financial resources in order to hedge against rising
19 business risks and finance large infrastructure investments. As a result, investors'
20 attention has shifted from dividends to earnings. Therefore, earnings growth
21 provides a more meaningful guide to investors' long-term growth expectations.
22 Indeed, it is growth in earnings that will support future dividends and share prices.

1 **Q. Is there any empirical evidence documenting the importance of earnings in**
2 **evaluating investors' expectations?**

3 A. Yes, there is an abundance of evidence attesting to the importance of earnings in
4 assessing investors' expectations.

5 First, the sheer volume of earnings forecasts available from the investment
6 community relative to the scarcity of dividend forecasts attests to their
7 importance. To illustrate, Value Line, Yahoo Finance, Zacks Investment, First
8 Call Thompson, Reuters, and Multex provide comprehensive compilations of
9 investors' earnings forecasts. The fact that these investment information providers
10 focus on growth in earnings rather than growth in dividends indicates that the
11 investment community regards earnings growth as a superior indicator of future
12 long-term growth.

13 Second, Value Line's principal investment rating assigned to individual stocks,
14 Timeliness Rank, is based primarily on earnings, which accounts for 65% of the
15 ranking.

16 **Q. How did you approach the composition of comparable groups in order to**
17 **estimate PSE's cost of equity with the DCF method?**

18 A. Because PSE is not publicly traded, the DCF model cannot be applied to PSE and
19 proxies must be used. There are two possible approaches in forming proxy groups
20 of companies.

21 The first approach is to apply cost of capital estimation techniques to a select
22 group of companies directly comparable in risk to PSE. These companies are

1 chosen by the application of stringent screening criteria to a universe of utility
2 stocks in an attempt to identify companies with the same investment risk as PSE.
3 Examples of screening criteria include bond rating, beta risk, size, percentage of
4 revenues from utility operations, and common equity ratio. The end result is a
5 small sample of companies with a risk profile similar to that of PSE, provided the
6 screening criteria are defined and applied correctly.

7 The second approach is to apply cost of capital estimation techniques to a large
8 group of utilities representative of the utility industry average and then make
9 adjustments to account for any difference in investment risk between the company
10 and the industry average, if any. As explained below, in view of substantial
11 changes in circumstances in the utility industry, I have chosen the latter approach.

12 In the unstable capital market environments, it is important to select relatively
13 large sample sizes representative of the utility industry as a whole, as opposed to
14 small sample sizes consisting of a handful of companies. This is because the
15 equity market as a whole and utility industry capital market data are volatile. As a
16 result of this volatility, the composition of small groups of companies is very
17 fluid, with companies exiting the sample due to dividend suspensions or
18 reductions, insufficient or unrepresentative historical data due to recent mergers,
19 impending merger or acquisition, and changing corporate identities due to
20 restructuring activities.

21 From a statistical standpoint, confidence in the reliability of the DCF model result
22 is considerably enhanced when applying the DCF model to a large group of
23 companies. Any distortions introduced by measurement errors in the two DCF

1 components of equity return for individual companies, namely dividend yield and
2 growth are mitigated. Utilizing a large portfolio of companies reduces the
3 influence of either overestimating or underestimating the cost of equity for any
4 one individual company. For example, in a large group of companies, positive and
5 negative deviations from the expected growth will tend to cancel out owing to the
6 law of large numbers, provided that the errors are independent.² The average
7 growth rate of several companies is less likely to diverge from expected growth
8 than is the estimate of growth for a single firm. More generally, the assumptions
9 of the DCF model are more likely to be fulfilled for a large group of companies
10 than for any single firm or for a small group of companies.

² If σ_i^2 represents the average variance of the errors in a group of N companies, and σ_{ij} the average covariance between the errors, then the variance of the error for the group of N companies, σ_N^2 is:

$$\sigma_N^2 = \frac{1}{N} \sigma_i^2 + \frac{N-1}{N} \sigma_{ij}$$

If the errors are independent, the covariance between them (σ_{ij}) is zero, and the variance of the error for the group is reduced to:

$$\sigma_N^2 = \frac{1}{N} \sigma_i^2$$

As N gets progressively larger, the variance gets smaller and smaller.

1 Moreover, small samples are subject to measurement error, and in violation of the
2 Central Limit Theorem of statistics.³ From a statistical standpoint, reliance on
3 robust sample sizes mitigates the impact of possible measurement errors and
4 vagaries in individual companies' market data. Examples of such vagaries include
5 dividend suspension, insufficient or unrepresentative historical data due to a
6 recent merger, impending merger or acquisition, and a new corporate identity due
7 to restructuring.

8 The point of all this is that the use of a handful of companies in a highly fluid and
9 unstable industry produces fragile and statistically unreliable results. A far safer
10 procedure is to employ large sample sizes representative of the industry as a
11 whole and apply subsequent risk adjustments to the extent that the company's risk
12 profile differs from that of the industry average.

³ The Central Limit Theorem describes the characteristics of the distribution of values we would obtain if we were able to draw an infinite number of random samples of a given size from a given population and we calculated the mean of each sample. The Central Limit Theorem asserts:

- (1) The mean of the sampling distribution of means is equal to the mean of the population from which the samples were drawn.
- (2) The variance of the sampling distribution of means is equal to the variance of the population from which the samples were drawn divided by the size of the samples.
- (3) If the original population is distributed normally, the sampling distribution of means will also be normal. If the original population is not normally distributed, the sampling distribution of means will increasingly approximate a normal distribution as sample size increases.

1 **Q. Can you describe the proxy group for PSE's utility business?**

2 A. As proxies for PSE, I examined a group of investment-grade dividend-paying
3 combination gas and electric utilities covered in Value Line's Electric Utility
4 industry group, meaning that these companies all possess utility assets similar to
5 PSE's. I began with all the companies designated as combination gas and electric
6 utilities by AUS Utility Reports that are also covered in the Value Line Survey as
7 shown on Exhibit No. ____ (RAM-3). Sempra Energy was added to the group since
8 it is a combination gas and electric utility covered in the Value Line database.
9 Foreign companies, private partnerships, private companies, non-dividend-paying
10 companies, and companies below investment-grade (with a Moody's bond rating
11 below Baa3 as reported in AUS Utility Reports) were eliminated, as well as those
12 companies whose market capitalization was less than \$1 billion, in order to
13 minimize any stock price anomalies due to thin trading.⁴

14 From the list provided in Exhibit No. ____ (RAM-3), and as shown on the
15 accompanying notes in the last column of that exhibit, I excluded six companies
16 that have pending merger or acquisition activities. The first excluded company
17 was Black Hills which is in the process of acquiring SourceGas. The second
18 excluded company was Dominion Resources, Inc., which announced an
19 agreement on February 1, 2016, to combine with Questar Corporation. The third
20 excluded company was Duke Energy on account of its acquisition of Piedmont

⁴ This is necessary in order to minimize the well-known thin trading bias in measuring beta.

1 Natural Gas. The fourth excluded company was Empire District Electric which
2 announced an agreement on February 9, 2016, to combine with a subsidiary of
3 Liberty Utilities Co., the wholly owned regulated utility business subsidiary of
4 Algonquin Power & Utilities Corp. The fifth excluded company was Pepco
5 Holdings which has been merged with Exelon. The sixth excluded company was
6 TECO Energy which has been acquired by Emera.

7 Finally, Entergy Corp. was excluded on account of its very high nuclear exposure.
8 After excluding these companies, the final group of companies only included
9 those companies with at least 50% of their revenues from regulated utility
10 operations. Please see Exhibit No. ___(RAM-4) for a list of the eighteen
11 companies that that comprise the PSE proxy group.

12 I stress that this proxy group must be viewed as a portfolio of comparable risk. It
13 would be inappropriate to select any particular company or subset of companies
14 from this group and infer the cost of common equity from that company or subset
15 alone.

16 **Q. What DCF results did you obtain for PSE using Value Line growth**
17 **projections?**

18 A. Exhibit No. ___(RAM-5) displays the DCF analysis using Value Line growth
19 projections for the eighteen companies in PSE's proxy group. As shown on
20 column 3, line 20 of Exhibit No. ___(RAM-5), the average long-term earnings per
21 share growth forecast obtained from Value Line is 6.03% for PSE's proxy group.
22 Combining this growth rate with the average expected dividend yield of 3.75%

1 shown on column 4, line 20 of Exhibit No. ____ (RAM-5), produces an estimate of
2 equity costs of 9.78% for PSE's proxy group, as shown on column 5, line 20 of
3 Exhibit No. ____ (RAM-5).

4 **Q. What DCF results did you obtain for PSE using analysts' consensus growth**
5 **forecasts?**

6 A. Exhibit No. ____ (RAM-6) displays the DCF analysis using analysts' consensus
7 growth forecasts for the eighteen companies in PSE's proxy group. Please note
8 that MGE Energy and Chesapeake Utilities were eliminated since no analyst
9 forecast were available.

10 As shown on column 3, line 20, of Exhibit No. ____ (RAM-6), the average long-
11 term earnings per share growth forecast obtained from analysts is 5.46% for
12 PSE's proxy group. Combining this growth rate with the average expected
13 dividend yield of 3.90% shown on column 4, line 20, of Exhibit No. ____ (RAM-
14 6), produces an estimate of equity costs of 9.36% for PSE's proxy group, as
15 shown on column 5, line 20, of Exhibit No. ____ (RAM-6).

16 **Q. Please summarize the DCF estimates for PSE.**

17 A. Table 1 below summarizes the DCF estimates for PSE:

18 **Table 1. DCF Estimates for PSE**

DCF STUDY	ROE
Electric Utilities Value Line Growth	9.8%
Electric Utilities Analysts Growth	9.4%

1 **B. CAPM Estimates**

2 **Q. Please describe your application of the CAPM risk premium approach.**

3 A. My first two risk premium estimates are based on the CAPM and on an empirical
4 approximation to the CAPM (ECAPM). The CAPM is a fundamental paradigm of
5 finance. Simply put, the fundamental idea underlying the CAPM is that risk-
6 averse investors demand higher returns for assuming additional risk, and higher-
7 risk securities are priced to yield higher expected returns than lower-risk
8 securities. The CAPM quantifies the additional return, or risk premium, required
9 for bearing incremental risk. It provides a formal risk-return relationship anchored
10 on the basic idea that only market risk matters, as measured by beta (β).

11 According to the CAPM, securities are priced such that:

12
$$\text{EXPECTED RETURN} = \text{RISK-FREE RATE} + \text{RISK PREMIUM}$$

13 Denoting the risk-free rate by R_F and the return on the market as a whole by R_M ,
14 the CAPM is stated as follows:

15
$$K = R_F + \beta \times (R_M - R_F)$$

16 where: K = investors' expected return on equity
17 R_F = risk-free rate
18 R_M = return on the market as a whole
19 β = systematic risk (i.e., change in a security's return
20 relative to that of the market)

21 This is the seminal CAPM expression, which states that the return required by
22 investors is made up of a risk-free component, R_F , plus a risk premium
23 determined by $\beta \times (R_M - R_F)$. The bracketed expression ($R_M - R_F$) expression is
24 known as the market risk premium (MRP). To derive the CAPM risk premium

1 estimate, three quantities are required: the risk-free rate (R_F), beta (β), and the
2 MRP, ($R_M - R_F$).

3 For the risk-free rate (R_F), I used 4.4%, based on forecast interest rates on long-
4 term U.S. Treasury bonds.

5 For beta (β), I used 0.70, based on Value Line estimates.

6 For the MRP ($(R_M - R_F)$), I used 7.0%, based on historical risk premium studies.

7 These inputs to the CAPM are explained below.

8 **Q. How did you arrive at your risk-free rate estimate of 4.4% in your CAPM**
9 **and risk premium analyses?**

10 A. To implement the CAPM and Risk Premium methods, an estimate of the risk-free
11 return is required as a benchmark. I relied on noted economic forecasts which call
12 for a rising trend in interest rates in response to the recovering economy, renewed
13 inflation, and record high federal deficits. Value Line, Global Insight, the
14 Congressional Budget Office, Blue Chip Forecast, the U.S. Energy Information
15 Administration, and the U.S. Bureau of Labor Statistics all project higher long-
16 term Treasury bond rates in the future.

17 **Q. Why did you rely on long-term bonds instead of short-term bonds?**

18 A. The appropriate proxy for the risk-free rate in the CAPM is the return on the
19 longest-term Treasury bond possible. This is because common stocks are very
20 long-term instruments more akin to very long-term bonds rather than to short-
21 term Treasury bills or intermediate-term Treasury notes. In a risk premium model,

1 the ideal estimate for the risk-free rate has a term to maturity equal to the security
2 being analyzed. Since common stock is a very long-term investment because the
3 cash flows to investors in the form of dividends last indefinitely, the yield on the
4 longest-term possible government bonds, that is the yield on 30-year Treasury
5 bonds, is the best measure of the risk-free rate for use in the CAPM. The expected
6 common stock return is based on very long-term cash flows, regardless of an
7 individual's holding time period. Moreover, utility asset investments generally
8 have very long-term useful lives and should correspondingly be matched with
9 very long-term maturity financing instruments.

10 While long-term Treasury bonds are potentially subject to interest rate risk, this is
11 only true if the bonds are sold prior to maturity. A substantial fraction of bond
12 market participants, usually institutional investors with long-term liabilities
13 (e.g., pension funds and insurance companies), in fact hold bonds until they
14 mature, and therefore are not subject to interest rate risk. Moreover, institutional
15 bondholders neutralize the impact of interest rate changes by matching the
16 maturity of a bond portfolio with the investment planning period, or by engaging
17 in hedging transactions in the financial futures markets. The merits and mechanics
18 of such immunization strategies are well documented by both academicians and
19 practitioners.

20 Another reason for utilizing the longest maturity Treasury bond possible is that
21 common equity has an infinite life span, and the inflation expectations embodied
22 in its market-required rate of return will therefore be equal to the inflation rate
23 anticipated to prevail over the very long term. The same expectation should be

1 embodied in the risk-free rate used in applying the CAPM model. It stands to
2 reason that the yields on 30-year Treasury bonds will more closely incorporate
3 within their yields the inflation expectations that influence the prices of common
4 stocks than do short-term Treasury bills or intermediate-term U.S. Treasury notes.
5 Among U.S. Treasury securities, 30-year Treasury bonds have the longest term to
6 maturity and the yields on such securities should be used as proxies for the risk-
7 free rate in applying the CAPM. Therefore, I have relied on the yield on 30-year
8 Treasury bonds in implementing the CAPM and risk premium methods.

9 **Q. Are there other reasons why you reject short-term interest rates as proxies**
10 **for the risk-free rate in implementing the CAPM?**

11 A. Yes. Short-term rates are volatile, fluctuate widely, and are subject to more
12 random disturbances than are long-term rates. Short-term rates are largely
13 administered rates. For example, Treasury bills are used by the Federal Reserve as
14 a policy vehicle to stimulate the economy and to control the money supply, and
15 are used by foreign governments, companies, and individuals as a temporary safe-
16 house for money.

17 As a practical matter, it makes no sense to match the return on common stock to
18 the yield on 90-day Treasury Bills. This is because short-term rates, such as the
19 yield on 90-day Treasury Bills, fluctuate widely, leading to volatile and unreliable
20 equity return estimates. Moreover, yields on 90-day Treasury Bills typically do
21 not match the equity investor's planning horizon. Equity investors generally have
22 an investment horizon far in excess of 90 days.

1 As a conceptual matter, short-term Treasury Bill yields reflect the impact of
2 factors different from those influencing the yields on long-term securities such as
3 common stock. For example, the premium for expected inflation embedded into
4 90-day Treasury Bills is likely to be far different than the inflationary premium
5 embedded into long-term securities yields. On grounds of stability and
6 consistency, the yields on long-term Treasury bonds match more closely with
7 common stock returns.

8 **Q. What is your estimate of the risk-free rate in applying the CAPM?**

9 A. All the noted interest rate forecasts that I am aware of point to significantly higher
10 interest rates over the next several years. Table 2 below reports the forecast yields
11 on 30-year US Treasury bonds from the Congressional Budget Office, U.S.
12 Department of Labor, U.S. Energy Information Administration, IHS (Global
13 Insight) and Value Line⁵.

⁵ When only forecasts of 10-year U.S. Treasury notes are available, 50 basis points were added to obtain the 30-year forecast, based on the historical spread between 30-year and 10-year U.S. Treasury bond yields.

1
2

**Table 2. Forecast Yields on
30-year U.S. Treasury Bonds**

Source	U.S. 30-Yr Treas. L/T Yield Forecast
Congressional Budget Office ⁶	4.6%
U.S. Department of Labor ⁷	4.8%
U.S. Energy Information Administration ⁸	4.2%
IHS (Global Insight) ⁹	4.1%
Value Line Economic Forecast ¹⁰	4.1%
AVERAGE	4.4%

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10

Q. Why did you ignore the current level of interest rates in developing your proxy for the risk-free rate in a CAPM analysis?

A. The CAPM is a forward-looking model based on expectations of the future. As a result, in order to produce a meaningful estimate of investors' required rate of return, the CAPM must be applied using data that reflects the expectations of actual investors in the market. While investors examine history as a guide to the future, it is the expectations of future events that influence security values and the cost of capital.

⁶ Congressional Budget Office, "The Budget and Economic Outlook 2016 to 2026," Table E-1, January 2016.

⁷ U.S. Department of Labor, "The U.S. Economy to 2024." Table 1, December 2015.

⁸ U.S. Energy Information Administration, "Annual Energy Outlook 2016," Annual Projections A20.

⁹ IHS (Global Insight) Forecast 10/2016.

¹⁰ Value Line Investment Survey, "Value Line Forecast for the US Economy," 12/2/2016.

1 **Q. How did you select the beta for your CAPM analysis?**

2 A. A major thrust of modern financial theory as embodied in the CAPM is that
3 perfectly diversified investors can eliminate the company-specific component of
4 risk, and that only market risk remains. The latter is technically known as
5 “beta” (β), or “systematic risk”. The beta coefficient measures change in a
6 security’s return relative to that of the market. The beta coefficient states the
7 extent and direction of movement in the rate of return on a stock relative to the
8 movement in the rate of return on the market as a whole. It indicates the change in
9 the rate of return on a stock associated with a one percentage point change in the
10 rate of return on the market, and thus measures the degree to which a particular
11 stock shares the risk of the market as a whole. Modern financial theory has
12 established that beta incorporates several economic characteristics of a
13 corporation that are reflected in investors’ return requirements.

14 PSE is not publicly traded, and therefore, proxies must be used. In the discussion
15 of DCF estimates of the cost of common equity earlier, I examined a sample of
16 investment-grade dividend-paying combination gas and electric utilities covered
17 by Value Line that have at least 50% of their revenues from regulated electric
18 utility operations. The average beta for this group is 0.70. Please see Exhibit
19 No. ___(RAM-7) for the beta estimates of the proxy group for PSE. Based on
20 these results, I shall use 0.70, as an estimate for the beta applicable to PSE.

1 **Q. What MRP did you use in your CAPM analysis?**

2 A. For the MRP, I used 7.0%. This estimate was based on the results of historical
3 studies of long-term market risk premiums.

4 **Q. Can you describe the historical MRP study used in your CAPM analysis?**

5 A. Yes. The historical MRP estimate is based on the results obtained in Duff &
6 Phelps' 2016 Valuation Handbook (formerly published by Morningstar and
7 earlier by Ibbotson Associates), which compiles historical returns from 1926 to
8 2015. This well-known study shows that a very broad market sample of common
9 stocks outperformed long-term U.S. Government bonds by 6.0%. The historical
10 MRP over the income component of long-term Government bonds rather than
11 over the total return is 7.0%. The historical MRP should be computed using the
12 income component of bond returns because the intent, even using historical data,
13 is to identify an expected MRP. The income component of total bond return
14 (i.e., the coupon rate) is a far better estimate of expected return than the total
15 return (i.e., the coupon rate + capital gain), because both realized capital gains and
16 realized losses are largely unanticipated by bond investors. The long-horizon
17 (1926-2015) MRP (based on income returns, as required) is 7.0%.

18 As a check on my 7.0% MRP estimate, I examined the historical return on
19 common stocks in real terms (inflation-adjusted) over the 1926-2015 period and
20 added current inflation expectations to arrive at a current inflation-adjusted
21 common stock return. According to the Duff & Phelps study, the average
22 historical return on common stocks averaged 12.0% over the 1926-2015 period

1 while inflation averaged 3.0% over the same period, implying a real return of
2 9.0% (12.0% - 3.0% = 9.0%). With current long-term inflation expectations of
3 2.0%,¹¹ the inflation-adjusted return on common stock becomes 11.0% (9.0% +
4 2.0% = 11.0%). Given the current yield on 30-year U.S. Treasury bonds of 3.0%,
5 the implied MRP is therefore 8.0% (11.0% - 3.0% = 8.0%). Using the forecast
6 yield of 4.4%, the implied MRP is 6.6% (11.0% - 4.4% = 6.6%). The average of
7 the two estimates is 7.3% which is slightly higher than my 7.0% estimate.

8 **Q. On what maturity bond does the Morningstar historical risk premium data**
9 **rely?**

10 A. Because 30-year bonds were not always traded or even available throughout the
11 entire 1926-2015 period covered in the Duff & Phelps study of historical returns,
12 the latter study relied on bond return data based on 20-year Treasury bonds. Given
13 that the normal yield curve is virtually flat above maturities of 20 years over most
14 of the period covered in the study, the difference in yield is not material.

15 **Q. Why did you use long time periods in arriving at your historical MRP**
16 **estimate?**

17 A. Because realized returns can be substantially different from prospective returns
18 anticipated by investors when measured over short time periods, it is important to
19 employ returns realized over long time periods rather than returns realized over
20 more recent time periods when estimating the MRP with historical returns.

¹¹ 30-year U.S. Treasury bonds are currently trading at a 3.0% yield while 30-year inflation-adjusted bonds are trading at an approximate yield of 1.0% implying a long-term inflation rate expectation of 2.0%.

1 Therefore, a risk premium study should consider the longest possible period for
2 which data are available. Short-run periods during which investors earned a lower
3 risk premium than they expected are offset by short-run periods during which
4 investors earned a higher risk premium than they expected. Only over long time
5 periods will investor return expectations and realizations converge.

6 I have therefore ignored realized risk premiums measured over short time periods.
7 Instead, I relied on results over periods of enough length to smooth out short-term
8 aberrations, and to encompass several business and interest rate cycles. The use of
9 the entire study period in estimating the appropriate MRP minimizes subjective
10 judgment and encompasses many diverse regimes of inflation, interest rate cycles,
11 and economic cycles.

12 To the extent that the estimated historical equity risk premium follows what is
13 known in statistics as a random walk, one should expect the equity risk premium
14 to remain at its historical mean. Since I found no evidence that the MRP in
15 common stocks has changed over time, at least prior to the onslaught of the
16 financial crisis of 2008-2009 which has now partially subsided, that is, no
17 significant serial correlation in the Morningstar study prior to that time, it is
18 reasonable to assume that these quantities will remain stable in the future.

1 **Q. Should studies of historical risk premiums rely on arithmetic average returns**
2 **or geometric average returns?**

3 A. Whenever relying on historical risk premiums, only arithmetic average returns
4 over long periods are appropriate for forecasting and estimating the cost of
5 capital, and geometric average returns are not.¹²

6 **Q. Please explain how the issue of what is the proper “mean” arises in the**
7 **context of analyzing the cost of equity?**

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

¹² See Roger A. Morin, Regulatory Finance: Utilities’ Cost of Capital, Chapter 11 (1994); Roger A. Morin, The New Regulatory Finance: Utilities’ Cost of Capital, Chapter 4 (2006); Richard A Brealey, *et al.*, Principles of Corporate Finance (8th ed. 2006).

1 **Q. If both are “representative” of the series, what is the difference between the**
2 **two?**

3 A. Each represents different information about the series. The geometric mean of a
4 series of numbers is the value which, if compounded over the period examined,
5 would have made the starting value to grow to the ending value. The arithmetic
6 mean is simply the average of the numbers in the series. Where there is any
7 annual variation (volatility) in a series of numbers, the arithmetic mean of the
8 series, which reflects volatility, will always exceed the geometric mean, which
9 ignores volatility. Because investors require higher expected returns to invest in a
10 company whose earnings are volatile than one whose earnings are stable, the
11 geometric mean is not useful in estimating the expected rate of return which
12 investors require to make an investment.

13 **Q. Can you provide a numerical example to illustrate this difference between**
14 **geometric and arithmetic means?**

15 A. Yes. Table 3 below compares the geometric and arithmetic mean returns of a
16 hypothetical Stock A, whose yearly returns over a ten-year period are very
17 volatile, with those of a hypothetical Stock B, whose yearly returns are perfectly
18 stable during that period. Consistent with the point that geometric returns ignore
19 volatility, the geometric mean returns for the two series are identical (11.6% in
20 both cases), whereas the arithmetic mean return of the volatile stock (26.7%) is
21 much higher than the arithmetic mean return of the stable stock (11.6%):

1 If relying on geometric means, investors would require the same expected return
 2 to invest in both of these stocks, even though the volatility of returns in Stock A is
 3 very high while Stock B exhibits perfectly stable returns. That is clearly contrary
 4 to the most basic financial theory, that is, the higher the risk the higher the
 5 expected return.

6 **Table 3. Arithmetic vs Geometric Mean Returns**

Year	Stock A	Stock B
2006	50.0%	11.6%
2007	54.7%	11.6%
2008	98.5%	11.6%
2009	42.2%	11.6%
2010	32.3%	11.6%
2011	39.2%	11.6%
2012	153.2%	11.6%
2013	-10.0%	11.6%
2014	38.9%	11.6%
2015	20.0%	11.6%
Standard Deviation	64.9%	0.0%
Arithmetic Mean	26.7%	11.6%
Geometric Mean	11.6%	11.6%

7 Chapter 4, Appendix A, of my book, The New Regulatory Finance, contains a
 8 detailed and rigorous discussion of the impropriety of using geometric averages in
 9 estimating the cost of capital. Briefly, the disparity between the arithmetic
 10 average return and the geometric average return raises the question as to what
 11 purposes should these different return measures be used. The answer is that the
 12 geometric average return should be used for measuring historical returns that are
 13 compounded over multiple time periods. The arithmetic average return should be

1 used for future-oriented analysis, where the use of expected values is appropriate.
2 It is inappropriate to average the arithmetic and geometric average return; they
3 measure different quantities in different ways.

4 **Q. Is your MRP estimate of 7.0% consistent with the academic literature on the**
5 **subject?**

6 A. Yes, it is, although in the upper portion of the range. In their authoritative
7 corporate finance textbook, Professors Brealey, Myers, and Allen¹³ conclude from
8 their review of the fertile literature on the MRP that a range of 5% to 8% is
9 reasonable for the MRP in the United States. My own survey of the MRP
10 literature, which appears in Chapter 5 of my latest textbook, The New Regulatory
11 Finance, is also quite consistent with this range.

12 **Q. What is your estimate of PSE's cost of equity using the CAPM approach?**

13 A. Inserting those input values into the CAPM equation, namely a risk-free rate of
14 4.4%, a beta of 0.70, and a MRP of 7.0%, the CAPM estimate of the cost of
15 common equity is: $4.4\% + 0.70 \times 7.0\% = 9.3\%$.

16 **Q. Can you describe your application of the empirical version of the CAPM?**

17 A. There have been countless empirical tests of the CAPM to determine to what
18 extent security returns and betas are related in the manner predicted by the
19 CAPM. This literature is summarized in Chapter 6 of my latest book, The New
20 Regulatory Finance. The results of the tests support the idea that beta is related to

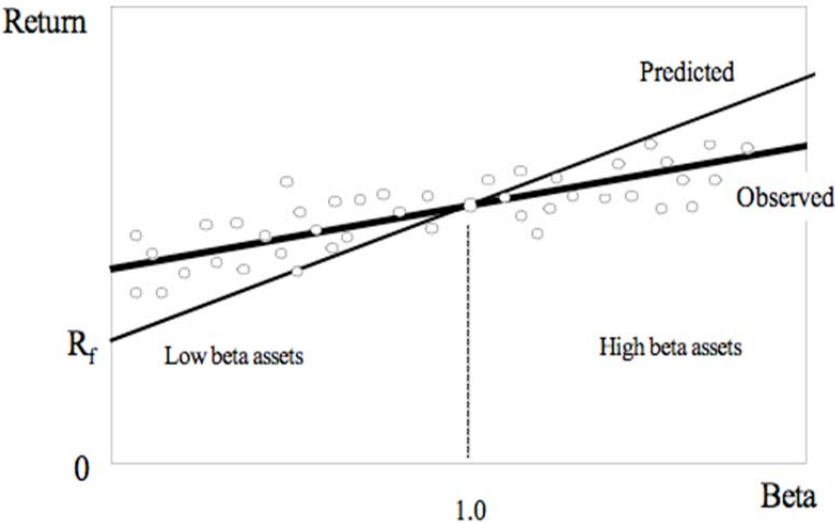
¹³ Richard A. Brealey, Stewart C. Myers, and Paul Allen, Principles of Corporate Finance, 8th Edition, Irwin McGraw-Hill, 2006.

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security returns, that the risk-return tradeoff is positive, and that the relationship is linear. The contradictory finding is that the risk-return tradeoff is not as steeply sloped as the predicted CAPM. That is, empirical research has long shown that low-beta securities earn returns somewhat higher than the CAPM would predict, and high-beta securities earn less than predicted.

A CAPM-based estimate of cost of capital underestimates the return required from low-beta securities and overstates the return required from high-beta securities, based on the empirical evidence. This is one of the most well-known results in finance, and it is displayed graphically below.

CAPM: Predicted vs Observed Returns



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1 A number of variations on the original CAPM theory have been proposed to
2 explain this finding. The ECAPM makes use of these empirical findings. The
3 ECAPM estimates the cost of capital with the equation:

$$4 \quad K = R_F + \alpha + \beta \times (MRP - \alpha)$$

5 where: K = investors' expected return on equity
6 R_F = the risk-free rate
7 α = the "constant" of the risk-return line
8 β = systematic risk (i.e., change in a security's
9 return relative to that of the market)
10 MRP = market risk premium (i.e., (R_M - R_F))

11 Inserting the long-term risk-free rate as a proxy for the risk-free rate, an alpha in
12 the range of 1% - 2%, and reasonable values of beta and the MRP in the above
13 equation produces results that are indistinguishable from the following more
14 tractable ECAPM expression:

$$15 \quad K = R_F + 0.25 \times (R_M - R_F) + 0.75 \times \beta \times (R_M - R_F)$$

16 An alpha range of 1% - 2% is somewhat lower than that estimated empirically.
17 The use of a lower value for alpha leads to a lower estimate of the cost of capital
18 for low-beta stocks such as regulated utilities. This is because the use of a long-
19 term risk-free rate rather than a short-term risk-free rate already incorporates
20 some of the desired effect of using the ECAPM. In other words, the long-term
21 risk-free rate version of the CAPM has a higher intercept and a flatter slope than
22 the short-term risk-free version which has been tested. This is also because the use
23 of adjusted betas rather than the use of raw betas also incorporates some of the

1 desired effect of using the ECAPM.¹⁴ Thus, it is reasonable to apply a
2 conservative alpha adjustment.

3 Please see Exhibit No. ___(RAM-8) for a discussion of the ECAPM, including its
4 theoretical and empirical underpinnings.

5 In short, the following equation provides a viable approximation to the observed
6 relationship between risk and return, and provides the following cost of equity
7 capital estimate:

$$K = R_F + 0.25 \times (R_M - R_F) + 0.75 \times \beta \times (R_M - R_F)$$

8
9 Inserting the risk-free rate (R_F) of 4.4%, an MRP ($(R_M - R_F)$) of 7.0%, and a
10 beta (β) of 0.70 in the above equation, the return on common equity is 9.8%.

11 **Q. Is the use of the ECAPM consistent with the use of adjusted betas?**

12 A. Yes, it is. Some have argued that the use of the ECAPM is inconsistent with the
13 use of adjusted betas, such as those supplied by Value Line, Bloomberg, and
14 Morningstar. This is because the reason for using the ECAPM is to allow for the
15 tendency of betas to regress toward the mean value of 1.00 over time, and, since
16 Value Line betas are already adjusted for such trend, an ECAPM analysis results
17 in double-counting. This argument is erroneous. Fundamentally, the ECAPM is

¹⁴ The regression tendency of betas to converge to 1.0 over time is very well known and widely discussed in the financial literature. As a result of this beta drift, several commercial beta producers adjust their forecasted betas toward 1.00 in an effort to improve their forecasts. Value Line, Bloomberg, and Merrill Lynch betas are adjusted for their long-term tendency to regress toward 1.0 by giving approximately 66% -weight to the measured raw beta and approximately 33% weight to the prior value of 1.0 for each stock:

$$\beta_{\text{adjusted}} = 0.33 + 0.66 \beta_{\text{raw}}$$

1 not an adjustment, increase or decrease in beta. The observed return on high beta
2 securities is actually lower than that produced by the CAPM estimate. The
3 ECAPM is a formal recognition that the observed risk-return tradeoff is flatter
4 than predicted by the CAPM based on myriad empirical evidence. The ECAPM
5 and the use of adjusted betas comprise two separate features of asset pricing. Even
6 if a company's beta is estimated accurately, the CAPM still understates the return
7 for low-beta stocks. Even if the ECAPM is used, the return for low-beta securities
8 is understated if the betas are understated. Referring back to the previous graph,
9 the ECAPM is a return (vertical axis) adjustment and not a beta (horizontal axis)
10 adjustment. Both adjustments are necessary. Moreover, the use of adjusted betas
11 compensates for interest rate sensitivity of utility stocks not captured by
12 unadjusted betas.

13 **Q. Please summarize your CAPM estimates.**

14 A. Table 4 below summarizes the common equity estimates obtained from the
15 CAPM studies.

16 **Table 4. CAPM Estimates for PSE**

CAPM Method	ROE
Traditional CAPM	9.3%
Empirical CAPM (ECAPM)	9.8%

1 **C. Historical Risk Premium Estimates**

2 **Q. Please describe your historical risk premium analysis of the utility industry**
3 **using Treasury bond yields.**

4 A. A historical risk premium for the utility industry was estimated with an annual
5 time series analysis applied to the utility industry as a whole over the 1931-2015
6 period, using Standard and Poor's Utility Index ("S&P Index") as an industry
7 proxy. The risk premium was estimated by computing the actual realized return
8 on equity capital for the S&P Utility Index for each year, using the actual stock
9 prices and dividends of the index, and then subtracting the long-term Treasury
10 bond return for that year. Please see Exhibit No. ___(RAM-9) for this analysis.

11 As shown on Exhibit No. ___(RAM-9), the average risk premium over the period
12 was 5.5% over long-term Treasury bond yields and 6.1% over the income
13 component of bond yields. As discussed previously, the latter is the appropriate
14 risk premium to use. Given the risk-free rate of 4.4%, and using the historical
15 estimate of 6.1% for bond returns, the implied cost of equity is
16 $4.4\% + 6.1\% = 10.5\%$

17 **Q. Are you concerned about the realism of the assumptions that underlie the**
18 **historical risk premium method?**

19 A. No, I am not, for they are no more restrictive than the assumptions that underlie
20 the DCF model or the CAPM. While it is true that the method looks backward in
21 time and assumes that the risk premium is constant over time, these assumptions
22 are not necessarily restrictive. By employing returns realized over long time

1 periods rather than returns realized over more recent time periods, investor return
2 expectations and realizations converge. Realized returns can be substantially
3 different from prospective returns anticipated by investors, especially when
4 measured over short time periods. By ensuring that the risk premium study
5 encompasses the longest possible period for which data are available, short-run
6 periods during which investors earned a lower risk premium than they expected
7 are offset by short-run periods during which investors earned a higher risk
8 premium than they expected. Only over long time periods will investor return
9 expectations and realizations converge, or else, investors would be reluctant to
10 invest money.

11 **D. Allowed Risk Premium Estimates**

12 **Q. Please describe your analysis of allowed risk premiums in the electric utility**
13 **industry.**

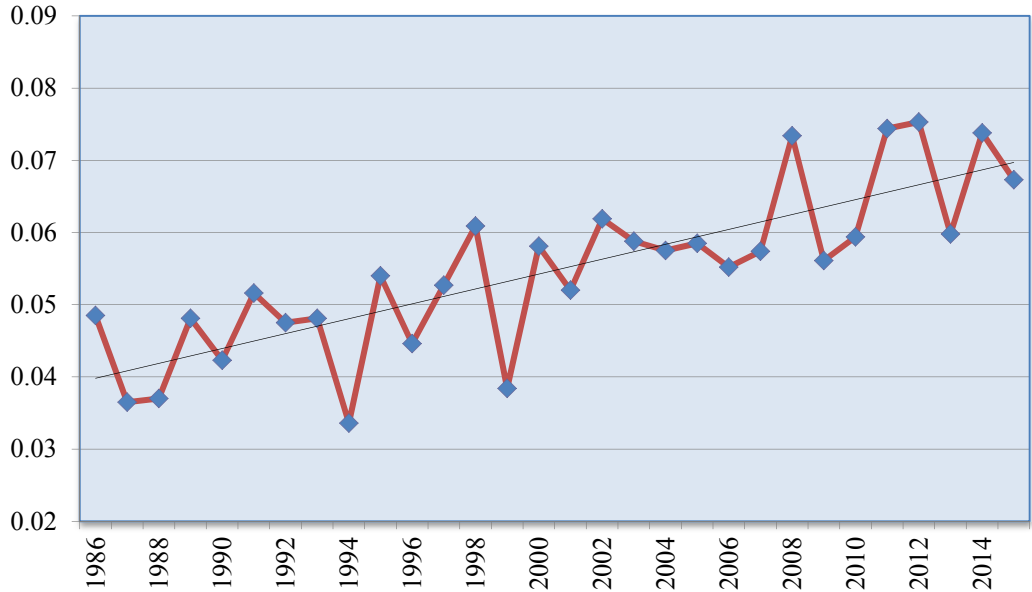
14 A. To estimate the electric utility industry's cost of common equity, I also examined
15 the historical risk premiums implied in the ROEs allowed by regulatory
16 commissions for electric utilities over the 1986-2015 period for which data were
17 available, relative to the contemporaneous level of the long-term Treasury bond
18 yield. Please see Exhibit No. ___(RAM-10) for this analysis.

19 This variation of the risk premium approach is reasonable because allowed risk
20 premiums are presumably based on the results of market-based methodologies
21 (DCF, CAPM, Risk Premium, etc.) presented to regulators in rate hearings and on
22 the actions of objective unbiased investors in a competitive marketplace.

1 Historical allowed ROE data are readily available over long periods on a quarterly
2 basis from Regulatory Research Associates (now S&P Global Market
3 Intelligence) and easily verifiable from past publications and past commission
4 decision archives.

5 The average ROE spread over long-term Treasury yields was 5.6% over the entire
6 1986-2015 period for which data were available from SNL. The graph below
7 shows the year-by-year allowed risk premium. The escalating trend of the risk
8 premium in response to lower interest rates and rising competition is noteworthy.

Allowed Risk Premium 1986-2015

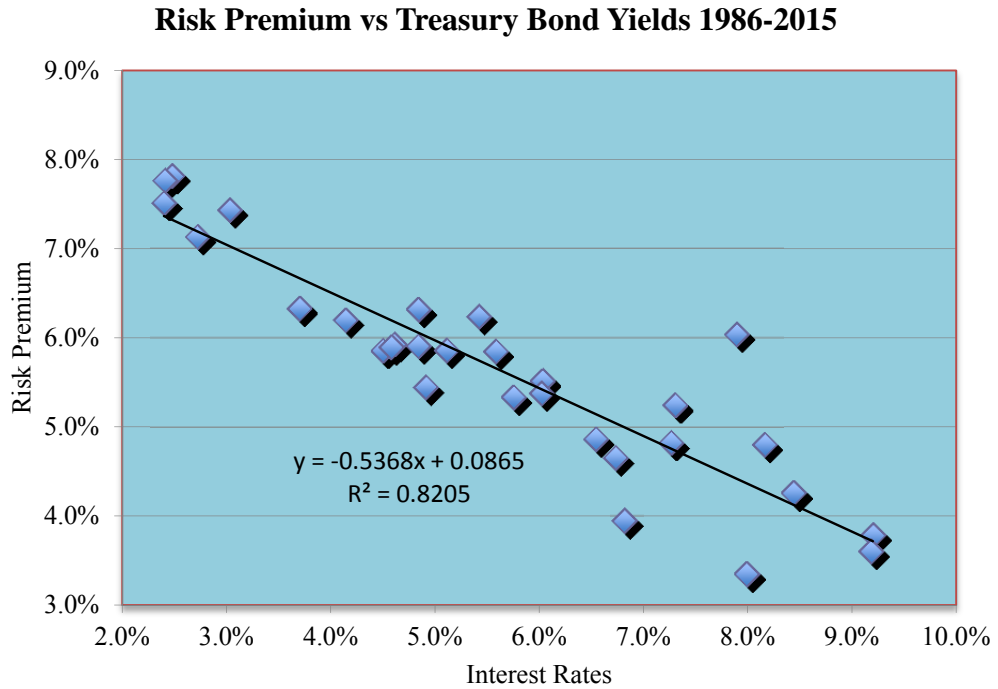


9
10 A careful review of these ROE decisions relative to interest rate trends reveals a
11 narrowing of the risk premium in times of rising interest rates, and a widening of
12 the premium as interest rates fall. The following statistical relationship between
13 the risk premium (R_p) and interest rates (YIELD) emerges over the 1986-2015
14 period:

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$$R_p = 8.6500 - 0.5368 \text{ YIELD } R^2 = 0.82$$

The relationship is highly statistically significant¹⁵ as indicated by the very high R^2 . The graph below shows a clear inverse relationship between the allowed risk premium and interest rates as revealed in past ROE decisions.



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Inserting the long-term Treasury bond yield of 4.4% in the above equation suggests a risk premium estimate of 6.3%, implying a cost of equity of 10.7%.

¹⁵ The coefficient of determination R^2 , sometimes called the “goodness of fit measure,” is a measure of the degree of explanatory power of a statistical relationship. It is simply the ratio of the explained portion to the total sum of squares. The higher R^2 the higher is the degree of the overall fit of the estimated regression equation to the sample data.

1 **Q. Do investors take into account allowed returns in formulating their return**
2 **expectations?**

3 A. Yes, they do. Investors do indeed take into account returns granted by various
4 regulators in formulating their risk and return expectations, as evidenced by the
5 availability of commercial publications disseminating such data, including Value
6 Line and SNL (formerly Regulatory Research Associates). Allowed returns, while
7 certainly not a precise indication of a particular company's cost of equity capital,
8 are nevertheless important determinants of investor growth perceptions and
9 investor expected returns.

10 **Q. Please summarize your risk premium estimates.**

11 A. Table 5 below summarizes the ROE estimates obtained from the two risk
12 premium studies.

13 **Table 5. Risk Premium Estimates for PSE**

Risk Premium Method	ROE
Historical Risk Premium Electric	10.5%
Allowed Risk Premium	10.7%

14 **IV. CONCLUSION**

15 **Q. Please summarize your results and recommendation.**

16 A. To arrive at my final recommendation, I performed

17 (i) a DCF analysis on a group of investment-grade dividend-
18 paying combination gas and electric utilities using Value
19 Line's growth forecasts;

- (ii) a DCF analysis on a group of investment-grade dividend-paying combination gas and electric utilities using analysts' growth forecasts;
- (iii) a traditional CAPM using current market data;
- (iv) an empirical approximation of the CAPM using current market data;
- (v) historical risk premium data from electric utility industry aggregate data, using the current yield on long-term US Treasury bonds; and
- (vi) allowed risk premium data from electric utility industry aggregate data, using the current yield on long-term US Treasury bonds.

Table 6 below summarizes the ROE estimates for PSE.

Table 6. Summary of ROE Estimates

Study	ROE
DCF - Electric Utilities Value Line Growth	9.8%
DCF - Electric Utilities Analysts Growth	9.4%
Traditional CAPM	9.3%
Empirical CAPM	9.8%
Historical Risk Premium Electric	10.5%
Allowed Risk Premium	10.7%
Average	9.9%
Median	9.8%
Truncated Mean	9.9%

The average estimate is 9.9%, the median result is 9.8%, and truncated mean¹⁶ is 9.9%. In light of those central results, I view the 9.8% ROE requested by PSE as a

¹⁶ The truncated mean is obtained by removing the high and low results and computing the average of the remaining observations.

1 fair and reasonable estimate, although I consider this estimate very conservative
2 for reasons stated below.

3 I stress that no one individual method provides an exclusive foolproof formula for
4 determining a fair return, but each method provides useful evidence so as to
5 facilitate the exercise of an informed judgment. Reliance on any single method or
6 preset formula is hazardous when dealing with investor expectations. Moreover,
7 the advantage of using several different approaches is that the results of each one
8 can be used to check the others. Thus, the results shown in Table 6 above must be
9 viewed as a whole rather than each as a stand-alone. It would be inappropriate to
10 select any particular number from Table 6 and infer the cost of common equity
11 from that number alone.

12 **Q. Do your various cost of equity estimates for PSE include an allowance for**
13 **flotation costs?**

14 A. No, they do not. Although flotation cost adjustments are necessary for privately
15 held subsidiary utilities, I am not advocating a flotation cost adjustment for PSE
16 in this proceeding because of the unique ownership structure of PSE. PSE's
17 ultimate parent, Puget Holdings LLC, is owned by infrastructure investors that are
18 predominantly pension funds. These pension funds do not issue equity to obtain
19 funds and instead obtain funds from participants to a pension plan that must pay
20 into such plan. In obtaining funds, these pension plans do not incur the types of
21 costs that are normally associated with the flotation cost allowance. Additionally,
22 it is my understanding that neither PSE nor any affiliate of PSE has any current
23 plans to issue equity. In other words, it is unlikely that any equity injected into

1 PSE for the foreseeable future will be funded by any equity issuance by PSE or
2 any affiliate entity. For this reason, I do not advocate a flotation cost adjustment
3 for PSE in this proceeding.

4 **Q. Please elaborate on the statement earlier in your testimony that PSE's**
5 **requested ROE of 9.8% is a "barebones" estimate.**

6 A. Yes. I consider PSE's requested ROE of 9.8% as "barebones" for the following
7 three reasons: 1) PSE's dependence on a huge capital spending program relative
8 its size, 2) PSE's small size relative to the peer group, and 3) PSE's slightly
9 weaker common equity ratio compared to that of its peers.

10 **Q. Please comment on PSE's small size and its effect on risk.**

11 A. My second reason for considering the ROE of 9.8% requested by PSE to be
12 "barebones" is because PSE possesses very small revenue and asset bases, both in
13 absolute terms and relative to the other electric utilities in the peer group.
14 Investment risk increases as company size diminishes, all else remaining constant.
15 The size phenomenon is well documented in the finance literature, and is fully
16 discussed in Chapter 6 of my book The New Regulatory Finance and is also fully
17 discussed in the Duff & Phelps 2016 Valuation Handbook (formerly Morningstar
18 Valuation Yearbook). Small companies have very different returns than large
19 ones and on average those returns have been higher.

20 **Q. Please comment on PSE's common equity ratio compared to that of its peers.**

21 A. My third reason for considering the ROE of 9.8% requested by PSE as
22 "barebones" is because PSE's common equity ratio of 48.5% is slightly weaker

1 than that of its peers. As shown on Exhibit No. ___(RAM-11), the average
2 common equity ratio for the peer group is 49.6% and the median common equity
3 ratio is 50.6% compared to PSE's 48.5%. In other words, PSE has a slightly
4 weaker capital structure than that of its peers and more financial risk.

5 **Q. Does this conclude your pre-filed direct testimony?**

6 A. Yes, it does.