UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

Inquiry Regarding the Commission's Policy	)	
For Determining Return on Equity	)	Docket No. PL19-4-000

PREPARED AFFIDAVIT OF

DR. MICHAEL J. VILBERT

ON BEHALF OF

THE INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA

June 26, 2019

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I, Michael J. Vilbert, state under penalty of perjury that the foregoing is true and correct to the best of my knowledge and information.

I. INTRODUCTION AND QUALIFICATIONS

1. My name is Michael J. Vilbert, and I am a Principal Emeritus of *The Brattle Group* (Brattle). I am submitting this affidavit on behalf of The Interstate Natural Gas Association of America (INGAA). I am sponsoring this Affidavit, Attachment A, as well as Attachment B, which contains my résumé.

2. I am a Principal Emeritus of The Brattle Group, an economic, environmental, and management consulting firm with offices in Boston, Washington D.C., London, San Francisco, Madrid, Rome, New York, Toronto, Sydney, and Brussels with specialties including financial economics, regulatory economics, and the gas, water, and electric industries. My work concentrates on financial and regulatory economics. I hold a B.S. from the U.S. Air Force Academy, an MA from the Fletcher School of Law and Diplomacy, Tufts University, an MBA from the University of Utah, and a Ph.D. in financial economics from the Wharton School of Business at the University of Pennsylvania. My business address is 201 Mission Street, Suite 2800, San Francisco, CA 94105, USA.

3. Brattle's specialties include financial economics, regulatory economics, and the gas, water and electric industries. As a Principal Emeritus of The Brattle Group, I work in the areas of cost of capital, investment risk, and related matters for many industries, regulated and unregulated alike, in many forums. I have testified or filed cost-of-capital testimony before many regulatory bodies including the Federal Energy Regulatory

Commission ("FERC" or the "Commission"), the Arizona Corporation Commission, the Pennsylvania Public Utility Commission, the Public Service Commission of West Virginia, the State Corporation Commission of Virginia, the Public Utilities Commission of Ohio, the Tennessee Regulatory Authority, the Public Service Commission of Wisconsin, the South Dakota Utilities Commission, the California Public Utilities Commission, the Michigan Public Service Commission, the Canadian National Energy Board, the Alberta Energy and Utilities Board, the Ontario Energy Board, and the Labrador & Newfoundland Board of Commissioners of Public Utilities. Attachment B contains more information on my professional qualifications.

II. <u>PURPOSE OF AFFIDAVIT</u>

4. INGAA has requested that I respond to some of the questions posed in the Federal Energy Regulatory Commission's (FERC or Commission) Notice of Inquiry (NOI) with regard to how to implement the four models to estimate the return on equity (ROE) proposed in the revised FERC methodology specified in the *Coakley* Briefing Order.[1] The purpose of my affidavit is to explain my recommendations on both application and modifications to the proposed methodologies in the *Coakley* Briefing Order as applied to samples in an interstate natural gas pipeline proceeding.

5. My affidavit is organized as follows. *Section III* formally defines the cost of capital and briefly describes the principles relating to the estimation of the cost of capital for a

[1] Coakley v. Bangor Hydro-Elec. Co., Opinion No. 531, 147 FERC ¶ 61,234 (2014), order on paper hearing, Opinion No. 531-A, 149 FERC ¶ 61,032 (2014), order on reh'g, Opinion No. 531-B, 150 FERC ¶ 61,165 (2015), vacated & remanded sub nom. Emera Maine, 854 F.3d 9, order on remand, Coakley v. Bangor Hydro-Elec. Co., 165 FERC ¶ 61,030 (2018) ("*Coakley* Briefing Order").

business. *Section IV* first presents the Commission's revised cost of capital estimation methodology and then previews the discussion of the models. *Section V* discusses the capital asset pricing model (CAPM) and my recommended method of implementing the model. *Section VI* presents the theory underlying the discounted cash flow (DCF) model, its strengths and weaknesses, and my proposed adjustments to the DCF model. *Section VII* and *Section VIII* address the Expected Earnings model and Risk Premium model, respectively. *Section IX* critiques FERC's proposed outlier tests for high-end and low-end outliers.

III. COST OF CAPITAL THEORY

A. The Cost of Capital and Risk

6. The cost of capital can be defined as *the expected rate of return in capital markets on alternative investments of equivalent risk.*[2] In other words, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost; it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected" in my affidavit, as in the definition of the cost of capital itself, refer to the probability-weighted average of all possible outcomes. The definition of the cost of capital recognizes a tradeoff between risk and return that is known as the "security market risk-return line," or "security market line" (SML) for short. This line is depicted

[2] See *Principles of Corporate Finance*, 12th edition, 2017, by Brealey, Myers, and Allen, McGraw-Hill/Irwin, p.10 for a discussion of the opportunity cost of capital.

in Figure 1**.** The higher the risk, the higher the cost of capital. Variations of Figure 1 apply for all investments.

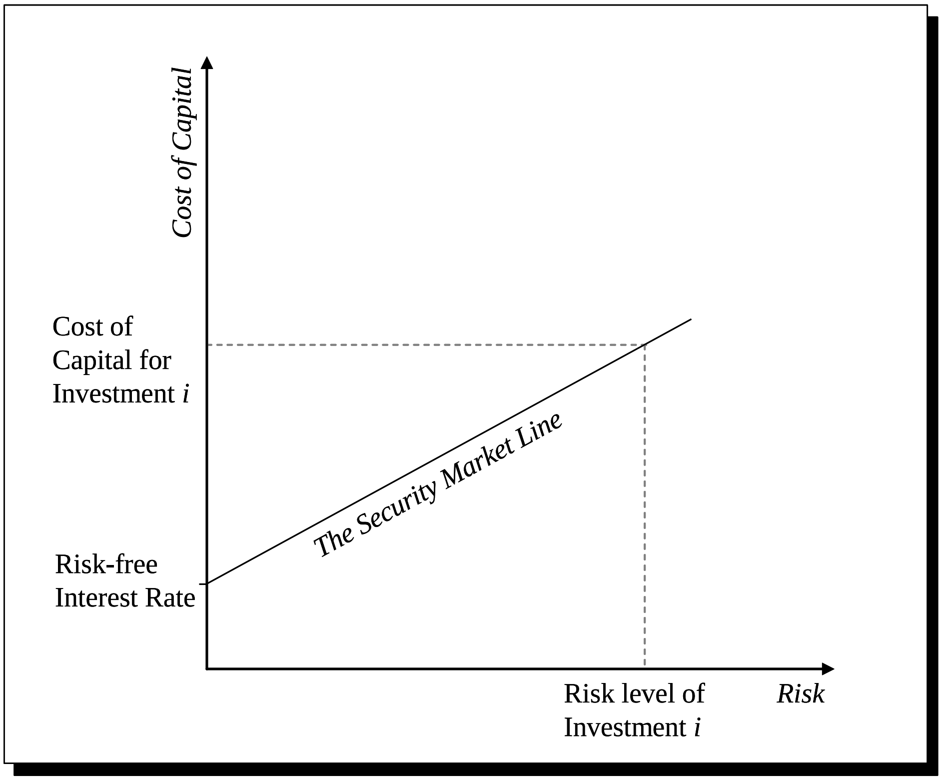

Figure 1: The Security Market Line

B. Application of the Cost of Capital in Regulation

7. In U.S. rate regulation, the "cost of capital" is viewed as the appropriate expected rate of return on utility investment[3] consistent with the U.S. Supreme Court's opinions in *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*, 262 U.S. 679 (1923)(*Bluefield*), and *FPC v. Hope Natural Gas Co.*, 320 U.S. 591 (1944)(*Hope*).

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

8. From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the minimum that compensate investors for the risks they bear.

9. There are short and long-term consequences to setting an expected rate of return below the cost of capital for both investors and consumers. In the short run, deviations of the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game" – investors gain if the rate of return is set at higher levels, and customers gain if investors are shortchanged. But in fact, in the short run, such inadequate returns may adversely affect the regulated company's ability to provide stable and favorable rates because some potentially desirable investments may be delayed or may require the utility to file more frequent rate cases. Inadequate returns are likely to cost customers—and society generally—far more than is "gained" in the short run. In the long run, such a return denies a utility the ability to attract capital, to maintain its financial integrity, and to expect a return commensurate with that of other enterprises attended by corresponding risks and uncertainties. As a result, inadequate returns lead to inadequate investment, in existing and new plant and equipment. The costs of an undercapitalized industry can be far greater than the short-run gains from shortfalls in the cost of capital. Moreover, in capital-intensive industries (such as the natural gas pipeline industry), systems that take a long time to decay cannot be fixed overnight. Thus, it is in the customers' interest not only to make sure the return investors expect does not exceed the cost of capital, but also to make sure that it does not fall short of the cost of capital.

10. Finally, the cost of capital cannot be estimated with perfect certainty through any methodology, and other aspects of the way the revenue requirement is set may mean investors expect to earn more or less than the cost of capital even if the allowed rate of

return equals the cost of capital exactly.[4] However, a commission that sets rates so investors expect to earn the cost of capital treats both customers and investors fairly, and acts in the long-run interests of both groups.

IV. THE COMMISSION'S PROPOSED REVISION OF ITS COST OF EQUITY CAPITAL METHODOLOGY

11. This section describes the Commission's proposal to revise its ROE methodology in general and provides the specifics of the implementation of the models.

A. Proposal to Revise FERC Revised ROE Estimation Methodology

12. On October 16th, 2018, FERC issued an Order Directing Briefs (*Coakley* Briefing Order) on the ROE to be used by New England electric utilities for setting transmission rates. FERC proposes to expand the methodological basis for determining the Zone of Reasonableness (ZOR) to a multiple model approach. Brattle has long advocated the use of multiple models when estimating the cost of capital.

13. Various economic theories postulate how the cost of capital is determined in capital markets. Tests of those theories have not yet resolved which model is the best or most reliable method. As a result, there are a number of models in use to estimate the cost of capital.[5]

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[4] Setting the revenue requirement requires estimation of numerous parameters such as forecast sales and costs. A systematic estimation error will result in the regulated company not expecting to earn its allowed ROE on average. Systematic in this context means that the regulator either consistently over or under estimates costs or revenues.

[5] *Risk and Return For Regulated Industries*, Elsevier, Academic Press, 2017, by Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, p. 5.

14. Because the cost of capital cannot be observed and therefore must be estimated, it is important to use multiple models. No single model should be relied upon in isolation because all models have strengths and weaknesses. Some models perform better under certain economic conditions than others, but each provides information for the analyst to evaluate when forming an opinion on the cost of equity.

B. The Proposed Models

15. The FERC has proposed to expand the models to encompass the following three analyses, each applied to the same proxy group and a fourth model, the Risk Premium model applied to past allowed returns:

1. Capital Asset Pricing Model (CAPM)
2. Two-step DCF Model,
3. Expected Earnings Model, and
4. Risk Premium Model.

16. After excluding low- and high-end outliers from each model's results, the first three proposed methodologies establish a composite Zone of Reasonableness by averaging the high estimates and the low estimates of the three models. Under the Commission's policy, outliers are to be identified as estimates that are less than 100 basis points (bps) greater than the yield on BBB-rated utility debt (low-end) or greater than a 1.5 multiple of the median estimate (high-end), both subject to a "natural break" analysis.

17. A "Presumptively Just and Reasonable" range of ROEs for Average Risk Utilities is established consisting of one quarter of the composite ZOR, centered on the sample midpoint or median ROE estimate.

18. For setting the new ROE of an average risk utility (*i.e.*, if an existing ROE is determined to be no longer just and reasonable or if setting the ROE for a new service or utility), the methodology uses the average of the midpoints (for a group of companies) or the medians (for a single company) of the three models along with a *single point estimate* from a fourth methodology, the Risk Premium analysis. For setting the ROE of an above average risk utility, the Commission uses the median of the upper half of the composite zone of reasonableness from the DCF, CAPM, and Expected Earnings methods.

V. <u>The Capital Asset Pricing Model</u>

19. In the NOI, the Commission asks the following questions regarding the CAPM.[6]

20. *Question H.2.b.1: If the market risk premium is determined by applying the DCF methodology to a representative market index, should a long-term growth rate be used, as in the Commission's two-step DCF methodology?*

21. My answer is no. I discuss my recommended approach to estimating the market risk premium (MRP) in more detail below.

22. *Question H.2.b.2: Beta is a measure of a security's risk relative to the broader market, such as the S&P 500, not of its absolute risk. Do CAPM's assumptions break down if both utility stocks and the broader market become riskier over time on an absolute basis, but the relative increase in risk in utility stocks rises more slowly?*

23. Theoretically, the answer is no. I interpret riskier on an "absolute basis" to mean that the volatility of the market and the utility industry have both increased. The average beta of

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6 NOI, P. 38.

the utility industry will decrease because the beta of the market is always 1.0, and the systematic risk of the utility industry has declined relative to the market. Recall that the theory of the CAPM is that the market is fully diversified so the increased volatility cannot be diversified away. If the stock market is riskier, I would expect that the return on the market to increase as well because the risk-return tradeoff between risk-free assets and the market would have a higher slope. The change in the expected return on utility stocks is undetermined. The expected return on utility stocks will be the net of an increase because of the greater risk-return tradeoff but will decrease because of the reduced industry beta. In either case, theoretically the CAPM should estimate the cost of capital correctly.

24. *Question H.2.b.3: What are appropriate data sources for the beta value?*

25. Beta is calculated somewhat differently by different data sources. I recommend *Value Line* because it is widely available and provides estimates for all sample companies.

26. *Question H.2.b.4: Should the Commission employ more sophisticated versions of the CAPM model that consider more variables instead of only beta, such as the Fama-French Model?*

27. No. Fama and French recognized certain limitations in the CAPM and attempted a revised version to address those limitation, however, in my experience, the estimates from the Fama-French model have been highly variable so that estimates can be quite different simply based on the timing of the estimates even though the sample companies are of comparable risk in both periods.

A. CAPM Theory

28. Modern models of capital market equilibrium express the cost of equity as the sum of a risk-free rate and a premium for risk. The CAPM is the longest-standing and most widely used of these theories. Implementation of the model requires specification of: (1) the current values of the benchmarks that determine the Security Market Line (see Figure 1 above); (2) the relative risk of a security or investment; and (3) how the benchmarks combine to produce the Security Market Line. Given these specifications, a company's cost of capital can be calculated based on its relative risk. Specifically, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \tag{1}$$

where $\boldsymbol{r_S}$ is the cost of capital for investment S;

$\boldsymbol{r_f}$ is the risk-free interest rate;

$\boldsymbol{\beta_S}$ is the beta risk measure for investment S; and

$\boldsymbol{MRP}$ is the market equity risk premium.

29. The CAPM relies on the empirical fact that investors require risky securities to offer a higher expected rate of return than safe securities. It says that the Security Market Line starts at the risk-free interest rate (i.e., the return on a zero-risk security, the y-axis intercept in Figure 1 equals the risk-free interest rate). Further, it says that the risk premium of a security above the risk-free rate equals the product of the beta of that

security and the risk premium on a value-weighted portfolio of all investments, which by definition has average risk, i.e., a beta equal to 1.0.

B. Model Parameters

1. The Risk-Free Interest Rate

a. Term to Maturity

30. Modern capital market theories of risk and return use the short-term risk-free rate of return as the starting benchmark, but regulatory bodies such as FERC use a version of the risk positioning model that is based upon the long-term risk-free rate. I recommend relying on the long-term version of the risk positioning model because short-term interest rates are subject to manipulation by the Federal Reserve to manage economic activity. Accordingly, the implementation I recommend requires use of long-term U.S. Treasury bond interest rates.

31. Two aspects of the risk-free interest rate for use in the CAPM are important. First, the risk-free interest rate should be consistent with the MRP. Recall that the MRP represents the additional expected return on an investment of average risk over the yield on the risk-free asset. If the MRP is measured relative to a risk-free Treasury bond with a 20-year term to maturity, the risk-free interest rate in the CAPM should also be for a 20-year Treasury bond. In principle, the CAPM can be estimated with a risk-free interest rate of any term to maturity as long as the MRP used is consistent with the selected risk-free interest rate. In other words, if a 20-year Treasury bond yield is used as the risk-free interest rate in Figure 1, the MRP used should also be relative to a 20-year Treasury bond. Second, there are advantages to using a long-term bond yield over using a short-term

Treasury bill yield because long-term bond yields are less volatile. The methodology in the *Coakley* Briefing Order included a 30-year Treasury bond as the benchmark risk-free interest rate perhaps because it is the longest term available; however, there is at least one disadvantage to using the 30-year Treasury bond yield. Specifically, 30-year bonds were not issued for a period of time so that long-term historical data are not available for that time. In contrast, there is data on 20-year Treasury bond yields provided by Duff & Phelps back to 1926. Data provided by Duff & Phelps is useful for many purposes, and it is beneficial to use models that are consistent with the information provided by that service. For this reason, I recommend using 20-year Treasury bond yields as a measure of the risk-free interest rate.

b. Current or Forecast Risk-Free Interest Rate

32. Another aspect of the risk-free interest rate is whether to use current yields or forecast yields. I recommend using a forecast interest rate because the goal is to match the cost of capital as closely as possible with the period rates are expected to be in effect. Decisions in regulatory proceedings always require time to complete, which makes current yields at the time of the analysis out of date by the time the decision is rendered. Use of forecast risk-free interest rates is more consistent with estimating a forward-looking cost of capital than current (*i.e.*, historical) interest rates. Forecast rates may be higher or lower than current yields so there is no concern that forecast rates favor companies or customers.

33. Because investors are aware of and rely upon forecasts to inform their investment decisions, forecast rates are preferable to current rates.

2. The Market Risk Premium

34. In general, a risk premium is the amount of "excess" return—above the yield on the risk-free benchmark—that investors require to compensate them for taking on risk. As illustrated in Figure 1 above, investors require larger risk premiums for riskier investments. The MRP is the risk premium associated with investing in the market as a whole. The so-called "market portfolio" is a fully diversified portfolio, meaning that the risk of the market consists only of systematic risk which is the risk that affects the cost of capital.

35. The MRP is a highly relevant benchmark indicating the level of risk compensation demanded by capital market participants. It is also a direct input necessary to estimate the cost of equity using the CAPM and other risk-positioning models. Like the cost of capital itself, the MRP is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable and must be inferred or forecasted based on known market information.

36. Experience (*e.g.*, the recent credit crisis in stock markets worldwide and the U.S. market's October Crash of 1987) demonstrates that shareholders, even well-diversified shareholders, are exposed to enormous risks. By investing in stocks instead of risk-free government Treasury securities, investors subject themselves not only to the risk of earning a lower than expected return but also to the risk that they might lose some or all of their initial investment. This is fundamentally why investors demand a risk premium.

37. The MRP is the most important as well as the most controversial parameter to estimate for the CAPM. There are a number of ways to estimate the MRP, but the four general categories of estimates are those based upon (1) averages from historical data, (2) survey data, (3) the so-call "supply model" which derives the MRP from expected productivity in the real economy, and (4) conditional estimates which attempt to adjust for current economic conditions. Although the MRP can be estimated in different ways, survey evidence is generally regarded as unreliable because it is difficult to ensure that respondents are consistent in their responses. Few analysts rely upon the supply side model perhaps because it is the newest of the methods. Most analysts rely on either historical data or the conditional model using the DCF model to estimate the expected market return. The latter model is often based upon forecast market returns using the dividend valuation model, *i.e.*, the DCF model. The MRP reported in Order No. 551 was calculated using the DCF model using the weighted-average of IBES and *Value Line* EPS growth rate forecasts.[7]

38. All methods of estimating the MRP try to estimate the expected (*i.e.*, forward-looking) MRP even if the estimation method may rely upon historical data. When relying upon historical data, the theory is that the historical data is the best estimate of the expected MRP if you have no other information. In other words, the future will look like the past, but there is always information on current economic conditions.

7 Order No. 551, P. 138-139.

a. Arithmetic versus Geometric Mean

39. When using historical realized data to estimate the MRP, the appropriate measure of the MRP is the arithmetic mean not the geometric mean. The arithmetic mean represents the expected return on the market which is what the MRP represents. Ibbotson also confirms that the appropriate measure of the MRP is the arithmetic mean. Conversely, the geometric mean is a compound rate of return between two periods and is appropriate for measuring performance.

b. Market Index

40. Estimation of the MRP requires specifying a market index. There are several choices, but the two most often used are the S&P 500 Index and the New York Stock Exchange Index (NYSE). Both are market-value weighted-average indices, and the returns between the two indices are highly correlated, meaning that there is little difference in the daily percentage point changes in the indices. I recommend the S&P 500 index which is the index used to develop the MRP estimate in the *Coakley* Briefing Order.

c. Historical Estimate

41. Duff & Phelps publishes historical realized returns on the S&P 500 back to 1926 in their publication *Ibbotson Stock, Bonds, Bills, and Inflation*. When estimating the MRP using historical data, Ibbotson recommends using the longest period for which reliable data is

available. The benefit of this method is that the MRP can be "looked up" in the annual Duff & Phelps publication. The historical estimate of the MRP is 6.94 percent.[8]

42. The weakness of the historical MRP estimate is that it does not consider current economic conditions which means that it is an unconditional estimate. An unconditional estimate is the best estimate if you have no information on current capital market conditions, but, of course, there is always information available on market conditions. Thus, I recommend the conditional estimate of the MRP.

d. Conditional MRP Estimates

43. The difficulty with estimating a conditional MRP is determining the best way to make the estimate. The most prevalent way to estimate a conditional MRP is through the dividend valuation model, *i.e.*, the DCF model. As discussed earlier, the DCF model requires a dividend yield and a growth rate. The dividend yield can be for the market as a whole (top down estimate) or for individual stocks within the selected market index weighted by the market capitalization of each individual stock (bottom up estimate). Similarly, the growth rate of dividends (and earnings and stock price) can be estimated for the market as a whole or as the market-capitalization weighted-average of the stocks in the index.

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8 Duff and Phelps's *Ibbotson SBBI 2018 Valuation Yearbook* reports the realized arithmetic average MRP from 1926 to 2017 to be 7.07 percent. This decreased to 6.94 percent in the *Ibbotson SBBI 2019 Valuation Yearbook* from the period 1926 to 2018.

44. *Value Line* publishes the expected dividend yield and growth rate for the market, making the top down method relatively easy.[9] However, the top down approach can be criticized as being based upon the opinion of one analyst or one reporting firm as opposed to the more consensus view of multiple analysts focusing on individual companies in the index.

45. The bottom up estimate requires market-capitalization weighted-average dividend yield information for all companies in the index (*e.g.*, S&P 500) and weighted-average earnings per share (EPS) information for all dividend paying stocks in the index. Note one weakness of the bottom up approach: it can only be applied to dividend paying stocks, and non-dividend paying stocks are frequently companies whose growth prospects are so valuable that they chose to reinvest in the company to support additional growth rather than pay dividends. To the extent that the non-dividend paying stocks are among the fastest growing and most risky companies in the index, the bottom up approach has a downward bias.

46. The dividend yield in the MRP estimate should also be adjusted for share repurchases. If share repurchase is ignored, a source of cash to investors will be omitted, and dividend yield will be understated. A comparison of the weighted-average dividend yield and share repurchase yield is shown in Figure 2 using data from Bloomberg. Share buybacks yield actually exceeds dividend yield on the S&P 500 over the last six quarters as shown in Figure 3.

9 *Value Line* publishes Part 1, Summary & Index weekly. The median of estimated dividend yields on all dividend paying stocks over the next 12 months and the median capital gain for the universe of 1700 stocks covered by the publication are provided.

Figure 2: Dividend yield and share buyback yield on S&P 500

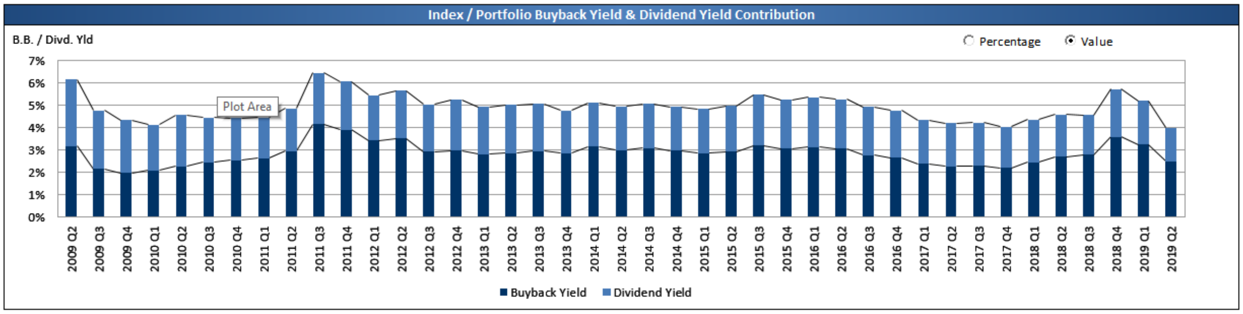

Figure 3: Buyback Yield and Dividend Yield on the S&P 500

Period	*2019 Q2*	*2019 Q1*	*2018 Q4*	*2018 Q3*	*2018 Q2*	*2018 Q1*
Buyback (BLN)	8.07	197.38	219.26	203.00	196.00	182.80
Buyback Yield	2.51%	3.26%	3.58%	2.78%	2.69%	2.46%
Dividend (BLN)	4.99	123.11	125.85	119.44	119.14	114.76
Dividend Yield	1.49%	1.94%	2.14%	1.79%	1.89%	1.90%

47. Adjusting the dividend yield for share repurchase can be done by adding an additional term to the dividend yield portion of the DCF model using the following method: Adjusted dividend yield is dividend*(1 +forecast EPS growth)/price + (dollar value of shares repurchased)/(price of shares times shares outstanding before repurchase).

48. Note that the (1 + g) term is only multiplied times the dividends paid portion of the dividend yield because share repurchase cannot grow indefinitely. The share repurchases dollars are equal to the announced number of shares to be repurchased times the price per share. The adjustment for share repurchase is discussed in more detail in in the discussion of the DCF model in *Section VI*.

49. The MRP reported in Order No. 551 by Dr. Avera used a bottom up approach and used a single-stage DCF model on all dividend paying stocks in the S&P 500 index. He relied upon EPS growth rate estimates from IBES and *Value Line* without screening the growth rates estimates or the resulting ROE estimates for individual companies. Some object

that individual company estimates may be high while others may be low, but the actual calculation is of a weighted-average dividend yield plus a weighted-average growth rate for the market as a whole. Note that the weighted average growth rate for the S&P 500 includes both high and low growth rate estimates and reflects the expected growth rate of the S&P 500, but it omits the forecast growth rate for the non-dividend paying stocks, which may be among the fastest growing companies in the index.

50. I recommend including share repurchases in the dividend yield and estimating the expected growth rate for the dividend paying companies in the S&P 500 using the weighted-average growth rate from IBES and *Value Line*. The estimated MRP is the estimated return on the market minus the yield on the benchmark interest rate

3. Beta

51. Beta (β) represents the sensitivity of a given security's or portfolio's returns to the market's returns. The usual approach to calculating beta is a statistical comparison of the sensitivity of a stock's (or a portfolio's) return to the market's return. Formally,

$$\boldsymbol{\beta}_s = \frac{covariance(\boldsymbol{r}_s, \boldsymbol{R}_m)}{variance(\boldsymbol{R}_m)} \quad \textbf{(2)}$$

where $\boldsymbol{R}_m$ is the return on the market portfolio.

52. The basic idea behind beta is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification. Beta is a measure of the risks that cannot be eliminated by diversification. That is, it measures the "systematic" risk of a stock—the extent to which a stock's value fluctuates more or less

than average when the market fluctuates. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up or down by 10 percent on average when the market goes up or down by 10 percent. Stocks with betas above 1.0 exaggerate the swings in the market: stocks with betas of 2.0 tend to fall 20 percent when the market falls 10 percent, for example. Stocks with betas below 1.0 are less volatile than the market. A stock with a beta of 0.5 will tend to rise 5 percent when the market rises 10 percent.

53. FERC has long relied upon beta estimates provided by *Value Line.* *Value Line* betas are estimated using 5 years of weekly return data (*i.e.*, 260 weeks) using the NYSE as the market return. *Value Line* betas are "adjusted" which, for an estimated beta greater than 1.0, results in a decrease in the adjusted beta relative to the unadjusted beta estimate. Interstate pipeline sample companies frequently have *Value Line* betas greater than 1.0, which means that their unadjusted betas are even higher.

54. I recommend that FERC continue to rely upon beta estimates from *Value Line.* However, I recommend that FERC also leave open the possibility of using an alternative source of beta estimates for an industry that has experienced a substantial change in the risk. Return data further in the past will not reflect the changed risk characteristic of the industry so that relying upon 5 years of historical data may not reflect the industry's risk as well as a beta estimated using a shorter time period. In the case of altered industry risk, an alternate source of betas will be required including calculating betas by the analyst.

VI. FERC Two-Step DCF Model

55. In Section C of the NOI, the Commission asks about the performance of the DCF Model. In particular, the "Commission seeks comment on the robustness of the DCF model over time and under differing investment conditions."[10]

56. *Question C1: "The DCF model assumes stock prices are equal to the present value of projected future cash flows. Is there evidence of situations when these assumptions are inaccurate?"*

57. *Question C2: "Have current and projected proxy company earnings over the last 10 to 20 years increased in a manner that would justify any increases in their stock prices over the same period, consistent with DCF model assumptions?"*

58. *Question C3: "How does the DCF methodology perform over a wide range of interest rate conditions?"*

59. *Question C3.a: "What specific assumptions of the DCF model, if any, do not work well in low or high interest rate environments?"*

60. *Question C3.b: "Is there evidence that the volatility of price*-to-earnings ratios over the *last 10 to 20 years, assumed to be constant in the DCF methodology, has been driven by the wide swings in interest rates over this period? If so, would the constant P/E assumption impact the award of reasonable ROEs?"*

[10] NOI, P. 33.

61. In this section of my affidavit, I address the DCF model and my proposed modifications to its implementation. The discussion addresses most of the Commission's questions.

A. Theory of the DCF Model

62. The DCF model takes the first approach to cost of capital estimation, *i.e.*, to attempt to estimate the cost of capital in one step instead of estimating the cost of capital for the entire market and then determining the cost of capital for an individual investment as is done with the CAPM. The DCF method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow stream:

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

where P_0 is the current market price of the stock;
D_t is the dividend cash flow expected at the end of period t;
T is the last period in which a dividend cash flow is to be received; and
r is the cost of equity capital.

63. The formula simply says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received.

64. Most DCF applications go even further and make strong assumptions that yield a simplification of the standard formula, which then can be rearranged to estimate the cost

of capital. Specifically, if investors expect a dividend stream that will grow forever at a steady rate, then the market price of the stock will be given by a very simple formula:

$$P_0 = \frac{D_1}{r - g} \quad \textbf{(4)}$$

where D_1 is the dividend expected at the end of the first period, g is the perpetual growth rate, and P_0 and r are the current market price and the cost of equity capital, as before.

65. Equation (4) is a simplified version of Equation (3) that can be solved to yield the well-known "DCF formula" for the cost of capital, Equation (5):

$$r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g \quad \textbf{(5)}$$

where D_0 is the current dividend, which investors expect to increase at rate g by the end of the next period, and the other symbols are defined as before.

66. Equation (5) says that if Equation (4) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future (constant) growth rate of dividends. I refer to this as the "simple DCF" model. Of course, the "simple" model is simple because it relies on strong assumptions. If the assumptions are violated, the model could produce biased estimates.

67. The DCF approach is grounded in solid finance theory. It is widely accepted by regulatory commissions and provides useful insight regarding the cost of capital based on forward-looking metrics. DCF estimates of the cost of capital complement those of the CAPM because the two methods rely on different inputs and assumptions. The DCF method is particularly valuable in the current economic environment, because of the

effects on capital market conditions of the Fed's efforts to maintain interest rates at historically low levels which can bias the CAPM estimates downward if not considered in the implementation of the CAPM.

B. FERC Two-Step DCF Model

68. The proposed two-step DCF model in the *Coakley* Briefing Order is largely unchanged. The ROE estimated is the sum of the dividend yield and an estimated growth rate in earnings per share (EPS). The growth rate is estimated as the weighted-average of the IBES 3-5 year earnings per share (EPS) forecast (2/3rd weight) and the forecast of long-term GDP growth rate (1/3rd weight). The dividend yield is calculated as the 6-month average of the dividend yield adjusted by (1 + 0.5 g) where g is the EPS growth rate. The formula is below.

$$r = \frac{D_0 * (1 + 0.5g)}{P_0} + g \qquad \textbf{(6)}$$

Strengths and Weaknesses of the DCF Model

69. Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the CAPM. Specifically, the DCF model reflects current market conditions more quickly because the market price of a company's stock changes daily.[11] In theory, the dividend yield will adjust quickly to changes in interest rates because among other things investors compare dividend yields with bond yields. In general, when interest rates in the economy increase, stock prices

[11] The advantage is weakened somewhat by the reliance on a 6-month average dividend yield instead of a shorter period. Six months represents two dividend payments.

decline. Dividend yields increase when market prices fall and reflect the increased cost of capital.

70. The challenge for the DCF model is that the model requires forecasts of earnings growth rates. Although market prices may adjust quickly, revised EPS growth rate forecasts are generally available with a lag so there may be a mismatch between the dividend yield and the forecast EPS growth rates. Moreover, EPS forecasts are more reliable when based upon stable economic conditions which are required to satisfy the constant dividend growth rate assumption. The model assumes a constant payout ratio, a constant growth rate in dividends and EPS, a growth of earnings less than the discount rate, *i.e.*, the constant cost of capital, and a constant price/earnings ratio. If economic conditions are not stable, it is unlikely that a company's EPS growth rates would be stable either.[12] Although the dividend yield quickly reacts to changes in the market, the growth rate estimates may be less precise during times of market uncertainty because future growth rates may be more volatile.

71. In times of economic turmoil, the DCF model's estimates could be affected by a "flight to safety" in which demand increases for relatively safe investments such as bonds and regulated companies. The effect is an increase in the price of regulated companies with a corresponding decrease in dividend yield. The dividend yield should decrease as interest rates decrease but may do so to a greater degree than warranted as a result of the flight to safety. Nevertheless, because dividend yields and forecast growth rates change

[12] It is not fruitful to try to define stable economic conditions, but economic conditions in two periods can be compared.

quickly, the DCF model is likely to more quickly reflect investors' current cost of capital expectations than other models.

72. I recognize that the DCF model, like all models, relies upon assumptions that do not always correspond to reality. For example, the DCF approach assumes that the variant of the present value formula that is used matches the variations in investor expectations for the growth of dividends, and that the growth rate(s) used in that formula match current investor expectations. In fact, Professor Robert Shiller won a Nobel Prize in Economics[13] for his work showing that stock prices were much more variable than dividends which means that the DCF model may not always estimate the cost of capital correctly. Less frequently noted conditions, such as the value of real options incorporated in a company's market price (i.e., increasing it), may create issues that the DCF model does not incorporate. Nevertheless, under current economic conditions, because of its forward-looking nature, the strengths of the DCF method outweigh any weaknesses the method may have.

73. Of course, the assumptions underlying all models are violated to some degree so the question becomes "Are the assumptions as applied to the specific industry being evaluated currently violated to a greater or lesser degree than is normally the case?" And if violated, what is the likely effect on the estimates? This concern leads to some recommended adjustments to how the Commission implements the model.

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[13] Professor Robert Shiller won the Nobel Prize in Economics in 2013. See https://www.nobelprize.org/prizes/economic-sciences/2013/shiller/facts/.

C. Recommended Adjustments to FERC Two-Step DCF Model

74. I recommend the following adjustments to the Commission's proposed two-step DCF model. I discuss each adjustment below.

1. Return to the Commission's previous decision[14] and eliminate the need for a high-end outlier test based upon the observation that GDP growth is by definition "sustainable." In the past, some ROE estimates were eliminated as being "unsustainable" because the EPS forecast growth rate was deemed unsustainable if greater than an arbitrary cut off of 13.3 percent. When the two-step model was introduced (called two-step because the growth rate in the model included a weighted average of IBES and GDP), GDP was deemed sustainable by definition, eliminating the need for a high end outlier test. The proposed methodology resurrected the high-end outlier test. The Commission should return to no high-end outlier test for the DCF model. I discuss the outlier test in *Section IX* of my affidavit.

2. Supplement the IBES EPS growth rate forecasts with one from *Value Line* using the weighted-average as the 3-5 year EPS forecast to calculate the short-term growth rate.

3. Use the 3-5 year EPS forecast to calculate the adjusted dividend yield instead of the weighted-average growth rate which includes GDP growth. The 3-5 year EPS forecast is likely to be more representative of dividend growth in the near term that the weighted-average EPS growth rate including GDP.

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[14] Coakley Briefing Order, P. 52 referencing Order No 531.

4. Use the quarterly version of the DCF model instead of the annual version. Sample companies pay dividends quarterly so use of the quarterly DCF model is consistent with the actual period of dividend payments. Additionally, it eliminates the need for a 0.50 adjustment to the dividend growth rate in the dividend yield term to approximate when dividends may be increased over the year. There would be no need for an approximation.

5. Change the weight on the GDP growth rate estimate to 1/5th.

6. Recognize that the large and persistent difference between free cash flow and distributable cash flow for midstream companies may bias the DCF model estimates as discussed below.

7. Eliminate the 0.5 adjustment to the GDP growth rate for MLPs.

8. If the adjustment for distributable CF recommended by INGAA is not accepted, recognize that share repurchases are equivalent to dividend payments. Theoretically, the DCF model assumes that a company either pays out earnings in the form of dividends or reinvests its earning in the firm, but companies occasionally repurchase shares. The dividend yield should be adjusted when a company forecasts that it will repurchases shares.

1. Include Growth Rate Estimates from *Value Line*

75. The proposed FERC two-step DCF model relies solely on IBES EPS growth rate estimates for the 3-5 year growth rate estimate. For implementation of the Commission's two-step DCF model, I recommend supplementing IBES growth rate estimates with the *Value Line* forecast for each sample company. The growth rate estimate is a weighted-

average short-term growth rate that combines the IBES forecast with the *Value Line*. The weighted average is equal to the number of IBES analysts included in the consensus forecast times the IBES EPS forecast plus the *Value Line* EPS forecast divided by the number of IBES analysts plus 1 (*i.e.*, the single *Value Line* analyst). For example, if there were two IBES analysts with a consensus forecast of 4.5 percent and the *Value Line* forecast were 6 percent, then the weighted-average EPS consensus forecast would be 5% -- *i.e.*, (4.5% * 2 + 6% * 1) / (2 + 1).

76. I believe that the use of *Value Line*'s EPS estimates is consistent with the intent of the Commission's Opinion No. 551, because the decision established a consensus estimate as the Commission's preferred estimate for growth rates. The Commission wants as valid an estimate as possible of the ROE for the sample companies. In Opinion No. 551, the Commission seemed to be concerned that the EPS forecasts from *Value Line* would be inconsistent with the forecasts from IBES either because the *Value Line* estimates are not as current or because the *Value Line* estimates represent the view of a single analyst and thus do not represent a "consensus" estimate as do the IBES estimates. Neither of these concerns should preclude the use of *Value Line*.

77. Thomson Reuters collects EPS growth rate estimates from individual financial analysts who have agreed to be included in the IBES system. The financial analysts are from different brokerage firms, and to my knowledge there is no system by which the individual analysts under contract to provide estimates to IBES agree on a methodology for preparing their estimates. As noted by the Commission, individual analysts may have a different approach to estimating the growth rate, but slightly different approaches by financial analysts are inherent in the IBES estimates. Rather, the IBES "consensus

estimate" is merely the average of the individual estimates submitted, regardless of how those estimates were prepared. There is no process established to improve, alter, or arrive at the consensus estimate. The consensus estimate is simply the mathematical average of the individual estimates. Moreover, many potential sample companies have an IBES "consensus" 3-5 year estimate from at most two analysts. This was a concern noted by the Commission in the *Coakley* Briefing Order regarding the robustness of the DCF.[15] Namely, the Commission noted that the reduced number of current IBES growth projections raised the question of whether IBES growth rates reflect a consensus among investors, and resulted in the real possibility that a significant change in growth rate by even one analyst can have a major effect on the DCF result. "Accordingly, the decreased number of short-term growth projections necessary to perform a DCF analysis of the proxy companies reduces our confidence in the results of that analysis and its suitability as the sole basis for our ROE determinations."[16] Including estimates from the *Value Line* analysts simply increases the number of estimates in the consensus forecasts.

78. Additionally, in many cases the IBES consensus growth rate forecasts are determined by averaging estimates from a small and variable group of contributing analysts. Changes in the composition of analysts who contribute estimates can alter the reported consensus estimate substantially in a relatively short period of time, especially when there are very few contributing analysts. As a result, the IBES consensus estimate can depend upon when the data source was accessed.

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[15] *Coakley* Briefing Order, P. 47.

[16] *Id.*, P. 48.

79. One way to mitigate such variability in growth rate estimates is to include as many independent earnings growth forecasts as there are available from the financial analyst community. Including an independent estimate from a reputable source such as *Value Line* provides one additional professional view about a company's expected earnings growth performance and contributes to producing a more stable growth rate projection for the sample companies.

80. Relying solely on an IBES "consensus estimate" can also potentially produce skewed results because each contributing analyst could have taken a different approach to calculating growth rates. Any variations in the estimates driven by the methodology employed can be mitigated by considering as many reliable estimates as available and observing their weighted mean values. A weighted average growth rate estimate using estimates from each contributing analyst in IBES and the one analyst represented by *Value Line* furthers this goal. This would enhance FERC's goal of relying upon a consensus estimate because adding the *Value Line* forecast would increase the information in the consensus estimate. As a practical matter, there is no reason to ignore a reliable source of information on a parameter of importance to the DCF model (*i.e.*, the forecast of EPS growth) when information from *Value Line* is widely available and used by investors. Use of *Value Line* information does not detract from use of IBES, but rather enhances the information available to the Commission to make the best possible estimate of the cost of capital.

81. *Value Line* analysts are independent from the analysts who provide estimates to IBES because *Value Line* analysts provide their estimates only to the subscribers to the *Value Line Investment Survey*. There is no overlapping or duplication of the EPS estimates that

comprise the IBES consensus estimate. Moreover, because the *Value Line* analysts are all part of the same organization, their EPS estimates have a structure or approach that is consistent among *Value Line* analysts. In this sense, the estimates from *Value Line* have a degree of consensus and consistency that the IBES estimates lack. The *Value Line* estimates are all from analysts in a single company with a set of internal standards that ensures a comparable approach to investment analysis. In contrast, IBES estimates are from multiple companies and rely on multiple analysts for different sample companies. It is possible, even likely, that no single brokerage company that comprises the IBES average provides EPS estimates for all of the sample companies, unlike *Value Line* which is the sole source of the information on the companies they cover. In fact, relying upon EPS estimates solely from *Value Line* is likely to be the most internally consistent (if not the only internally consistent) set of FERC two-step model ROE estimates available.

82. In Opinion No. 551, the Commission expressed a concern that *Value Line* estimates are updated on a lagging, quarterly basis while IBES estimates are updated on a rolling basis, sometimes with daily frequency.[17] The Commission believes this has the potential to make *Value Line* estimates "stale" relative to the IBES estimates. This is not true, however, because both services contain stale data to some degree. *Value Line* estimates are updated at a minimum of every 13 weeks (*i.e.*, 91 days). Although it is true that IBES estimates may be updated more frequently, it is also true that IBES continues to include estimates in the consensus forecast for up to 180 days before removing the estimate from the consensus forecast for staleness. For sample companies with relatively few EPS estimates in the IBES consensus forecast, including estimates from *Value Line* will not

[17] Order No. 551, P. 64.

only increase the number of analyst estimates upon which the consensus forecast is based, but it will also potentially result in estimates that are more current on average.

2. Adjusted Dividend Yield

83. To adjust the current dividend for the expected growth in dividends, the Commission's two-step model should rely upon the 3-5 year EPS forecast as opposed to the weighted-average of the 3-5 year EPS forecast and the GDP growth rate forecast. This is consistent with the Commission's decision in the Seaway Crude Pipeline Company LLC proceeding.[18] I recommend that Seaway decision on this point be accepted for interstate natural gas pipelines. The 3-5 year EPS is the expected growth rate of dividends for the next five years, so it should be used to adjust the dividend yield. The long-term growth rate would still be the weighted-average of the IBES and *Value Line* growth rate estimate and forecast GDP growth.

3. Quarterly DCF Model

84. I recommend using a quarterly version of the DCF model as opposed to using an annual version. The quarterly DCF model is identical to the annual version of the model except that the model uses quarterly inputs instead of annual inputs. The DCF model does not specify the period between dividends, and the companies in the samples submitted by analysts before FERC pay dividends quarterly rather than on an annual basis. There is no reason not to match the model to the actual payment interval for dividends. The actual pattern of dividends can be properly captured by using the most recent quarterly dividend

[18] Seaway Crude Pipeline Company LLC, Docket No. IS12-226-002, Opinion No. 546, February 1, 2016, P. 198.

multiplied by (1 + the compound quarterly forecast EPS growth rate) and then adding the quarterly growth rate to obtain the quarterly estimate of the ROE which can then easily be annualized to derive the annual ROE estimate. This is the same as the current FERC two-step except that the inputs are quarterly instead of annual. The quarterly growth can be the current growth rate which a weighted average of the 3-5 year EPS and GDP forecast growth rates as is currently the case. The formula to annualize the quarterly estimate is

$$ROE_{annual} = \left(1 + ROE_{Quarter}\right)^4 - 1$$

85. This method ensures that the quarterly dividends and the quarterly compound growth rate matches the actual payment of dividends reflected in stock prices and provides a more theoretically consistent estimate of the ROE than the approximation using the annual growth rate to estimate the expected dividend yield.

86. The quarterly estimates correspond to the frequency and timing of actual dividend payments. In addition, use of the quarterly DCF model avoids having to modify the dividend yield by ½ — as is done in the Commission’s two-step DCF model as an *approximation* to when a dividend increase may occur over the course of a year. Use of the quarterly DCF model eliminates the need to make this approximation because the model period is matched to the timing of dividend payments.

4. Weight on the GDP Growth Rate Forecast

87. The two-step model results are reduced because current forecasts of real GDP growth are lower than the historical average real GDP growth rates. Compound real GDP growth

between 1929 and 2018 was 3.22 percent per year compared to 1.89 percent forecast real GDP growth between 2018 and 2050 based upon forecast data from the Bureau of Economic Analysis. Currently, the difference is 133 bps which seems large, as shown in Table 1.

Table 1

Difference between Historical & Forecasted Real GDP

		Start Year	End Year	Growth Rate
Historical GDP (1929 - 2018)	[a]	1,109	18,566	3.22%
Forecasted GDP (2018 - 2050)	[b]	17,582	32,006	1.89%

Sources & Notes:
[a]: Bureau of Economic Analysis, ''Current-Dollar and 'Real' Gross Domestic Product,'' May 30, 2019 release.
[b]: EIA Annual Energy Outlook 2019 Table A20. Macroeconomic indicators.

88. Obviously, the lower the forecast GDP growth rate, the lower will be the average two-step DCF EPS growth rate forecast. I propose a weighting of 1/5th on forecast GDP and 4/5th on the weighted average of IBES and *Value Line* EPS growth rates.

89. There are several reasons to reduce the weight on the GDP forecast. First, given the low forecast of real GDP growth relative to historical growth, an adjustment would be to weight GDP growth less. If forecasts of real GDP growth are downward biased relative to historical growth due to undue pessimism in the current economic and political environment, giving long-term growth less weight is warranted. Additionally, there is no evidence that investors consider the long-term forecast of GDP growth in their investment decisions. The longest forecasts analysts provide are EPS growth rate forecasts for 3-5 years. To my knowledge, there is no publicly available source for

estimates of a longer duration. Investors must not demand such information, or it would be provided by brokerage houses, which implies that investors do not rely upon such forecasts.

90. As noted earlier, the DCF model assumes a constant payout ratio that is consistent with a constant growth rate in EPS. The two-step model is based upon the assumption that EPS growth will slow and converge on the rate of growth of GDP, which is why the growth rate in the FERC two-step DCF model is a blend of short-term and long-term growth rate estimates. However, the assumption of a constant payout ratio is only applicable for the constant growth portion of the model. In the model, a constant payout ratio is associated with a constant retention ratio, *i.e.*, investment of retained earnings. The investment of retained earnings is assumed to generate the growth in EPS. As growth slows, the investment required, *i.e.*, the percentage of retained earnings, necessary to support the reduced growth rate decreases. This means that the payout ratio, and consequently, the dividend payout can increase. The DCF model does not capture that additional cash flow available for dividend growth available as growth rate declines. Giving more weight to the short-term growth is a partial adjustment for this issue.

91. Finally, for midstream companies, distributable cash flow (DistCF) greatly exceeds free cash flow, and the difference is likely to persist for an extended period. As a result, the DCF model is likely to be downward biased. Below I describe how DistCF may bias the DCF estimates. INGAA proposes an adjustment to the dividend yield to correct for the bias, but if that proposal is not accepted, the adjustment to the weight on forecast GDP would be another way to recognize the inherent downward bias in the DCF model due to distributable cash flow.

5. Eliminate the 0.5 Adjustment for GDP growth for MLPs

92. For MLPs, the Commission current policy is to reduce forecast GDP growth in the FERC two-step DCF model by 50 percent. As I understand the Commission's original concern that resulted in the 50 percent reduction of long-term growth represented by GDP growth was based upon a view of the MLPs' business model, which required that MLPs pay out nearly all of their free cash flow as distributions. To grow, MLPs would issue new equity (i.e., limited partnership (LP) shares) so that their EPS growth rate would be reduced compared to a C-corp. Even if both entities grew at the same rate, the EPS growth rate for the C-corp. would exceed that of the MLP because the C-corp. would rely more upon retained earnings to fund growth than would an MLP.

93. The MLP's business model changed due in part to the elimination of an income tax allowance (ITA) for MLPs. Elimination of the ITA means that MLPs will generate less cash and that MLPs have become less attractive as an investment. This reduces MLPs' access to equity capital markets. As a result, MLPs will rely more on retained earnings to fund growth meaning that fewer LP shares will be issued. EPS growth rates will increase more due to fewer LP shares outstanding than when MLPs funded growth by issuing additional shares. In fact, there is no reason to believe that an MLP will grow more slowly than a C-corp., and given the change in business model, an MLP's EPS will also grow in a similar manner to a C-corp.

94. Moreover, MLPs are riskier now without an ITA because their net income is more variable and the increase in variability is likely to be systematic. The latter point is not a problem if the entire sample consists of MLPs but that is less likely to be the case going forward.

95. Why is net income more variable for an MLP without an ITA? Because the tax obligation absorbs some of the variability in taxable income. With a 25 percent tax rate, an increase of 10 percent in taxable income results in a 7.5 percent increase in net income for a C-corporation, but a 10 percent increase in net income for an MLP. Similarly, for a 10 percent decrease in taxable income, an MLP's net income will decrease by the full 10 percent, but a C-corporation's net income will only decrease by 7.5 percent.

96. These factors justify the elimination of the 0.5 weight on GDP forecast growth in the two-step model for MLPs.

6. Distributable Cash Flow

97. There is a potential source of downward bias in the DCF model that affects midstream companies to a greater degree than other companies. The source of the downward bias is that net income, i.e., earnings or free cash flow both underestimate the amount of cash available for distribution by midstream companies. Free cash flow is net income plus depreciation and amortization minus capital investment minus changes in working capital. In the DCF model, depreciation and capital expenditures are assumed to be equal and it is assumed that there is no change in working capital so that net income, *i.e.*, earning per share reflects all of the cash to be considered in the model.

98. Distributable cash flow (DistCF) differs from the traditional estimate of free cash flow primarily for two reasons. First, book depreciation is not a good estimate of economic depreciation for today's natural gas pipelines. DistCF recognizes that economic depreciation is less than book depreciation because the capital needed for maintenance of the pipeline system (i.e., economic depreciation) is lower than the depreciation based

upon the book life of the assets. Although this difference will reverse in the long-term, long term could be very long. The second main difference is the difference in cash taxes and book taxes. Again, until the difference reverses, cash taxes are substantially lower than book taxes, and the reversal is also likely to be far into the future due to the ongoing nature of the business. As the company invests in additional capital assets, the reversal of the difference in free cash flow and DistCF is further delayed. The result is that DistCF is a metric followed extensively by financial analysts and relied upon to a greater extent than estimates of EPS,[19] which means that DistCF is likely to be more important to investors than EPS, although both are important.

99. Theoretically, differences in timing of cash flows will reverse over the long term. For example, differences in tax depreciation versus GAAP depreciation will zero out over the depreciable life of the asset. Additionally, the fact that maintenance capital is less than book depreciation will reverse over time when book depreciation for an asset is exhausted. For most midstream companies with ongoing capital investments, the time for reversal will likely be far into the future. DistCF will likely substantially exceed free cash flow for an extended time even though the differences will reverse in the long term, but the long-term could be very long.

100. If DistCF exceeds free cash flow for an extended period, what is the likely effect on the DCF model? Because the constant growth DCF model assumes that retained earnings are the source of EPS growth, [20] EPS understates the amount of cash available for capital

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[19] "A Review of Midstream/MLP Trends & Statistics," *Midstream Monthly Outlook*: June 2019, Wells Fargo Securities.

[20] This discussion does not consider the additional growth available from issuing equity at a market price greater than book value.

investment, dividend payments, share repurchases, or debt retirement relative to DistCF. Financial analysts are aware of DistCF and likely make their estimates of EPS growth with DistCF in mind, which means that DistCF is considered in EPS growth rate forecasts. The effect of DistCF on the DCF model is likely to be downward bias in the forecast of dividend growth in the long term.

101. Why is the likely effect of DistCF on the DCF model an effect on dividends? In the DCF model, growth in EPS is assumed to be equal to the ROE times the retention ratio (i.e. 1-payout ratio) which is the amount of reinvestment per share. The model assumes that the ROE is constant for all periods into the future and that the growth of dividends is equal to the growth in EPS because the payout ratio is assumed to be constant. The FERC two-step model is based upon the assumption that the company's growth slows and converges on a sustainable level of growth equal to the forecast growth in GDP. The problem for the models is that as growth slows, the payout ratio can increase because investment needed to fund slower growth decreases. As a result, dividends are likely to grow faster than assumed in the model. The difference in DistCF and free cash flow (or EPS) means that the problem is larger earlier in the convergence to GDP growth.

102. INGAA's proposed solution is to include a term for distributable cash flow yield in the DCF calculation. A firm cannot grow faster than GDP over the long-term as a theoretical matter. However, in the transition to a growth rate equal to GDP, the need to reinvest in productive assets is reduced so that cash available for dividends increases.[21] The time

[21] It is perhaps easiest to envision the concern by considering an abrupt decrease in growth form the 3-5 year forecast to the GDP forecast. In such a case, there will be a "one-time" increase in the dividend payment due to the reduced investment required to maintain growth at the GDP rate. Dividend growth from that point will be at the rate of GDP growth, but the higher level of dividends will be maintained.

when the difference in free cash flow and DistCF reverses is likely to be so far in the future that the present value of potentially slower growth in dividends is greatly offset by the present value of expected dividends received much earlier.

7. Share Repurchases

103. Companies sometimes repurchase outstanding shares of stock and this practice has become increasingly common in recent years.[22] From investors' point of view, this is equivalent in many ways to a dividend payment because investors receive cash in the form of dividends or in the form of repurchased shares. Ignoring share repurchases underestimates the company's dividend yield. Not all sample companies repurchase shares every year. However, when a company forecasts that it will repurchase shares, the effect should be included in the dividend yield calculation. This is true when estimating the expected market return using the dividend valuation model (see *Section V* for the discussion on estimating the MRP) as well as when estimating a sample company's ROE.

104. If share repurchase is ignored, a source of cash to investors will be omitted, and dividend yield will be understated. Companies can return value to investors through dividends, share repurchases, reinvestment in the firm, repurchases of debt or a combination of these. The theory of the dividend valuation model captures the effect of all uses of funds except share repurchases. Net repurchases of stock and debt should be considered by financial analysts when making their EPS growth rate forecasts because fewer shares of

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[22] See, for example, "Dividends and Buybacks" S&P 500 Buyback Index Outperforms," April 2019 by S&P Dow Jones Indices.

stock outstanding means that earnings re divided by fewer shares and debt repurchase means less interest expense. However, the cash leaving the firm for share repurchase is not captured by the model. This failure has been noticed by economists, and adjustments to the model have been proposed.[23]

105. The way to capture the effect of share repurchases in the DCF model is to adjust the dividend yield for the dollars forecast to be spent on share repurchase. The adjustment is simply to add an additional term to the dividend yield when the sample company forecasts net share repurchases. The adjustment adds the value of the shares repurchased to the dividend yield in the model. The total dollar amount of the shares repurchased is equal to the number of shares repurchased times the purchase price. The adjusted dividend yield term is (total dollars of shares repurchased)/(price of shares times shares outstanding before repurchase) which is added to the standard dividend yield term.

$$\text{Adjustment to the dividend yield} = (SH_{Rp} * P_S)/(SH_{OUT} * P_S)$$

Where SH_{Rp} = Shares repurchased,

SH_{Out} = Total shares outstanding before repurchase, and

P_S = Price of shares repurchased.

106. If the price at which shares are forecast to be repurchased is the same as the market price in the standard dividend yield term, i.e., P_S, the adjustment simply becomes the ratio of the number of shares repurchased to the number of shares outstanding prior to

[23] "Stock Price Volatility, Ordinary Dividends, and Other Cash Flows to Shareholders," Lucy F. Ackert and Brian F. Smith, *The Journal of Finance*, Vol. XLVIII, No. 4, September 1993, "Valuation with the Discounted Dividend Model when Corporations Repurchase," Douglas J. Lamdin, *Financial Practice and Education*, Spring/Summer 2000, and "Estimating the Cost of Equity for Corporations That Repurchase: Theory and Application, Douglas J. Lamdin, The Engineering Economist, Vol. 46, Number 1, 2001.

repurchase. So, a company forecasting repurchase of 1 percent of outstanding shares, would have its dividend yield increased by 1 percent in recognition of the cash flow leaving the firm in a form other than dividends.

$$\text{Adjustment to the dividend yield} = \quad = \frac{SH_{Rp}}{SH_{Out}}$$

107. If INGAA's proposal on the recognition of DistCF is accepted, then an adjusted for share repurchase would not be warranted because DistCF includes the cash that would be available for share repurchase. If INGAA's proposal is not accepted, the effect of share repurchase should be added to the FERC two-step DCF model.

VII. Expected Earnings Method

108. With regard to the Expected Earnings method, the Commission asks:[24]

Question B3: Given the tendency of the Expected Earnings methodology to produce more high-end outliers than the other methodologies, would there be a sufficient number of natural gas and oil pipeline proxy members to implement the Expected Earnings methodology for gas and oil pipelines?

109. Whether there are sufficient sample companies to implement the Expected Earnings method depends, of course, on the criteria for inclusion in the sample of comparable risk companies. INGAA has proposed a modification to the sample selection process that if implemented would expand the sample size in natural gas pipeline cases.

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[24] NOI, p. 22.

110. *Question H.2.c.1: Should the use of utilities in the proxy group for the Expected Earnings model be predicated on the Expected Earnings analysis being forward-looking?*

111. *H.2.c.2: What, if any, concerns regarding circularity are there with using the Expected Earnings analysis to determine the base ROE, as opposed to using the analysis for corroborative purposes?*

112. *H.2.c.2.i.: If there are circularity concerns, are there ways to mitigate these concerns for the Expected Earnings analysis? If these concerns exist, are these concerns more significant than those surrounding the DCF methodology, which effectively separates Expected Earnings and ROE into its dividend yield and growth rate subcomponents?*[25]

113. The Expected Earnings method should be based upon forward-looking analysis. Below I discuss the circularity problem with regard to historical, realized accounting returns.

114. I recommend that the Commission implement the Expected Earnings method in the same manner it was done in the *Coakley* Briefing Order. Specifically, the Expected Earnings method uses the expected or forecast return on book equity as provided by *Value Line*. The forecast used is the expected ROE 3 to 5 years in the future. Because the forecast is assumed to be an ROE based upon the company's book equity at the end of the year, an adjustment is needed to convert the forecast ROE to the average book value of equity over the year. The adjustment used is to multiply the forecast ROE by an adjustment factor equal to 2*(1 + 5-yr. change in equity)/ (2 + 5-yr. change in equity).

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[25] NOI, p. 31.

115. A weakness of the Expected Earnings estimates is that they are not based upon market information. They are accounting-based estimates derived by *Value Line's* equity analysts, but they have the advantage of being a book rate of return. This is the only method among the three methods I propose for interstate pipelines that provides a return on the book value of equity, and in that sense is comparable to the allowed return on rate base that is measured on a book value basis.

116. Some have asserted that Expected Earnings method is inherently circular, just as is the Comparable Earnings method when applied to regulated companies. This is not entirely true. It is true that the expected earnings data published by analysts such as *Value Line* are accounting data and may be influenced by the allowed rates of returns determined by regulatory commissions, but that is not a sufficient reason to declare a model entirely circular and useless.

117. Consider how circularity works for the Comparable Earnings model which relies upon historical realized returns if regulated companies are used in the sample. Under fair regulation, a utility should be expected to earn its allowed ROE. Fair regulation simply means that the utility expects to earn its allowed ROE on average. A review of accounting returns would then likely show that the allowed ROE was achieved on average. Setting the allowed ROE based upon the realized accounting returns of regulated companies would result in that return being "locked" in regardless of market or industry conditions. It would not change with economic conditions but would largely depend upon what had been the allowed ROE in the past. One flaw in the Comparable Earnings model is that the model is circular if applied to a sample of regulated companies. As a result of that concern, analysts who rely upon Comparable Earnings select a sample of non-regulated

companies based normally upon a series of metrics related to the risk of the sample company. The challenge of the Comparable Earnings method when applied to non-regulated companies is to select a sample that others agree to be of comparable risk to a natural gas pipeline, making Comparable Earnings a method that is tough to convince a regulator to rely upon. Similarly, if an industry becomes more or less risky, the Comparable Earnings method would not capture this as it would rely on historical returns.

118. An issue is whether the Expected Earnings method is circular for the same reasons that the Comparable Earnings method is circular. The answer is no. First, the allowed rates of returns, that may influence analysts' expectations of future return on the book equity of a company, are one of several variables considered by analysts when forecasting expected return. Allowed returns are themselves a result of a variety of financial models and information that are market-based. The Expected Earnings method would be circular if you believed that expected returns forecast by analysts depend entirely or almost entirely on allowed returns. Even if allowed returns are one factor, it is unlikely to be the only factor considered by analysts. In contrast, for Comparable Earnings using regulated companies, the sole factor to set allowed ROE is the realized accounting return, so historical Comparable Earnings is circular.

119. Second, the expected returns used in the model are 3-5 years in the future which (currently about 2021 to 2023) disrupts the potential circularity because that future period is less affected by current events. In other words, if economic conditions change, the expected earnings estimate is likely to change even though the allowed ROE has not changed, because the analyst will try to forecast the effect of the changed economic

conditions now and in the future on expected earnings. The result is that expected earnings could be quite different from current allowed returns. In addition, to the extent that the Expected Earnings method is one of three or four used to estimate the allowed return, its impact and potential circularity are substantially reduced.

120. For natural gas pipelines Expected Earnings represents a third model to add to the DCF model and the CAPM.

121. In conclusion, I acknowledge that the Expected Earnings method has no theoretical basis as a means of estimating the market cost of capital. It is an accounting rate of return, not a market-based estimate. It is a return sourced from a single *Value Line* analyst, does not change quickly with market conditions, and has a potential element of circularity if regulated companies are included in the sample. However, it does provide a return on a book value of equity which is comparable to a regulated ROE on a book value rate base. It represents additional information available to investors for their consideration when making investment decisions and should be considered by the Commission. The Expected Earnings model addresses the capital attraction standard of *Hope*. Finally, the Commission has addressed many of these concerns in Opinion No. 551.[26]

VIII. <u>The Risk Premium Method</u>

122. Regarding the Risk Premium Model, the Commission asks:[27]

Question B2: "The Risk Premium methodology approved in Opinion Nos. 531 and 551 relied to a large extent on ROEs set forth in numerous settlements involving public

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[26] 156 FERC ¶ 61,234, Docket No. EL14-12-002, Opinion No. 551, P. 230-239.

[27] NOI, p.22, and pp. 31-32,

utility formula rates approved by the Commission over the preceding 15 or 20 years. Natural gas and oil pipelines have stated rates and settlements of their rate cases are typically "black box" settlements that do not specify an agreed-upon ROE. *How could the Risk Premium methodology be implemented in natural gas or oil pipeline rate cases where there is no history of ROE settlements from which to develop a risk premium study of the type used in Opinion Nos. 531 and 551?"*

123. *Question H.2.d.1. Should the analysis be historical or forward-looking?*

124. While some variation of the Risk Premium approach may provide useful results, the Risk Premium model as applied by the *Coakley* Briefing Order cannot be applied in a natural gas pipeline proceeding because there are insufficient FERC allowed ROEs from litigated or settled pipeline rate cases.[28] The method provides a point estimate of the appropriate ROE by considering the relationship between FERC allowed ROEs and a contemporaneous benchmark interest rate. The relationship is estimated through regression analysis with the allowed ROE as the dependent variable and the interest rate as the independent variable. The result is an equation which provides a current estimate of the likely FERC allowed ROE given the current yield on the benchmark interest rate.

125. The theory underlying the method is based upon the assumption that the risk of the industry is unchanged over the time period represented by the data so that the change in the required ROE, *i.e.*, the cost of capital, is fully captured by the change in the benchmark interest rate. Even if data were available for natural gas pipelines, this

[28] Since 2010, there has been only one fully litigated allowed ROE.

assumption is not valid as discussed more extensively in INGAA's introductory remarks on the risk of the interstate pipeline industry.[29]

IX. Outlier Tests

A. Commission's High-End Screen

126. I do not believe that the proposed high-end outlier test is justified or needed for the DCF model or the CAPM. The *Coakley* Briefing Order proposes to identify outliers as estimates that are less than 100 basis points (bps) greater than the yield on BBB-rated utility debt (low-end) or greater than a 1.5 multiple of the median estimate (high-end), both subject to a "natural break" analysis.[30] There is no theoretical support for a high-end outlier test of 1.5 times the median of the sample results comparable to the theoretical support for the low-end cut off of an ROE greater than the cost of debt.

127. The ROE estimation process begins with a careful selection of companies considered to be of comparable risk, so any estimate from a sample company is then appropriate for inclusion because the company is from the universe of comparable risk companies.

128. The concept underlying an outlier test is to determine whether a data point is properly included in the sample.[31] There are two concerns. First, is the data point from the appropriate universe of interest? Second, is there an error in the data?

129. A data point that appears to be an outlier should be reviewed to determine if there is a data error or if the data is not properly part of the universe from which the sample is

[29] INGAA's affidavit has a discussion of the changing risk profile of the industry.
[30] *Coakley* Briefing Order, P. 53.
[31] It has been argued that the comparable risk proxy group represents a complete universe of comparable risk companies which would eliminate the issue of whether the estimate was properly included in the set.

being taken. Simply because an observation is "unusual" is not a sufficient reason to delete the observation. Eliminating such an observation would discard valuable information about the universe from which the observation was taken.

130. The distribution of ROE estimates is likely to be skewed to the right, meaning that there are likely to be more estimates above the sample mean than below. This is logical because investors will not purchase an asset with a negative expected return, but an expected return could be relatively high. This means that estimates that appear "high" are more frequent in the estimation process.

131. Accordingly, the first step in a review of the results of the estimation process should be to check for data errors. If the sample was properly selected to be of comparable risk companies, the estimates must be part of the distribution of possible estimates for the comparable risk universe of companies.

132. Selecting a level of demarcation above the median as the high-end cut-off point (in this case, 150 percent above the median) to determine that the observation is "atypical" or "unsustainably high" is an arbitrary selection, without a fundamental underpinning in investor behavior. Most fundamentally, there is no evidence that investors generally disregard high-end estimates from any model, much less any evidence to suggest that investors rely on the proposed 150 percent of the median criterion to excise high-end estimates from pertinent models.

133. Additionally, determining the magnitude of a "natural break" versus a normal distribution of return estimates is undefined, largely subjective, and affected by the sample size. Breaks in estimates would be expected to be larger for a small sample

because the ROE estimation process provides estimates that represent a "draw" from a distribution of the cost of capital for the industry. Some estimates will be further from the mean of the distribution than others, but that does not mean that they are not valid estimates. There could be many reasons why a gap between the cost of equity estimated for two companies may (or may not) exist. Additionally, there could be a "break" between estimates in the middle of the rank ordered estimates that is as large as the break between the two highest estimates. It would be illogical to conclude that the break at the top of the list indicates an outlier while having no concern about a similar sized break elsewhere in the distribution of returns.

134. There is no basis to infer that the magnitude of any particular gap between adjacent, rank-ordered cost of equity estimates for the proxy group companies demonstrates where the boundary lies between economically logical and illogical results. Put simply, relying on the measure of dispersion from one cost of equity estimate to another to judge the reasonableness of any particular observation is arbitrary.

135. If the allowed ROE is to be based on the midpoint of the sample results, eliminating high-end outliers can have an outsized impact because the midpoint is derived from the sum of the lowest and highest ROE estimates divided by two. For the midpoint, the analysis only considers the highest and lowest estimates which means that those two estimates carry far more weight in the ROE determination than any others. The median is calculated differently. The median is calculated by ordering the ROE estimates from lowest to highest and selecting the middle value. This greatly reduces the impact of the high-end of the range of results as compared to the midpoint calculation. When relying upon the median, the magnitude of the "high" estimate has no impact on the median unless the

observation was deleted. The magnitude is meaningless; it is just above the median. Therefore, to the extent the Commission retains the high-end outlier test at all, it should retain it only for proceedings where the allowed ROE is based on the midpoint. It is for this reason that I recommend the Commission rely upon the median instead of the midpoint when setting the allowed ROE. Much of the argument about including or excluding potential sample companies revolves around companies whose estimates are high. Reliance on the median would reduce these debates.

136. For the DCF model, the FERC methodology already moderates the EPS growth rate forecasts from security analysts by weighting the forecast GDP growth rate. Previously, the Commission determined that use of a weighted-average EPS growth did not require a check on sustainability because GDP growth is by definition sustainable. This has not changed.[32]

137. Similarly, with regard to the CAPM, there is little room for unsustainable estimates because the estimates are constrained by the model to be on the Security Market Line as illustrated in Figure 1 above.

138. If the proxy group sample is of comparable risk, the CAPM estimates would not need a high-end outlier test. It is only for the expected earnings test that a high-end outlier test would have any relevance because estimates could vary if the company were recovering from an unusual event. But even for the expected earnings method, relying upon 1.5 times the median lacks theoretical support.

[32] Even if the weight placed on forecast GDP growth were changed, GDP growth is by definition sustainable.

139. In summary, the high-end outlier test as articulated has no theoretical foundation and is not required for either the CAPM or the Commission's two-step DCF model. It is unnecessary when relying upon the median of the estimates to set the allowed ROE. The only time in which a high-end outlier test should be considered is for the expected earnings model when the ROE is set relative to the midpoint of the zone of reasonableness.

B. Commission's Low-End Screen

140. The Commission's low-end outlier has theoretical support that is lacking in the high-end outlier test. Under the proposed methodology in the ROE Briefing Orders, the Commission removes estimates that are less than approximately 100 basis points (bps) greater than the 6-month average BBB-rated utility bond yield. The Commission subjects the 100 bps demarcation to a "natural break" analysis where the 100 bps may increase slightly by considering the extent to which the excluded estimates differ from other low-end estimates of the proxy group companies.

141. The low-end test has support in basic financial theory: any company's bonds are less risky than its equity, and investors cannot be expected to purchase common stock if less risky bonds yield essentially the same expected return. Thus, analysts agree that a low-end outlier test is appropriate to eliminate estimates which are inconsistent with financial theory.

142. The 100 bps minimum spread is too low. If the beta estimate for BBB-rated debt of 0.25[33] and the minimum beta for equity is about 0.50, the minimum spread would be the difference in betas 0.25 (*i.e.*, 0.50 -0.25) times the MRP. Even for relatively low estimate of the MRP of 6 percent, the minimum spread should be 150 bps and would be even larger for a higher MRP.

143. However, the minimum spread over BBB-rated debt should be adjusted for the interest rate environment. It is generally acknowledged that there is an inverse relationship between the market risk premium and the level of interest rates. The MRP increases when interest rates decrease and decreases when interest rates rise. Similarly, the minimum spread over BBB-rated debt should similarly be adjusted, although 150 bps should be the minimum. One way to adjust the minimum threshold would be to use 0.25 times the estimate MRP plus the current yield on BBB-rated utility debt.

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[33] Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, "Explaining the Rate Spread on Corporate Bonds," *The Journal of Finance*, February 2001, pp. 247 277 estimate the beta of BBB-rated debt to 0.26.

QUALIFICATIONS OF MICHAEL J. VILBERT

Dr. Michael J. Vilbert is a Principal Emeritus in The Brattle Group's San Francisco office and has more than 20 years of experience as an economic consultant. He is an expert in cost of capital, financial planning and valuation who has advised clients on these matters in the context of a wide variety of investment and regulatory decisions. In the area of regulatory economics, he has testified or submitted testimony on the cost of capital for regulated companies in the water, electric, natural gas and petroleum industries in the U.S. and Canada. His testimony has addressed the effect of regulatory policies such as decoupling or must-run generation on a regulated company's cost of capital and the appropriate way to estimate the cost of capital for companies organized as Master Limited Partnerships. He analyzed issues associated with situations imposing asymmetric risk on utilities, the prudence of purchased power contracts, the economics of energy conservation programs, the appropriate incentives for investment in electric transmission assets and the effect of long-term purchased power agreements on the financial risk of a company. He has served as a neutral arbitrator in a contract dispute and analyzed the effectiveness of a company's electric power supply auction. He has also estimated economic damages and analyzed the business purpose and economic substance of tax related transactions, valued assets in arbitration for purchase at the end of the contract, estimated the stranded costs of resulting from the deregulation of electric generation and from the municipalization of an electric utility's distribution assets and addressed the appropriate regulatory accounting for depreciation and goodwill.

He received his Ph.D. in Financial Economics from the Wharton School of the University of Pennsylvania, an MBA from the University of Utah, an M.S. from the Fletcher School of Law and Diplomacy, Tufts University, and a B.S. degree from the United States Air Force Academy. He joined The Brattle Group in 1994 after a career as an Air Force officer, where he served as a fighter pilot, intelligence officer, and professor of finance at the Air Force Academy.

REPRESENTATIVE CONSULTING EXPERIENCE

- Dr. Vilbert served as the consulting expert in several cases for the U.S. Department of Justice and the Internal Revenue Service regarding the business purpose and economic substance of a series of tax related transactions. These projects required the analysis of a complex series of financial transactions including the review of voluminous documentary evidence and required expertise in financial theory, financial market as well as accounting and financial statement analysis.

- In a securities fraud case, Dr. Vilbert designed and created a model to value the private placement stock of a drug store chain as if there had been full disclosure of the actual financial condition of the firm. He analyzed key financial data and security analysts'=

reports regarding the future of the industry in order to recreate pro forma balance sheet and income statements under a variety of scenarios designed to establish the value of the firm.

- For pharmaceutical companies rebutting price-fixing claims in antitrust litigation, Dr. Vilbert was a member of a team that prepared a comprehensive analysis of industry profitability. The analysis replicated, tested and critiqued the major recent analyses of drug costs, risks and returns. The analyses helped develop expert witness testimony to rebut allegations of excess profits.

- For an independent electric power producer, Dr. Vilbert created a model that analyzed the reasonableness of rates and costs filed by a natural gas pipeline. The model not only duplicated the pipeline=s rates, but it also allowed simulation of a variety of Awhat if@ scenarios associated with cost recovery under alternative time patterns and joint cost allocations. Results of the analysis were adopted by the intervenor group for negotiation with the pipeline.

- For the CFO of an electric utility, Dr. Vilbert developed the valuation model used to support a stranded cost estimation filing. The case involved a conflict between two utilities over the responsibility for out-of-market costs associated with a power purchase contract between them. In addition, he advised and analyzed cost recovery mechanisms that would allow full recovery of the stranded costs while providing a rate reduction for the company=s rate payers.

- Dr. Vilbert has testified as well as assisted in the preparation of testimony and the development of estimation models in numerous cost-of-capital cases for natural gas pipeline, water utility and electric utility clients before the Federal Energy Regulatory Commission (FERC) and state regulatory commissions. These have spanned standard estimation techniques (e.g., Discounted Cash Flow and Risk Positioning models). He has also developed and applied more advanced models specific to the industries or lines of business in question, e.g., based on the structure and risk characteristics of cash flows, or based on multi-factor models that better characterize regulated industries.

- Dr. Vilbert has valued several large, residual oil-fired generating stations to evaluate the possible conversion to natural gas or other fuels. In these analyses, the expected pre- and post-conversion station values were computed using a range of market electricity and fuel cost conditions.

- For a major western electric utility, Dr. Vilbert helped prepare testimony that analyzed the prudence of QF contract enforcement. The testimony demonstrated that the utility had not been compensated in its allowed cost of capital for major disallowances stemming from QF contract management.

- Dr. Vilbert analyzed the economic need for a major natural gas pipeline expansion to the Midwest. This involved evaluating forecasts of natural gas use in various regions of the United States and the effect of additional supplies on the pattern of natural gas pipeline use. The analysis was used to justify the expansion before the FERC and the National

Energy Board of Canada.

- For a Public Utility Commission in the Northeast, Dr. Vilbert analyzed the auction of an electric utility=s purchase power agreements to determine whether the outcome of the auction was in the ratepayers= interest. The work involved the analysis of the auction procedures as well as the benefits to ratepayers of transferring risk of the PPA payments to the buyer.

- Dr. Vilbert led a team tasked to determine whether bridge tolls were "just and reasonable" for a non-profit port authority. Determination of the cost of service for the authority required estimation of the value of the authority's assets using the trended original cost methodology as well as evaluation of the operations and maintenance budgets. Investment costs, bridge traffic information and inflation indices covering a 75 year period were utilized to estimate the value of four bridges and a passenger transit line valued in excess of $1 billion.

- Dr. Vilbert helped a recently privatized railroad in Brazil develop an estimate of its revenue requirements, including a determination of the railroad=s cost of capital. He also helped evaluate alternative rate structures designed to provide economic incentives to shippers as well as to the railroad for improved service. This involved the explanation and analysis of the contribution margin of numerous shipper products, improved cost analysis and evaluation of bottlenecks in the system.

- For a utility in the Southeast, Dr. Vilbert quantified the company=s stranded costs under several legislative electric restructuring scenarios. This involved the evaluation of all of the company=s fossil and nuclear generating units, its contracts with Qualifying Facilities and the prudence of those QF contracts. He provided analysis concerning the impact of securitizing the company=s stranded costs as a means of reducing the cost to the ratepayers and several alternative designs for recovering stranded costs.

- For a recently privatized electric utility in Australia, Dr. Vilbert evaluated the proposed regulatory scheme of the Australian Competition and Consumer Commission for the company=s electric transmission system. The evaluation highlighted the elements of the proposed regulation which would impose uncompensated asymmetric risks on the company and the need to either eliminate the asymmetry in risk or provide additional compensation so that the company could expect to earn its cost of capital.

- For an electric utility in the Southwest, Dr. Vilbert helped design and create a model to estimate the stranded costs of the company=s portfolio of Qualifying Facilities and Power Purchase contracts. This exercise was complicated by the many variations in the provisions of the contracts that required modeling in order to capture the effect of changes in either the performance of the plants or in the estimated market price of electricity.

- Dr. Vilbert helped prepare the testimony responding to a FERC request for further comments on the appropriate return on equity for electric transmission facilities. In addition, Dr. Vilbert was a member of the team that made a presentation to the FERC staff on the expected risks of the unbundled electric transmission line of business.

- Dr. Vilbert and Mr. Frank C. Graves, also of The Brattle Group, prepared testimony evaluating an innovative Canadian stranded cost recovery procedure involving the auctioning of the output of the province=s electric generation plants instead of the plants themselves. The evaluation required the analysis of the terms and conditions of the long-term contracts specifying the revenue requirements of the plants for their entire forecasted remaining economic life and required an estimate of the cost of capital for the plant owners under this new stranded cost recovery concept.

- Dr. Vilbert served as the neutral arbitrator for the valuation of a petroleum products tanker. The valuation required analysis of the Jones Act tanker market and the supply and demand balance of the available U.S. constructed tanker fleet.

- Dr. Vilbert evaluated the appropriate Abareboat@ charter rate for an oil drilling platform for the renewal period following the end of a long-term lease. The evaluation required analysis of the market for oil drilling platforms around the world including trends in construction and labor costs and the demand for platforms in varying geographical environments.

- Dr. Vilbert and Dr. Villadsen, also of The Brattle Group, evaluated the offer to purchase the assets of Pentex Alaska Natural Gas Company, LLC on behalf of the Western Finance Group for presentation to the Board of the Alaska Industrial Development and Export Authority. The report compared the proposed purchase price with selected trading and transaction multiples of comparable companies.

PRESENTATIONS

"Moving Toward Value in Utility Compensation – Shareholder Value Concept," with A. Lawrence Kolbe, California PUC Workshop, June 13, 2016.

"Natural Gas Pipeline FERC ROE," INGAA Rate of Return Seminar, with Mike Tolleth, March 23, 2016.

"The Cost of Capital for Alabama Power Company," Public Service Commission public meeting, July 17, 2013.

"An Empirical Study of the Impact of Decoupling on the Cost of Capital," Center for Research in Regulated Industries, Shawnee on Delaware, PA, May 17, 2013.

"Point – Counterpoint: The Regulatory Compact and Pipeline Competition," with (Jonathan Lesser, Continental Economics), Energy Bar Association, Western Meeting, February 22, 2013

"Introduction to Retail Rates," presented to California Water Services Company, 18-19 November

2010.

“Impact of the Ongoing Economic Crisis on the Cost of Capital of the U.S. Utility Sector”, National Association of Water Companies: New York Chapter, Albany, NY, May 21, 2009.

“Impact of the Ongoing Economic Crisis on the Cost of Capital of the U.S. Utility Sector”, New York Public Service Commission, Albany, NY, April 20, 2009.

ACurrent Issues in Explaining the Cost of Capital to Utility Commissions@ Cost of Capital Seminar, Philadelphia, PA, 2008.

ARevisiting the Development of Proxy Groups and Relative Risk Analysis,@ Society of Utility and Regulatory Financial Analysts: 39th Financial Forum, April 2007.

ACurrent Issues in Estimating the Cost of Capital,@ *EEI Electric Rates Advanced Course*, Madison, WI, 2006, 2007, 2008, 2009, 2010 and 2011.

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ACost of Capital Estimation: Issues and Answers,@ *MidAmerican Regulatory Finance Conference*, Des Moines, IA, April 7, 2005.

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ANot Your Father=s Rate of Return Methodology,@ *Utility Commissioners/Wall Street Dialogue*, NY, May 2004.

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AUtility Distribution Cost of Capital,@ *EEI Electric Rates Advanced Course*, Bloomington, IN, 2002, 2003.

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“Effect on the Cost of Capital of Ratemaking that Relaxes the Linkage between Revenue and kWh Sales: An Updated Empirical Investigation of the Electric Industry,” Michael J. Vilbert, Joseph B. Wharton, Shirley Zhang, and James Hall, *The Brattle Group*, November 2016.

"Decoupling and the Cost of Capital," Joe Wharton and Michael Vilbert, *The Electricity Journal, Volume 28, Issue 7,* August/September 2015.

"The Impact of Revenue Decoupling on the Cost of Capital for Electric Utilities: An Empirical Investigation," prepared for The Energy Foundation by Michael J. Vilbert, Joseph B. Wharton, Charles Gibbons, Melanie Rosenberg, and Yang Wei Neo, March 20, 2014.

"Estimating the Cost of Equity for Regulated Companies," (with P.R. Carpenter, Bente Villadsen, T. Brown, and P. Kumar), prepared for the Australian Pipeline Industry Association and filed with the Australian Energy Regulator and the Economic Regulation Authority, Western Australia, February 2013.

"Survey of Cost of Capital Practices in Canada," (with Bente Villadsen and Toby Brown), prepared for British Columbia Utilities Commission, May 2012.

"Impact of Portland Harbor Remediation Costs on City of Portland Water and Sewer Rates," with Professor David Sunding, March 2012.

"The Impact of Decoupling on the Cost of Capital – An Empirical Study," Joseph B. Wharton, Michael J. Vilbert, Richard E. Goldberg, and Toby Brown, Discussion Paper, *The Brattle Group*, March 2011, revised July 2012.

"Review of Regulatory Cost of Capital Methodologies," (with Bente Villadsen and Matthew Aharonian), Canadian Transportation Agency, September 2010.

"Understanding Debt Imputation Issues,@ by Michael J. Vilbert, Bente Villadsen and Joseph B. Wharton, *Edison Electric Institute*, June 2008.

"Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low," by A. Lawrence Kolbe, Michael J. Vilbert and Bente Villadsen, *Public Utilities Fortnightly*, August 2005.

"The Effect of Debt on the Cost of Equity in a Regulatory Setting," by A. Lawrence Kolbe, Michael J. Vilbert, Bente Villadsen and The Brattle Group, *Edison Electric Institute*, April 2005.

"Flaws in the Proposed IRS Rule to Reinstate Amortization of Deferred Tax Balances Associated with Generation Assets Reorganized in Industry Restructuring," by Frank C. Graves and Michael J. Vilbert, white paper for *Edison Electric Institute* (EEI) to the IRS, July 25, 2003.

TESTIMONY

Direct testimony before the California Public Utilities Commission on behalf of Pacific Gas and Electric Company (PG&E) on the cost of capital for PG&E's electric utility assets in the Cost of Capital 2020 proceeding, Application 19-04-___(U 39 M), April 2019.

Prepared affidavit (with Akarsh Sheilendranath) on behalf of Constellation Mystic Power, LLC, Docket No. ER18-1639-000, on the cost of capital for the Mystic reliability must run generating using the revised FERC ROE estimation methodology, April 2019.

Direct and rebuttal testimony before the Michigan Public Service Commission on behalf of the DTE Electric Company, Case No. U-20162, on the cost of common equity capital for DTE Electric Company's regulated electric utility assets, June 2018 and November 2018.

Direct and supplemental testimony before the Public Utilities Commission of Ohio on behalf of Vectren Energy Delivery of Ohio, Inc., Case No. 18-0298-GA-AIR, on the cost of capital for Vectren's gas local distribution assets, April 2018 and November 2018.

Direct and rebuttal testimony before the Public Utilities Commission of the State of Hawai‘i on behalf of Young Brothers, Limited, Docket No. 2017-0363, on the cost of capital for Young Brothers regulated intrastate barge operations, March 2018 and September 2018.

Direct and rebuttal testimony before the Michigan Public Service Commission on behalf of the DTE Gas Company, Case No. U-18999, on the cost of common equity capital for DTE Gas Company's regulated natural gas distribution assets, February 2018 and April 2018.

Supplemental testimony before the Public Utilities Commission of the State of Hawai‘i on behalf of Hawaiian Electric Company, Inc., Docket No. 2016-0328, with regard to the effect on the cost of capital of decoupling ratemaking that relaxes the linkage between revenue and kWh sales, February 2018.

Direct and rebuttal testimony before the Public Utilities Commission of the State of Hawai‘i on behalf of Maui Electric Company, Limited, Docket No. 2017-0150, with regard to the effect on the cost of capital of decoupling ratemaking that relaxes the linkage between revenue and kWh sales, October 2017 and May 2018.

Rebuttal testimony before the California Public Utilities Commission on behalf of California-American Water Company, Application 15-07-019, Phase 3A and Phase 3b, on the economic effect on the Company and the applicability of a fine based upon California-American Water Company's administration of its tariff for the Monterey Water District, August 2017.

Direct and rebuttal testimony before the Corporation Commission of Oklahoma on behalf of Public Service Company of Oklahoma, Cause No. PUD201700151, on the cost of capital for Public Service Company of Oklahoma's regulated assets, June 2017 and October 2017.

Direct and rebuttal testimony before the California Public Utilities Commission on behalf of California Water Services Company, Application No. A.1704-006, on the cost of capital for California Water Services Company's regulated assets, April 2017 and August 2017.

Direct and rebuttal testimony before the Michigan Public Service Commission on behalf of the DTE Electric Company, (Case No. U-18255) on the cost of common equity capital for DTE Electric's regulated electric assets, April 2017 and September 2017.

Prepared direct testimony before the Federal Energy Regulatory Commission, Docket No. RP17-598-000 on behalf of Great Lakes Gas Transmission Limited Partnership, regarding the appropriate ROE to allow for its regulated natural gas pipeline assets, March 2017.

Prepared direct testimony before the North Carolina Utilities Commission, Docket No. G-39, Sub 38, on behalf of the Cardinal Pipeline Company, LLC regarding the appropriate allowed ROE for the Company's pipeline assets, March 2017.

Prepared direct testimony before the Federal Energy Regulatory Commission, Docket No. ER17-706-000 on behalf of Gridliance West Transco LLC, regarding Gridliance West's application pursuant to section 205 of the Federal Power Act regarding the appropriate ROE, cost of debt, and capital structure to allow Gridliance West Transco LLC to earn on the transmission facilities acquired from Valley Electric Association, December 2016.

Prepared direct testimony and supporting exhibits before the Federal Energy Regulatory Commission, Docket No. EC17-049-000, on behalf of Gridliance West Transco LLC, regarding GridLiance West's application pursuant to section 203 of the Federal Power Act (FPA) to acquire certain high voltage transmission facilities from Valley Electric Transmission Association, LLC (VETA) through its parent non-profit electric cooperative parent Valley Electric Association, Inc. (Valley Electric), December 2016.

Prepared direct testimony and supporting exhibits before the Federal Energy Regulatory Commission, Docket No. ER16-2632-000, on behalf of Trans Bay Cable LLC, regarding the appropriate ROE and capital structure to allow for its regulated electric transmission assets, September 2016.

Prepared direct and rebuttal testimony before the Public Utilities Commission of Hawaiʻi on the effect on the cost of capital of decoupling ratemaking that relaxes the linkage between revenue and kWh sales on behalf of Hawaiʻi Electric Light Company, Inc. Docket No. 2015-0170, August 2016 and June 2017.

Direct testimony before the Michigan Public Service Commission on behalf of the Detroit Thermal, LLC (Case No. U-18131) on the cost of common equity capital for Detroit Thermal's regulated steam service, July 2016.

Pre-filed direct testimony and supporting exhibits before the Rhode Island Public Utilities Commission on behalf of The Narragansett Electric Company d/b/a National Grid Docket No. 47xx regarding Petition for the Approval of Gas Capacity Contracts and Cost Recovery, June 2016.

Prepared direct testimony and supporting exhibits before the Federal Energy Regulatory Commission, Docket No. RP16-440-000, on behalf of ANR Pipeline Company, regarding the appropriate ROE to allow for its regulated natural gas pipeline assets, January 2016.

Pre-filed direct testimony before the Massachusetts Department of Public Utilities on behalf of Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid regarding the risk transfer inherent in signing long-term contracts for natural gas pipeline capacity, Docket No. D.P.U. 16-05, January 2016.

Direct and rebuttal testimony before the Michigan Public Service Commission on behalf of the

DTE Electric Company (Case No. U-18014) on the cost of capital for DTE Electric Company's regulated electric assets, January 2016 and July 2016.

Rebuttal testimony before the Public Utility Commission of Texas on behalf of Ovation Acquisition I, L.L.C., Ovation Acquisition II, L.L.C., and Shary Holdings, L.L.C. concerning the adequacy of Oncor Electric Distribution Company's (Oncor) liquidity, access to capital and financial risk with regard to the proposed restructuring of Oncor, PUC Docket No. 451888, December, 2015.

Direct and rebuttal testimony before the Michigan Public Service Commission on behalf of the DTE Gas Company (Case No. U-17799) on the cost of capital for DTE Gas Company's natural gas distribution assets, December 2015 and May 2016.

Prepared direct testimony before the Federal Energy Regulatory Commission, Docket No. ER15-2594-000, on behalf of South Central MCN, LLC, regarding the appropriate ROE to include in the transmission rate formula (Formula Rate) to establish an annual transmission revenue requirement (ATRR) for transmission service over facilities that SCMCN will own in the Southwest Power Pool, Inc. (SPP) region, September 2015.

"Report on Gas LDC multiples," with Bente Villadsen, *Alaska Industrial Development and Export Authority*, May 2015.

Direct and reply testimony before the Regulatory Commission of Alaska on behalf of Cook Inlet Natural Gas Storage Alaska, LLC, Docket No. U-15-016 on the appropriate allocation of the proceeds from the sale of excess Found Native Gas discovered incidental to the construction of the storage facility, April 2015 and July 2015.

Direct testimony before the Michigan Public Service Commission on behalf of the Detroit Edison Electric Company (Case No. U-17767) on the cost of capital for DTE's electric utility assets, December 2014.

Direct and rebuttal testimony before the Washington Utilities and Transportation Commission on behalf of Puget Sound Energy, Inc. Docket Nos. UE-130137 and UG-130138 (consolidated) remand proceeding with regard to the effect of decoupling on the cost of capital, November 2014 and December 2014.

Initial and Reply Statement of Position before the Public Utilities Commission of Hawai‘i In the Matter of Instituting an Investigation to Reexamine the Existing Decoupling Mechanisms for Hawaiian Electric Company, Inc., Hawai‘i Electric Light Company, Inc., and Maui Electric Company, Limited, Docket No. 2013-0141, with Dr. Toby Brown and Dr. Joseph B. Wharton, May 2014 and September 2014.

Direct and rebuttal testimony before the Pennsylvania Public Utility Commission on behalf of Metropolitan Edison Company (Docket No. R-2014-2428745), Pennsylvania Electric Company (Docket No. R-2014-2428743), Pennsylvania Power Company (Docket No. R-2014-2428744), and West Penn Power Company (Docket No. R-2014-2428742) regarding the appropriate cost of common equity for the companies, September 2014 and December 2014.

Direct and rebuttal testimony before the Public Service Commission of West Virginia in the Matter of the Application of Monongahela Power Company and The Potomac Edison Company, Case No. 14-0702-E-42T for approval of a general change in rates and tariffs, June 2014 and October 2014.

Direct testimony before the Public Utilities Commission of Ohio in the Matter of the Determination of the Existence of Significantly Excessive Earnings for 2012 Under the Electric Security Plans of Ohio on behalf of the Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, Case No. 14-0828-EL-UNC, May 2014.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER14-1332-000, on behalf of DATC Path 15, LLC, regarding the appropriate ROE to include in the Submission of Revisions to Appendix I in TO Tariff Reflecting Updated TRR to be Effective February, 2014.

Direct testimony, rebuttal testimony and sur-surrebuttal testimony before the Arkansas Public Service Commission regarding the appropriate ROE to allow In the Matter of the Application of SourceGas Arkansas Inc., Docket No. 13-079-U for Approval of a General Change in Rates, and Tariffs, September 2013, March 2014, and April 2014.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER13-2412-000, on behalf of Trans Bay Cable LLC, regarding the appropriate ROE to include in the Submission of Revisions to Appendix I of the Trans Bay Transmission Owner Tariff to be Effective 11/23/2013, September 2013.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER13-2412-000, on behalf of Trans Bay Cable LLC, regarding the appropriate ROE to include in the Submission of Revisions to Appendix I of the Trans Bay Transmission Owner Tariff to be Effective 11/23/2013, September 2013.
Presentation on behalf of Alabama Power Company with regard to the appropriate cost of capital for the Rate Stabilization and Equalization mechanism, Dockets 18117 and 18416, July 2013.

Direct testimony before the Public Utilities Commission of Ohio in the Matter of the Determination of the Existence of Significantly Excessive Earnings for 2012 Under the Electric Security Plans of Ohio on behalf of the Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, Case No. 13-1147-EL-UNC, May 2013.

Expert Report, with A. Lawrence Kolbe and Bente Villadsen, on cost of equity, non-recovery of operating cost and asset retirement obligations on behalf of the behalf of oil pipeline in arbitration, April 2013.

Direct and Rebuttal testimony before the Public Utilities Commission of the State of Colorado on behalf of Rocky Mountain Natural Gas LLC regarding the cost of capital for an intrastate natural gas pipeline, Docket No. 13AL-143G, with Advice Letter No. 77, January 2013 and October 2013.

Rebuttal Testimony before the Public Utilities Commission of the State of California on behalf of Southern California Edison regarding Application 12-04-015 of Southern California Edison Company (U 338-E) For Authority to Establish Its Authorized Cost of Capital for Utility

Operations for 2013 and to Reset the Annual Cost of Capital Adjustment Mechanism , August 2012.

Direct testimony and supporting exhibits on behalf of Transcontinental Gas Pipeline Company, LLC, before the Federal Energy Regulatory Commission, on the Cost of Capital for Interstate Natural Gas Pipeline assets, Docket No. RP12-993-000, August 2012.

Direct Testimony before the North Carolina Utilities Commission on behalf of Cardinal Pipeline Company LLC, regarding the cost of capital for an intrastate natural gas pipeline, Docket G-39, Sub 28, August 2012.

Joint Rebuttal Testimony before the California Public Utility Commission on behalf of California American Water Company, regarding Application of California-American Water Company (U210W) for Authorization to increase its Revenues for Water Service, Application 10-07-007, and In the Matter of the Application of California-American Water Company (U210W) for an Order Authorizing and Imposing a Moratorium on New Water Service Connections in its Larkfield District, Application 11-09-016, August 2012.

Direct testimony before the Public Utilities Commission of Ohio, In the Matter of the Determination of the Existence of Significantly Excessive Earnings for 2011 Under the Electric Security Plan of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, Case No. 12-1544-EL-UNC, May 2012.

Deposition testimony in *Tahoe City Public Utility District, Plaintiff vs. Case No. SCV 27283 Tahoe Park Water Company, Lake Forest Water Company, Defendants*, May 2012.

Deposition testimony in *Primex Farms, LLC, Plaintiff, v. Roll International Corporation, Westside Mutual Water Company, LLC, Paramount Farming Company, LLC, Defendants*, Superior Court of the State of California, County of Fresno, Central, Case No. 10 CECG 01114, April 2012.

Direct and rebuttal testimony before the Michigan Public Service Commission, Case No. U-16999, on behalf of Michigan Consolidated Gas Company, regarding cost of service for natural gas distribution assets, April 2012 and October 2012.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. PA10-13-000, on behalf of ITC Holdings Corp. regarding a rehearing for FERC Staff, Office of Enforcement, Division of Audits, Report on the appropriate accounting for goodwill for the acquisition of ITC Midwest assets from Interstate Power and Light Company, February 2012.

Rebuttal testimony before the Florida Public Service Commission, Docket No. 110138-EL, on behalf of Gulf Power, a Southern Company, on the method to adjust the return on equity for differences in financial risk, November 2011.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER12-296-000, on behalf of Public Service Electric and Gas Company on the Cost of Capital and for Incentive Rate Treatment for the Northeast Grid Reliability Transmission Project, October 2011.

Rebuttal Evidence before the National Energy Board in the matter of AltaGas Utilities Inc., 2010-2012 GRA Phase I, Application No. 1606694; Proceeding I.D. 904, October, 2011.

Report before the Arbitrator on behalf of Canadian National Railway Company in the matter of a Submission by Tolko Marketing and Sales LTD for Final Offer Arbitration of the Freight Rates and Conditions Associated with Respect to the Movement of Lumber by Canadian National Railway Company from High Level, Alberta to Various Destinations in the Vancouver, British Columbia Area, October, 2011.

Written direct and reply evidence before the National Energy Board in the matter of the National Energy Board Act, R.S.C. 1985, c. NB7, as amended, and the Regulations made thereunder; and in the matter of an application by TransCanada PipeLines Limited for orders pursuant to Part I and Part IV of the *National Energy Board Act*, for determining the overall fair return on capital in the business and services restructuring and Mainline 2012 – 2013 toll application, RH-003-2011, September 2011 and May 2012.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. PA10-13-000, on behalf of ITC Holdings Corp. in response to FERC Staff, Office of Enforcement, Division of Audits, Draft Report on the appropriate accounting for goodwill for the acquisition of ITC Midwest assets from Interstate Power and Light Company, July 2011.

Initial testimony before the Public Utilities Commission of Ohio, Case No. 11-4553-EL-UNC, In the Matter of the Determination of the Existence of Significantly Excessive Earnings for 2010 Under the Electric Security Plan of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, July 2011.

Rebuttal testimony before the Public Utilities Commission of the State of California, Docket No. A.10-09-018, on behalf of California American Water Company, on Application of California American Water Company (U210W) for Authorization to Implement the Carmel River Reroute and San Clemente Dam Removal Project and to Recover the Costs Associated with the Project in Rates, June 2011.

Direct and rebuttal testimony before the Public Utilities Commission of the State of California, Docket No. A.11-05-001, on behalf of California Water Service Company, on the Cost of Capital for Water Distribution Assets, April 2011 and September 2011.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER11-013-000, on behalf of the Atlantic Wind Connection Companies, on the Cost of Capital and Cost of Capital incentive adders for Electric Transmission Assets, December 2010.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. RP11-1566-000, on behalf Tennessee Gas Pipeline Company, on the Cost of Capital for Natural Gas Transmission Assets, November 2010.

Direct and rebuttal testimony before the Michigan Public Service Commission, In the matter of the application of The Detroit Edison Company, for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority, Case No. U-16472, October 2010 and April 2011.

Direct and rebuttal testimony before the Federal Energy Regulatory Commission, Docket No. RP10-1398-000, on behalf of El Paso Natural Gas Company, on the Cost of Capital for Natural Gas Transmission Assets, September 2010 and September 2011.

Direct testimony before the Public Utilities Commission of Ohio, Case No. 10-1265-EL-UNC, In the Matter of the Determination of the Existence of Significantly Excessive Earnings for 2009 Under the Electric Security Plan of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company, September 2010.

Direct testimony before the Michigan Public Service Commission, Case No. U-16400, on behalf of Michigan Consolidated Gas Company, regarding cost of service for natural gas distribution assets, July 15, 2010.

Direct testimony before the Oklahoma Corporation Commission, Cause No. PUD 201000050, on behalf of Public Service Company of Oklahoma, regarding cost of service for a regulated electric utility, June 2010.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER10-516-000, on behalf of South Caroline Gas and Electric Company, on the Cost of Capital for Electric Transmission Assets, December 2009.

Direct and Rebuttal Testimony before the California Public Utilities Commission regarding cost of service for San Joaquin Valley crude oil pipeline on behalf of Chevron Products Company, Docket Nos. A.08-09-024, C.08-03-021, C.09-02-007 and C.09-03-027, December 2009 and April 2010.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER10-159-000, on behalf of Public Service Electric and Gas Company, on the incentive Cost of Capital for the Branchburg-Roseland-Hudson 500 kV Line electric transmission project (“BRH Project”), October 2009.

Rebuttal testimony before the Florida Public Service Commission in re: Petition for Increase in Rates by Progress Energy Florida, Inc., Docket No. 090079-EI, August 2009.

Direct and rebuttal testimony before the State of New Jersey Board of Public Utilities in the Matter of the Petition of Public Service Electric and Gas Company for Approval of an Increase in Electric and Gas Rates and for Changes in the Tariffs for Electric and Gas Service, B.P.U.N.J. No. 14 Electric and B.P.U.N.J No. 14 Gas Pursuant to N.J.S.A. 48:2-21 and N.J.S.A. 48:2-21.1 and for Approval of a Gas Weather Normalization Clause; a Pension Expense Tracker and for other Appropriate Relief BPU Docket No. GR09050422, June 2009 and December 2009.

Direct and rebuttal testimony before the Public Service Commission of Wisconsin, Docket No. 6680-UR-117, on behalf of Wisconsin Power and Light Company, on the cost of capital for electric and natural gas distribution assets, May 2009 and September 2009.

Written evidence before the Régie de l'Énergie on behalf of Gaz Métro Limited Partnership, Cause Tarifaire 2010, R-3690-2009, on the Cost of Capital for natural gas transmission assets, May 2009.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER09-681-000, on behalf of Green Power Express, LLP, on the Cost of Capital for Electric Transmission Assets, February 2009.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER09-548-000, on behalf of ITC Great Plains, LLC, on the Cost of Capital for Electric Transmission Assets, January 2009.

Written and Reply Evidence before the Alberta Utilities Commission in the matter of the Alberta Utilities Commission Act, S.A. 2007, c. A-37.2, as amended, and the regulations made thereunder; and IN THE MATTER OF the Gas Utilities Act, R.S.A. 2000, c. G-5, as amended, and the regulations made thereunder; and IN THE MATTER OF the Public Utilities Act, R.S.A. 2000, c. P-45, as amended, and the regulations made thereunder; and IN THE MATTER OF Alberta Utilities Commission 2009 Generic Cost of Capital Hearing, Application No. 1578571/Proceeding No. 85. 2009 Generic Cost of Capital Proceeding on behalf of AltaGas Utilities Inc., November 2008 and May 2009.

Written Evidence before the Alberta Utilities Commission in the matter of the Alberta Utilities Commission Act, S.A. 2007, c. A-37.2, as amended, and the regulations made thereunder; and IN THE MATTER OF the Gas Utilities Act, R.S.A. 2000, c. G-5, as amended, and the regulations made thereunder; and IN THE MATTER OF the Public Utilities Act, R.S.A. 2000, c. P-45, as amended, and the regulations made thereunder; and IN THE MATTER OF Alberta Utilities Commission 2009 Generic Cost of Capital Hearing, Application No. 1578571/Proceeding No. 85. 2009 Generic Cost of Capital Proceeding on behalf of NGTL, November 2008.

Direct and rebuttal testimony before the Public Service Commission of West Virginia, Case No. 08-1783-G-PC, on behalf of Dominion Hope Gas Company concerning the Cost of Capital for Gas Local Distribution Company assets, November 2008 and May 2009.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER09-249-000, on behalf of Public Service Electric and Gas Company, on the incentive Cost of Capital for Mid-Atlantic Power Pathway Electric Transmission Assets, November 2008.

Direct and rebuttal testimony before the Public Utilities Commission of Ohio, Case No. 08-935-EL-SSO, on behalf of Ohio Edison Company, The Toledo Edison Company, and The Cleveland Electric Illuminating Company, with regard to the test to determine Significantly Excessive Earnings within the context of Senate Bill No. 221, September 2008 and October 2008.

Direct and rebuttal testimony before the Public Service Commission of West Virginia, Case No.

08-0900-W-42t, on behalf of West Virginia-American Water Company concerning the Cost of Capital for Water Utility assets, July 2008 and November 2008.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER08-1233-000, on behalf of Public Service Electric and Gas Company, on the Cost of Capital for Electric Transmission Assets, July 2008.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER08-1207-000, on behalf of Virginia Electric and Power Company, on the incentive Cost of Capital for investment in New Electric Transmission Assets, June 2008.

Direct and rebuttal testimony before the Federal Energy Regulatory Commission, Docket No. RP08-426-000, on behalf of El Paso Natural Gas Company, on the Cost of Capital for Natural Gas Transmission Assets, June 2008 and August 2009.

Rebuttal testimony on the financial risk of Purchased Power Agreements, before the Public Utilities Commission of the State of Colorado, Docket No. 07A-447E, in the matter of the application of Public Service Company of Colorado for approval of its 2007 Colorado Resource Plan, June 2008.

Direct and rebuttal testimony before the California Public Utilities Commission, Docket No. A.08-05-003, on behalf of California-American Water Company, concerning Cost of Capital, May 2008 and August 2008.

Post-Technical Conference Affidavit on behalf of The Interstate Natural Gas Association of America in response to the Reply Comments of the State of Alaska with regard the FERC=s Proposed Policy Statement on to the Composition of Proxy Companies for Determining Gas and Oil Pipeline Return on Equity, Docket No. PL07-2-000, March, 2008.

Direct and rebuttal testimony on the Cost of Capital before the Tennessee Regulatory Authority, Case No. 08-00039, on behalf of Tennessee American Water Company, March and August 2008.

Comments in support of The Interstate Natural Gas Association of America=s Additional Initial Comments on the FERC=s Proposed Policy Statement with regard to the Composition of Proxy Companies for Determining Gas and Oil Pipeline Return on Equity, Docket No. PL07-2-000, December, 2007.

Written direct and reply evidence before the National Energy Board in the matter of the National Energy Board Act, R.S.C. 1985, c. NB7, as amended, and the Regulations made thereunder; and in the matter of an application by Trans Québec & Maritimes PipeLines Inc. ("TQM") for orders pursuant to Part I and Part IV of the *National Energy Board Act*, for determining the overall fair return on capital for tolls charged by TQM, December 2007 and September 2008, Decision RH-1-2008, dated March 2009.

Direct and rebuttal testimony before the California Public Utilities Commission, Docket No. A. 07-01-022, on behalf of California-American Water Company, on the Effect of a Water Revenue

Adjustment Mechanism on the Cost of Capital, October 2007 and November 2007.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER08-92-000 to Docket No. ER08-92-003, on behalf of Virginia Electric and Power Company, on the Cost of Capital for Transmission Assets, October 2007.

Direct and Supplemental testimony before the Public Utilities Commission of Ohio, Case No. 07-829-GA-AIR, Case No. 07-830-GA-ALT, and Case No. 07-831-GA-AAM, on behalf of Dominion East Ohio Company, on the rate of return for Dominion East Ohio=s natural gas distribution operations, September 2007 and June 2008.

Direct and rebuttal testimony before the State Corporation Commission of Virginia, Case No. PUE-2007-00066, on behalf of Virginia Electric and Power Company on the cost of capital for its southwest Virginia coal plant, July 2007 and December 2007.

Direct testimony before the Public Service Commission of West Virginia, Case No. 07-0998-W-42T, on behalf of West Virginia American Water Company on cost of capital, July 2007.

Direct, supplemental and rebuttal testimony before the Public Utilities Commission of Ohio, Case No. 07-551-EL-AIR, Case No. 07-552-EL-ATA, Case No. 07-553-EL-AAM, and Case No. 07-554-EL-UNC, on behalf of Ohio Edison Company, The Toledo Edison Company, and The Cleveland Electric Illuminating Company, on the cost of capital for the FirstEnergy Company=s Ohio electric distribution utilities, June 2007, January 2008 and February 2008.

Direct testimony before the Public Utilities Commission of the State of South Dakota, Docket No. NG-07-013, on behalf of NorthWestern Corporation, on the Cost of Capital for NorthWestern Energy Company=s natural gas operations in South Dakota, June 2007.

Rebuttal testimony before the California Public Utilities Commission, Docket No. A. 07-01-036-39, on behalf of California-American Water Company, on the Cost of Capital, May 2007.

Direct and rebuttal testimony before the Public Service Commission of Wisconsin, Docket No. 5-UR-103, on behalf of Wisconsin Energy Corporation, on the Cost of Capital for Wisconsin Electric Power Company and Wisconsin Gas LLC, May 2007 and October 2007.

Direct and rebuttal testimony before the Tennessee Regulatory Authority, Case No. 06-00290, on behalf of Tennessee American Water Company, on the Cost of Capital, November, 2006 and April 2007.

Direct testimony before the Federal Energy Regulatory Commission, Docket No. ER07-46-000, on behalf of Northwestern Corporation on the Cost of Capital for Transmission Assets, October 2006.

Direct and supplemental testimony before the Federal Energy Regulatory Commission, Docket No. ER06-427-003, on behalf of Mystic Development, LLC on the Cost of Capital for Mystic 8 and 9 Generating Plants Operating Under Reliability Must Run Contract, August 2006 and

September 2006.

Expert report in the United States Tax Court, Docket No. 21309-05, 34th Street Partners, DH Petersburg Investment, LLC and Mid-Atlantic Finance, Partners Other than the Tax Matters Partner, Petitioner, v. Commissioner of Internal Revenue, Respondent, July 28, 2006.

Direct and rebuttal testimony before the Pennsylvania Public Utility Commission, Return on Equity for Metropolitan Edison Company, Docket No. R-00061366 and Pennsylvania Electric Company, Docket No. R-00061367, April 2006 and August 2006.

Written evidence before the Ontario Energy Board, Cost of Capital for Union Gas Limited, Inc., Docket No. EB-2005-0520, January 2006.

Direct testimony before the Arizona Corporation Commission, Cost of Capital for Paradise Valley Water Company, a subsidiary of Arizona-American Water Company, Docket No. WS-01303A-05, May 2005.

Direct and rebuttal testimony before the Federal Energy Regulatory Commission on Energy Allocation of Debt Cost for Incremental Shipping Rates for Edison Mission Energy, Docket No. RP04-274-000, December 2004 and March 2005.

Direct and rebuttal testimony before the Public Service Commission of West Virginia, on Cost of Capital for West Virginia-American Water Company, Case No 04-0373-W-42T, May 2004.

Written evidence before the National Energy Board in the matter of the National Energy Board Act, R.S.C. 1985, c. NB7, as amended, (Act) and the Regulations made under it; and in the matter of an application by TransCanada PipeLines Limited for orders pursuant to Part IV of the *National Energy Board Act*, for approval of Mainline Tolls for 2004, RH-2-2004, January 2004.

Direct and rebuttal reports before the Alberta Energy and Utilities Board in the matter of the Alberta Energy and Utilities Board Act, R.S.A. 2000, c. A-17, and the Regulations under it; in the matter of the Gas Utilities Act, R.S.A. 2000, c. G-5, and the Regulations under it; in the matter of the Public Utilities Board Act, R.S.A. 2000, c. P-45, as amended, and the Regulations under it; and in the matter of Alberta Energy and Utilities Generic Cost of Capital Hearing, Application No. 1271597, July 2003, November 2003, Decision 2004-052, dated July 2004.

Direct report before the Arbitration Panel in the arbitration of stranded costs for the Town of Belleair, FL, Case No. 000-6487-C1-007, April 2003.

Direct testimony before the Federal Energy Regulatory Commission on behalf of Florida Power Corporation, dba Progress Energy Florida, Inc. in Docket No. SC03-1-000, March 2003.

Direct testimony and hearing before the Arbitration Panel in the arbitration of stranded costs for the City of Winter Park, FL, In the Circuit Court of the Ninth Judicial Circuit in and for Orange County, FL, Case No. C1-01-4558-39, December 2002.

Direct reports before the Arbitration Board for Petroleum products trade in the Arbitration of the Military Sealift Command vs. Household Commercial Financial Services, fair value of sale of the Darnell, October 2002.

Direct and rebuttal reports before the Arbitration Panel in the arbitration of stranded costs for the City of Casselberry, FL, Case No. 00-CA-1107-16-L, July 2002.

Direct testimony (with William Lindsay) before the Federal Energy Regulatory Commission on behalf of DTE East China, LLC in Docket No. ER02-1599-000, April 2002.

Written evidence before the Public Utility Board on behalf of Newfoundland & Labrador Hydro - Rate Hearings, October 2001, Order No. P.U.7 (2002-2003), dated June 2002.

Written evidence, rebuttal, reply and further reply before the National Energy Board in the matter of an application by TransCanada PipeLines Limited for orders pursuant to Part I and Part IV of the *National Energy Board Act*, Order AO-1-RH-4-2001, May 2001, Nov. 2001, Feb. 2002.

Direct testimony before the Federal Energy Regulatory Commission on behalf of Mississippi River Transmission Corporation in Docket No. RP01-292-000, March 2001.

Direct testimony before the Alberta Energy and Utilities Board on behalf of TransAlta Utilities Corporation for approval of its 2001 transmission tariff, May 2000.

Direct testimony before the Federal Energy Regulatory Commission on behalf of Central Maine Power in Docket No. ER00-982-000, December 1999.

Direct and rebuttal testimony before the Alberta Energy and Utilities Board on behalf of TransAlta Utilities Corporation in the matter of an application for approval of its 1999 and 2000 generation tariff, transmission tariff, and distribution revenue requirement, Docket U99099, October 1998.