STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **DTE GAS COMPANY** for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of natural gas, and for miscellaneous accounting authority	)))))))	Case No. U-20642

DIRECT TESTIMONY

OF

DR. BENTE VILLADSEN

LIST OF TOPICS ADDRESSED:

COST OF COMMON EQUITY CAPITAL

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No.

I. INTRODUCTION AND PURPOSE

Q1. Please state your name, occupation and business address for the record.

A1. My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts, 02108.

Q2. Briefly describe your present responsibilities at The Brattle Group.

A2. As a Principal, it is my responsibility to research and direct research into the utility industry as it pertains to cost of capital and related issues. It is also my responsibility to consult on utility industry issues and testify on utility industry matters. Among my other duties is the supervision and training of staff and ensuring that work products are of high quality and accurate.

Q3. Briefly describe your educational and professional qualifications.

A3. I have 20 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance, and accounting issues. I am the co-author of the text, "Risk and Return for Regulated Industries"[1] and a frequent speaker on regulatory finance at conferences and webinars. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, Michigan,[2] New Mexico, New York, Oregon, and Washington, as well as before the Bonneville Power Administration, Federal Energy Regulatory Commission, the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have provided white papers on cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency as well as to European and Australian regulators on cost of capital. I have testified or filed testimony on regulatory accounting

[1] Bente Villadsen, Michael J. Vilbert, Dan Harris, A. Lawrence Kolbe, "Risk and Return for Regulated Industries," Academic Press, 2017.

[2] Previously I filed testimony on cost of equity before the Michigan Public Service Commission ("Commission") in U-20561.

issues before the Federal Energy Regulatory Commission ("FERC"), the Regulatory Commission of Alaska, the Michigan Public Service Commission, the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management.

I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Appendix A contains more information on my professional qualifications as well as a list of my prior testimonies and publications.

Q4. What is the purpose of your testimony in this proceeding?

A4. DTE Gas Company ("DTE Gas" or the "Company") has asked me to estimate the cost of equity that the Michigan Public Service Commission ("Commission") should allow DTE Gas an opportunity to earn on the equity-financed portion of its regulated utility rate base. I also consider the relative risk of the Company and its proposed regulatory capital structure ratio to arrive at my recommendation for the allowed Return on Equity ("ROE").

Q5. Are you sponsoring any exhibits?

A5. Yes. I am sponsoring Exhibit D5, which contains the details of my analysis and supporting tables

Schedule	Description
D5.1	Table of Contents
D5.2	Classification of Companies by Assets
D5.3	Market Value of the Sample Companies
D5.4	Capital Structure Summary of the Samples
D5.5	Estimated Growth Rates of the Samples
D5.6	DCF Cost of Equity of the Samples
D5.7	Overall After-Tax DCF Cost of Capital of the Samples
D5.8	DCF Cost of Equity at DTE Gas Company's Proposed Capital Structure
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D5.11	Overall After-Tax Risk Positioning Cost of Capital of the Samples
D5.12	Risk Positioning Cost of Equity at DTE Gas Company's Proposed Capital Structure
D5.13	Hamada Adjustment to Obtain Unlevered Asset Beta
D5.14	The Samples' Average Asset Beta Relevered at DTE Gas Company's Proposed Capital Structure
D5.15	Risk-Positioning Cost of Equity using Hamada-Adjusted Betas
D5.16	Risk Premiums Determined by Relationship Between Authorized ROEs and Long-term Treasury Bond Rates
D5.17	Capital Intensity-Revenues
D5.18	Estimation of S&P 500 Cost of Equity - DDM

Q6. Was this material prepared by you or under your supervision?

A6. Yes. It was.

II. SUMMARY OF CONCLUSIONS

Q7. Do you have any preliminary comments regarding the appropriate ROE?

A7. Yes. DTE Gas' allowed ROE in its most recent rate case, U-18999, was 10 percent. Since then interest rates have declined and economic growth has increased. Interest rates are expected to increase, but at a slower pace than expected a year or two ago. However, current economic growth is higher than at the time of U-18999 and the long-term GDP growth estimate is virtually unchanged. Consequently, there are contradicting factors regarding economic conditions, so that the cost of equity might be relatively constant – in DTE Gas' last case, U-18999, so that I recommend the same return on equity, 10½ percent for the Company's requested 52 percent equity.

- The yield on both government bonds and utility bonds has declined since the filing of U-18999, but the spread between the yield on BBB-rated utility bond and 20-year government bonds is up slightly from U-18999.

- Nominal GDP growth was 4.2 percent in 2017,[3] whereas the most recent GDP for 2019 was 4.6 percent.[4] Thus, actual economic growth is up. However, the long-term forecast for GDP growth is 4.0 percent and slightly below the forecast of 4.2 percent as of 2017.[5]

- As for the industry, analysts' growth forecasts are higher today than at the time of U-18999, while the Value Line betas are similar.

I provide more discussion of the current capital market conditions and their impact on the ROE for DTE's gas operations in Section IV.

Q8. Please summarize your recommendation for DTE Gas' ROE.

A8. I recommend that DTE Gas be allowed to earn a 10½ percent rate of return on the equity portion of its regulated rate base including the requested 52 percent equity. This recommendation is based on my implementations of standard cost of capital estimation models including two versions each of the Discounted Cash Flow ("DCF") model and Capital Asset Pricing Model ("CAPM"), as well as an implied risk premium analysis, along with an analysis of DTE Gas' risks. Figure 1 below summarizes the model results using the requested 52 percent equity. The corresponding reasonable ranges that are presented are discussed in Section V below. Based on my consideration of the model results in the context of Michigan and DTE Gas' specific risk, I believe it is appropriate to place DTE Gas' allowed return at or near the upper end of the range that is reasonable.

Using DTE Gas' requested 52 percent equity, I find a range of 9.5 to 10.75 percent rate of return on equity to be reasonable using a sample of regulated gas utilities as well as regulated water utilities. In the current environment, where there has been considerable

[3] https://data.oecd.org/gdp/nominal-gdp-forecast.htm

[4] https://www.bea.gov/news/2019/gross-domestic-product-2nd-quarter-2019-second-estimate-corporate-profits-2nd-quarter

[5] Blue Chip Economic Indicators, March 10, 2017 and March 10, 2019.

consolidation in the natural gas industry and considerations of switching from gas to other fuels, I find it beneficial to add a sample of highly regulated water utilities.

Figure 1
Summary of Reasonable Ranges of Estimates at 52% Equity

	Gas Sample			Full Sample		
CAPM	9.25%	-	9.75%	9.50%	-	10.25%
ECAPM	9.50%		10.00%	9.50%		10.75%
DCF	9.25%	-	11.00%	9.25%	-	11.25%
Risk Premium	9.90%	-	10.00%	na	-	na
Average	9.48%	-	10.19%	9.42%	-	10.75%

Q9. How is the remainder of your testimony organized?

A9. Section III formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section IV discusses conditions and trends in capital markets and their impact on the cost of capital. Section V explains my analyses and presents the results. Finally, Section VI discusses DTE Gas' business risk characteristics, unique risks facing Michigan-based gas utilities, and other company-specific circumstances relevant to my recommended allowed ROE. Finally, Section VII concludes with a summary of my recommendations.

III. COST OF CAPITAL PRINCIPLES AND APPROACH

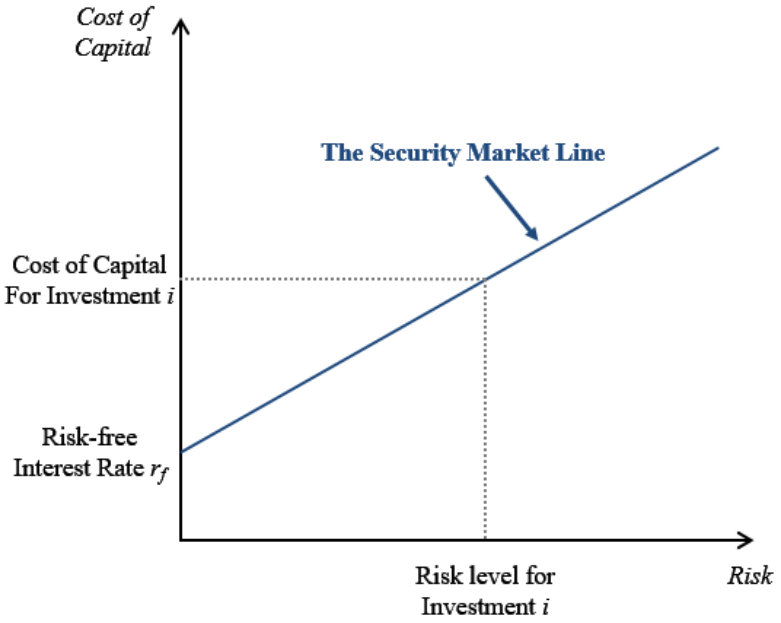
A. RISK AND THE COST OF CAPITAL

Q10. How is the "Cost of Capital" defined?

A10. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Put differently, 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," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 2 below. The higher the risk, the higher the cost of capital required.

Figure 2
The Security Market Line



Q11. What factors contribute to systematic risk for an equity investment?

A11. When estimating the cost of equity for a given asset or business venture, two categories of risk are important. The first is business risk, which is the degree to which the cash flows generated by the business (and its assets) vary in response to moves in the broader market. In context of the CAPM, business risk can be quantified in terms of an "assets beta" or "unlevered beta." For a company with an assets beta of 1, the value of its enterprise will increase (decrease) by 1% for a 1% increase (decline) in the market index.

The second category of risk relevant for an equity investment depends on how the business enterprise is financed and is called financial risk. Section III.B below explains how financial risk affects the systematic risk of equity.

Q12. What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A12. The seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases,[6] which found that:

- The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[7]
- The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
- The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[8]

Q13. How does the standard for just and reasonable rate of return relate to the cost of capital?

A13. The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly aligned with the financial concept of the opportunity cost of capital.[9] The cost of capital is the rate of return investors can expect to earn in capital markets on alternative investments of equivalent risk.[10]

By investing in a regulated utility asset, investors are tying up some capital in that investment, thereby foregoing alternative investment opportunities. Hence, the investors are incurring an "opportunity cost" equal to the returns available on those alternative

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6 Bluefield Water Works & Improvement Co. v. Public Service Com'n of West Virginia, 262 U.S. 679 (1923) ("Bluefield"), and Federal Power Com'n v. Hope Natural Gas Co., 320 U.S. 591 (1944) ("Hope").

7 Hope, 320 U.S. at 603.

8 Bluefield, 262 U.S. at 680.

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

10 The opportunity cost of capital is also referred to as simply the "cost of capital," and can be equivalently described in terms of the "required return" needed to attract investment in a particular security or other asset (i.e., the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

investments. The allowed return on equity needs to be at least as high as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead. If it is not, the utility's ability to raise capital and fund its operations will be negatively impacted. This is a fundamental concept in cost of capital proceedings for regulated utilities such as DTE Gas.

Q14. Please summarize how you considered risk when estimating the cost of capital.

A14. To evaluate comparable business risk, I looked to a proxy group of regulated natural gas and water utilities. The natural gas and water utilities I consider have a high proportion of regulated assets and revenue with the majority having more than 80% of assets subject to regulation. Additionally, they all have a network of assets that are used to serve end customers and they are capital intensive (meaning that each dollar in revenue requires substantial investment in fixed assets). Further, (as explained in Section III.B below) I analyzed and adjusted for differences in financial risk due to different levels of financial leverage among the proxy companies and between the capital structures of the proxy companies and the regulatory capital structure that will be applied to DTE Gas for ratemaking purposes. To determine where in the estimated range DTE Gas' ROE reasonably falls, I compared the business risk of DTE Gas to that of the proxy group companies.

B. FINANCIAL RISK AND THE COST OF EQUITY

Q15. How does capital structure affect the cost of equity?

A15. Debtholders in a company have a fixed claim on the assets of the company and are paid prior to the company's owners (equity holders) who hold the inherently variable residual claim on the company's operating cash flows. Because equity holders only receive the profit that is left over after the fixed debt payments are made, higher degrees of debt in the capital structure amplify the variability in the expected rate of return earned by equity-holders. This phenomenon of debt resulting in financial leverage for equity holders means that, all else equal, a greater proportion of debt in the capital structure increases

risk for equity holders, causing them to require a higher rate of return on their equity investment, even for an equivalent level of underlying business risk.

Q16. How do differences in financial leverage affect the estimation of the cost of equity?

A16. The CAPM and DCF models rely on market data to estimate the cost of equity for the proxy companies, so the results reflect the value of the capital that investors hold during the estimation period (market values).

The authorized ROE is applied to the regulatory equity portion of DTE Gas' rate base. Because the cost of equity is measured using a group of proxy companies, it may well be the case that these companies finance their operations with a different debt and equity proportion than the proportion the Commission allows in DTE Gas' rate base. Specifically, the CAPM and DCF models measure the cost of equity using market data and consequently are measures of the cost of equity using the proportion of debt and equity that is inherent in that data. Therefore, I consider the impact of any difference between the financial risk inherent in those cost of equity estimates and the capital structure used to determine DTE Gas' required return on equity.

Differences in financial risk due to the different degree of financial leverage in DTE Gas' regulatory capital structure compared to the capital structures of the proxy companies mean that the equity betas measured for the proxy companies must be adjusted before they can be applied in determining DTE Gas' CAPM return on equity. Similarly, the cost of equity measured by applying the DCF models to the proxy companies' market data requires adjustment if it is to serve as an estimate of the appropriate allowed ROE for DTE Gas at the regulatory capital structure the Commission grants.

Importantly, taking differences in financial leverage into account does not change the value of the rate base. Rather, it acknowledges the fact that a higher degree of financial leverage in the regulatory capital structure imposes a higher degree of financial risk for an equity investment in DTE Gas' rate base than is experienced by equity investors in the market-traded stock of the less leveraged proxy companies.

Q17. How specifically do you consider financial risk in your analysis of the cost of equity using market data for the proxy group companies?

A17. The impact of financial risk is taken into account in an analysis of cost of equity using market-based models such as the DCF and CAPM in several manners.[11] One way is to determine the after-tax weighted-average cost of capital for the proxy group using the equity and debt percentages as the weight assigned to the cost of equity and debt. Financial theory holds that for a given level of business risk, the weighted average cost of capital is constant over a broad set of capital structures, i.e., the weighted average cost of capital is the same at, for example, 55 and 45 percent equity, as the cost of equity increases as the percentage of equity decreases. I estimate the weighted cost of capital for each utility in the proxy group based on that utility's capital structure. I then evaluate the average weighted cost of capital across the proxy group. Once the weighted cost of capital is determined for the proxy group, I can determine the cost of equity that is required at DTE Gas' capital structure. This approach assumes that the after-tax weighted average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.

A second approach was developed by Professor Hamada, who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structure using beta. Specifically, in the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity financed firm to obtain a so-called all-equity or assets beta and then re-lever the beta to determine the beta associated with the regulatory capital structure. This requires an estimate of the systematic risk associated with debt (*i.e.*, the debt beta), which is usually quite small. In Appendix B, I set forth additional technical details regarding the methods that can be used to account for financial risk when estimating the cost of capital.

[11] The impact of financial leverage on the risk premium model needs to be considered separately as it uses regulatory data rather than market data, meaning that differences in regulatory capital structures are relevant for this model.

Q18. Can you provide a numerical illustration of how the cost of equity changes, all else being equal, when the degree of leverage changes?

A18. Yes. I constructed a simple example below, where only the leverage of a company varies. I assumed the return on equity is 11.00 percent at a 50 percent equity capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45 percent.

Figure 3
Illustration of Impact of Financial Risk on ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b]	$500	$450
Debt	[c]	$500	$550
Total Cost of Capital (8%)	[d] = [a] × 8%	$80.0	$80.0
Cost of Debt (5%)	[e] = [c] × 5%	$25.0	$27.5
Equity Return	[f] = [d] - [e]	$55.0	$52.5
Rate of Return on Equity (ROE)	**[g] = [f] / [b]**	**11.00%**	**11.67%**

Figure 3, above, illustrates how financial risk[12] affects returns and the ROE. The overall return remains the same for Company A and B at $80. But Company B with the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk to equity investors caused by the higher degree of leverage.

The principle illustrated in Figure 3 is an example of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to DTE Gas.

[12] Financial risk is risk that a company has due to its capital structure; specifically the higher a company's debt, the larger the financial risk.

C. APPROACH TO ESTIMATING THE COST OF EQUITY

Q19. Please describe your approach for determining the cost of equity for DTE Electric.

A19. As stated above, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for DTE Gas focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by DTE Gas. Because certain of the models require market data, my consideration of comparable companies is restricted to those that have publicly traded stock. To this end, I have selected two proxy groups consisting of publicly traded companies. The first proxy group consists of companies providing primarily regulated natural gas distribution services and the second proxy group consists of highly regulated companies in the water utility industry.[13] I consider both the natural gas distribution sample and the full sample when deriving estimates of the representative cost of equity according to standard financial models including two versions of the CAPM—the traditional version and a version that takes into account the empirical observation that the security market line in Figure 2 is too steep relative to what is observed using market data. I also implement a single-stage and a multi-stage version of the DCF.

Lastly, I perform an analysis of historical allowed ROEs for gas LDCs in relation to prevailing risk-free interest rates at the time the ROE was authorized, and use the implied allowed risk-premium relationship to estimate a utility cost of equity consistent with current economic conditions. The results of this implied risk premium analysis

[13] I consider both a natural gas distribution utility sample (because DTE Gas is a natural gas distribution utility) and a sample including water utilities. The latter sample has the advantage of being highly regulated and, like gas distribution utilities, engaged in distributing a commodity through an extensive network of pipes. Additionally, there is no substitute for water, while there are initiative to substitute gas for renewable sources in some jurisdictions. As a result, the estimates from water companies are less influenced by individual state policies or changing federal policies than those of the natural gas companies – i.e., they reflect to a larger degree the fundamental risks of regulated utilities. Lastly, the number of companies in the natural gas distribution industry is limited due to mergers and acquisitions, so the water utility industry serves to increase the number of available, fully regulated utilities that serve customers through a network of pipes.

(sometimes referred to herein as the "Risk Premium" model) are an additional consideration that informs my recommendation and serves as a check on the reasonableness of my market-based results.

Q20. How do your approach and the models you employ compare to what the Commission has considered in prior DTE Gas proceedings?

A20. The Commission has in past decisions considered the DCF, CAPM and Risk Premium models, as do I. Additionally, the Commission has in the past recognized that "some consideration should be given to current market volatility and uncertainty."[14] The Commission also stated that it will "monitor a variety of market factors in future applications to gauge whether volatility and uncertainty continue to be prevalent issues that merit more consideration in setting the ROE."[15]

Q21. Are there any potential concerns about how current capital market conditions may influence the DCF model results that may caution against giving it disproportionate weight in setting DTE Gas ROE?

A21. Yes. To the extent utility stocks are currently acting as a *relatively* less-risky investment vehicle for risk-averse investors, who look for returns during a time of volatile capital markets and low government bond yields, the demand for utility stocks contribute to their high price-to-earnings ratios ("PE ratios"). As a result, the dividend yields are unrepresentatively low—compared to what investors might expect in a more normal interest rate environment. If this is the case, implementing the DCF model using current market data may produce results that understate what investors' required returns will be when interest rates move higher, as expected. Additionally, some companies distribute cash to shareholders through buybacks of shares rather than through dividends. When that is the case, the dividend yield under-estimates the cash yield shareholders get.[16]

[14] Michigan Public Service Commission, Order for Case No. U-18999, September 13, 2018, p. 53.

[15] Michigan Public Service Commission, Order for Case No. U-20162, May 2, 2019, pp. 67-68.

[16] This is currently not an important consideration for the sample companies.

The Federal Energy Regulatory Commission ("FERC") addressed a similar issue in a recent order, where the FERC expressed its concern about the reliability of DCF model results in the current market environment as follows.

> Under [the premise of the DCF methodology], increases in a company's actual earnings or projected growth in earnings would ordinarily be required to justify an increase in the company's stock price. Moreover, there is no evidence that investments in the utility sector have become less risky during these periods. However, it appears that during the periods at issue in these complaint proceedings, average utility stock prices have increased by more than would be justified by any increase in actual utility earnings or projected growth in earnings. From October 1, 2012 through December 1, 2017, the Dow Jones Utility Average increased from about 450 to 762.59, an increase of almost 70 percent. However, utility earnings did not increase by nearly the same amount, as demonstrated in Figure 3 below, which shows the substantial increase in utilities' price to earnings (PE) ratio during the same period. Moreover, average IBES three to five year growth projections appear not to have increased during that period. Thus, there has not been an increase in either current or projected utility earnings that would justify the substantial increase in utility stock prices.[17]

The FERC concluded from this discussion that recent investor behavior with respect to utility stocks appears to have diverged from the DCF model's predictions, a factor that informs FERC's decision (discussed in Section III.C) to reconsider its primary reliance on the DCF in favor of giving equal weight to four different and complementary models. Similarly, this concern informs the way I consider the results of the DCF models as well as the CAPM and Risk Premium models in selecting my recommendation.

IV. CAPITAL MARKET CONDITIONS AND THE COST OF CAPITAL

Q22. Why do you discuss capital market conditions in testimony aimed at determining DTE Gas' ROE?

A22. This section discusses important market conditions that affect the inputs to the cost of equity models. Because the risk-free rate is an input to the CAPM, recent and expected developments in risk-free government interest rates are important to assess the validity

[17] Coakley v. Bangor Hydro-Electric Co., 165 FERC ¶61,030, October 2018 ("NETO Briefing Order"), paragraph 45 (citations omitted).

of any measure of the risk-free rate. Similarly, the Market Risk Premium ("MRP") is an input to the CAPM, so factors that affect the MRP (*e.g.*, volatility and changes in investors risk perception) are vital for an accurate determination of the ROE.

As to DCF model inputs, developments in the economy in general affect growth rates and utility stock prices. Consequently, the capital market developments affect the growth rates, dividend yield, and general assessment of the estimates' reasonableness.

Finally, the Tax Cuts and Jobs Act of 2017 ("TCJA") affected utilities differently than other companies in that tax reductions generally flow to customers and, consequently, impact the utility's credit metrics and earnings volatility. As a result, it is necessary that the allowed ROE and appropriate equity capital structure ratio for DTE Gas fulfill the requirements set forth by *Hope* and *Bluefield* once the implications of the TCJA are considered.

Q23. Please summarize how your analysis of capital market conditions affects your conclusions.

A23. First, I conclude that interest rates are unusually low and expected to increase over the next few years. This supports my reliance on forecasts of long-term U.S. Treasury yields for the risk-free rate during the time DTE Gas' rates will be in effect.

Second, there are several indicators that the forward-looking estimates of the MRP are above the historical average. I base this conclusion on several observations. The forecasts from Bloomberg and the forecasts that result from using the methodology relied upon by the FERC in its recent NETO Briefing Order find a MRP above the historical average. Further, the spread between utility bond yields and Treasury bonds of the same maturity is elevated by approximately 42 basis points relative to the historical spread prior to the 2008 financial crisis.

The elevation in the spread between utility bond yields and treasury bond yields is an indication that monetary policy has put downward pressure on risk-free rates or that the MRP has increased. Under the first explanation, risk-free rates are downward biased.

Alternatively, the increased yield spread is an indication that investors require a higher premium to hold assets that are not risk-free. Under that explanation, the historical MRP is downward biased relative to the current or forward-looking MRP. Consequently, I consider two scenarios. In Scenario I, I rely on the forecasted yield on the 10-year treasury as of March 2019, the latest Blue Chip forecast for 2021 I have, plus 50 basis points that account for the maturity premium between a 20-year and a 10-year government bond. I combine this forecast with the historical average arithmetic MRP. In Scenario II, I use the most recent forecast on the 10-year Treasury bond from CBO plus 50 basis points to account for the maturity premium.[18] I combine this risk-free rate with a forecasted MRP of 7.91%, which is in between the Bloomberg forecasted rate and that obtained using the FERC methodology to determine the MRP.[19] Alternatively, the Scenario II MRP can be viewed as accounting for the increase in yield spread, as an increase in the yield spread of 25 basis points would relate to an increase in the MRP of about 1 percent as explained in Appendix B.

Further, I conclude that because (all else equal) the TCJA results in reduced cash flows and increased volatility of cash flows for DTE Gas, it is appropriate to consider the impact on the cost of equity for DTE Gas.

A. INTEREST RATE DEVELOPMENTS

Q24. What are the relevant developments regarding interest rates?

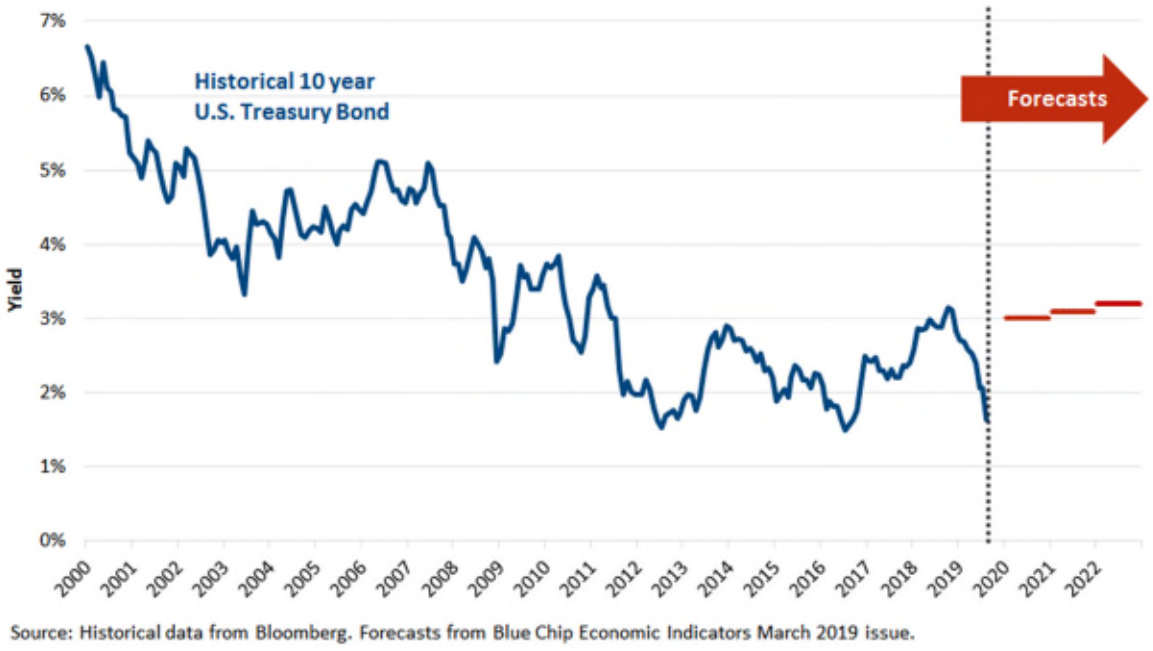
A24. Interest rates, including the long-term government bond yields that are typically used to represent the risk-free rate in the context of regulated utility ratemaking, have remained

[18] Blue Chip Economic Indicators, March 2019 forecast the 10-year yield at 3.1% in 2021, while the Congressional Budget Office in August 2019 forecast the year-end 2021 10-year yield at 2.7%; https://www.cbo.gov/about/products/budget-economic-data#4
The use of the CBO forecast is a deviation from my practice of using the most recent Blue Chip forecast, but given the decline in actual and forecast interest rates and the lack of a recent forecast for 2021, I find the use of an alternate source justified. For the same reason, I did not add any portion of the current yield spread to the Scenario I risk-free rate.

[19] Bloomberg reported a forward-looking MRP of approximately 7.3% over 20-year government bonds as of August 19, 2019 and I calculated a forward-looking MRP of 9.34% (over my forecasted risk-free rate of 3.35%) as of June 30, 2019 using FERC's methodology in the NETO Briefing Order.

extremely low in the years since the global financial crisis of 2008. While current yields are very low with the 20-year government bond yield around the 2 percent mark,[20] the yield is expected to increase over the next few months or years. Blue Chip Economic Indicators, Consensus Forecasts, and the CBO expect the 10-year yield to increase to 2.1 – 2.3 percent in 2020 for a 20-year government bond yield of 2.6 to 2.8 percent.[21] This is an increase of 60 to 80 basis points. The 2021 yield on government bond is expected to increase additionally. Figure 4 below shows the development in 10-year government bond yields as well as the forecasts for 2020 through 2022. The yield on 20-year government bonds is expected to be higher by about 50 basis points.

Figure 4
Historical and Projected Ten-Year Treasury Bond Yields



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators March 2019 issue.

[20] As of September 20, 2019, the Federal Reserve of St. Louis reported the 20-year yield at 1.99 percent.

[21] Blue Chip Economic Indicators, August 10, 2019 expect the 10-year government bond yield at 2.1%; Consensus Forecast, August 12, 2019 expects the 10-year government bond yield at 2.2% and CBO expects the 10-year government bond yield at 2.2 – 2.3% in 2020. Adding to that 50 basis points for the maturity premium, the 20-year government bond yield is expected to be 2.6 to 2.8 percent.

Q25. What forces contributed to the sustained period of very low interest rates over the decade following the 2008 financial crisis?

A25. The monetary policy actions of the Federal Reserve (the "Fed") in response to the financial crisis were a key driver of the low interest rates. The Fed's Federal Open Market Committee ("FOMC") undertakes market actions to influence interest rates—especially the so-called "federal funds rate"[22]—subject to its statutory mandate to maximize employment and keep inflation under control. In response to the financial crisis, the FOMC drastically reduced its target federal funds rate from 5.25 percent in August 2007 to 0.00 – 0.25 percent starting in December 2008.[23] The Fed's zero interest rate policy remained in effect for the next seven years, ending in December 2015 when the FOMC finally raised its federal funds target to 0.25 - 0.50 percent.[24]

Concurrent with its sustained monetary policy actions related to the short-term federal funds rate, the Fed also implemented several unprecedented policy interventions with the explicit goal of reducing interest rates on long-term borrowing instruments. This "quantitative easing" program of long-term government bonds served to keep Treasury yields at very low levels for an extended period of time. Importantly, even after the FOMC ceased buying securities, it maintained trillions of dollars' worth of Treasuries and government-backed mortgage backed securities on its balance sheet, continuing to reinvest the principal when the assets matured.[25]

Global economic conditions also contributed to the unprecedented low rates on U.S. government debt. For example, at the height of the European sovereign debt crisis in 2011-2012, flight from European bonds and yield-lowering actions by the European

[22] The federal funds rate is the rate at which large banks lend and borrow funds in the short-term. It is therefore influential in determining market interest rates throughout the economy.

[23] See FOMC Statements issued August 7, 2007 and December 16, 2008 accessed at https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm

[24] See FOMC Statement, December 16, 2015 accessed at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm

[25] As of June 30, 2019, the Fed's long-term Treasury and Agency securities balance was at $3.8 trillion. See Board of Governors of the Federal Reserve System, Credit and Liquidity Programs and the Balance Sheet, accessed at https://www.federalreserve.gov/aboutthefed/files/quarterly-report-20190630.pdf.

Central Bank ("ECB") spurred increased demand for U.S. Treasury bonds—thus driving up prices and bringing yields down. This pattern repeated in 2016 in the period leading up to, and especially following, the "Brexit" vote. Indeed, on July 10, 2016, shortly after Great Britain officially voted to leave the European Union, the ten-year U.S. Treasury Yield reached its all-time low of 1.37%.[26]

Q26. How does current interest rates relate?

A26. As shown in Figure 4 above, U.S. Treasury bond yields have recently declined. Following an upward trajectory from mid-2016 through year-end 2018, the yield on 10-year Treasury bonds (as well as that of other government bonds) started to decline, so that the current yield on the 10-year Treasury bond is below 2 percent and the yield on the 20-year Treasury bond is right around 2 percent.[27]

At the same time the Federal Reserve has lowered the federal funds rate twice in recent months – most recently on September 18, 2019, when the Federal Reserve lowered the funds rate to 1¾ to 2 percent.[28] Interest rate forecasts have similarly changed, so that Blue Chip Economic Indicators as well as, for example, the CBO have lowered the forecasted rate relative to late 2018 and forecast a slow albeit steady increase in the risk-free rate. As a result, I am conservatively using a forecasted risk-free rate of 3.35 and 3.60 percent for the 20-year treasury yield in 2021.

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[26] Yield from Bloomberg. See also "U.S. 10-Year Treasury Yield Closes at Record Low" (July 5, 2016) The Wall Street Journal, accessed at https://www.wsj.com/articles/government-bond-yields-in-u-s-europe-hit-historic-lows-1467731411.

[27] Federal Reserve, Fred, Accessed October 2, 2019; https://fred.stlouisfed.org/graph/?id=DGS20,

[28] Federal Reserve Press Release, "Federal Reserve Issued FOMC Statement," September 18, 2019; https://www.federalreserve.gov/newsevents/pressreleases/monetary20190918a.htm

B. RISK PREMIUMS AND YIELD SPREADS

Q27. What is the Market Risk Premium?

A27. In general, a risk premium is the amount of "excess" return—above the risk-free rate of return—that investors require to compensate them for taking on risk. As illustrated above in Figure 2, the riskier the investment, the larger the risk premium investors will require.

The MRP is the risk premium associated with investing in the market as a whole. Since the so-called "market portfolio" embodies the maximum possible degree of diversification for investors,[29] 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 estimating the cost of equity using the CAPM and other risk-positioning models.

Q28. Do you have any data on how estimates of the MRP have evolved over the time leading up to and since the 2008 financial crisis?

A28. Yes. Bloomberg publishes a forward-looking estimate of the MRP based on market prices and expected dividends for U.S. stocks.[30] Figure 5 displays the development of Bloomberg's forecasted MRP since 2006.

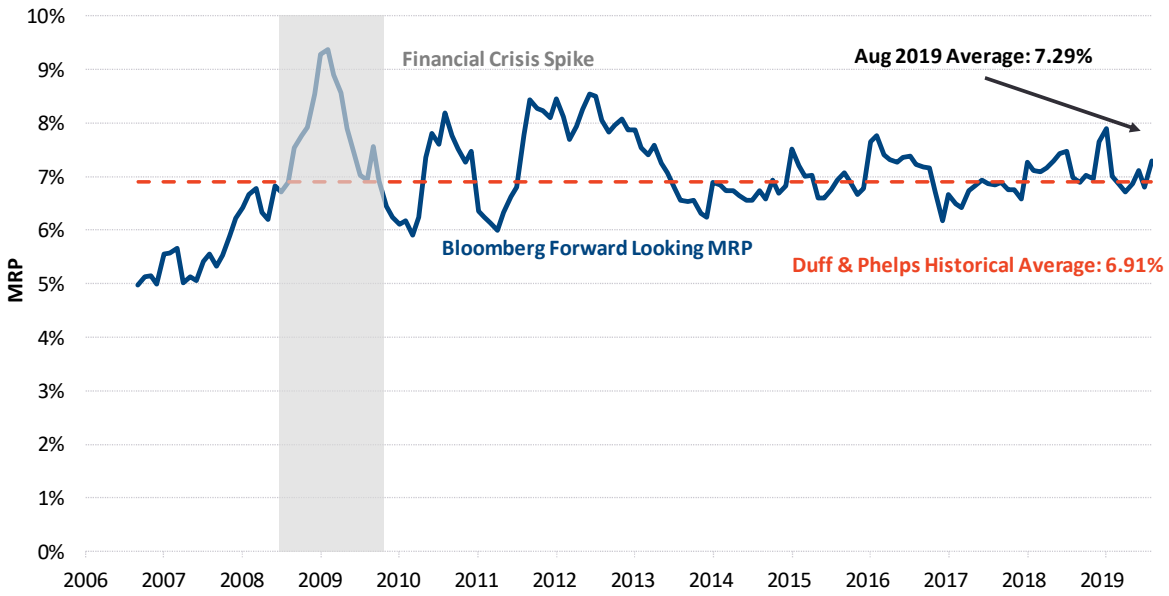
The Bloomberg MRP increased substantially with the onset of the financial crisis and has remained elevated relative to pre-crisis levels, though the August 2019 average forward-looking MRP reported by Bloomberg is in line with the long-term historical

[29] In finance theory, the "market portfolio" describes a value-weighted combination of all risky investment assets (e.g., stocks, bonds, real estate) that can be purchased in markets. In practice, academics and financial analysts nearly always use a broad-based stock market index, such as the S&P 500, to represent the overall market.

[30] Bloomberg's calculation of the expected market return is based on an implementation of a multi-stage DCF model (see Section V.C below) applied to all dividend paying stocks in the S&P 500 index; Bloomberg calculates the MRP by subtracting the current ten-year Treasury bond yield from the estimated expected market return, however, it is also possible to calculate the MRP measured relative to a 20-year Treasury bond yield. This is the calculation I perform for ease of comparison to historical average risk premiums calculated by comparing the Ibbotson data on stock market returns in excess income returns on long-term U.S. Treasury yields with an approximate average maturity of 20 years.

average MRP.[31] While the MRP has moderated since the financial crisis, it has been above the historical average almost every month since the financial crisis.[32]

Figure 5
Bloomberg Forward looking MRP (2006-2019)



Source: Bloomberg as of 8/31/2019.

A somewhat higher result is obtained if I, instead of looking to Bloomberg, consider the MRP that results from implementing the DCF model on the S&P 500 using growth forecasts from the Institutional Brokers' Estimation System ("IBES")[33] and current dividend yields as the FERC did in its NETO Briefing Order.[34] This resulted in a forecasted MRP of 9.34 percent at the end of Q2, 2019 (over my forecasted risk-free

31 As noted below, the historical average MRP calculated using the long-established Ibbotson stock and bond market data currently published by Duff & Phelps is 6.91 percent.

32 Average of Bloomberg forecasted MRP (relative to 20-year Treasury Bonds) for the U.S. from January 2009 - August 2019. Bloomberg as of August 31, 2019.

33 Institutional Brokers' Estimation System ("IBES") is a database that gathers and compiles the different estimates made by stock analysts on the future earnings for the majority of U.S. Publicly traded companies.

34 See Exhibit D5.18.

rate).[35] The FERC Staff in a recent filing presented an MRP of 7.65 percent over the 30-year Treasury bond or the equivalent of approximately 7.9 to 8.15 percent over the 20-year Treasury bond although this calculation did not follow the FERC's NETO Briefing Order.[36] Consequently, empirical evidence suggests that the forward-looking MRP is substantially higher than the historical average MRP and some regulators are considering these results.[37]

Q29. Are these observations supported by academic research?

A29. Yes, a study by Duarte and Rosa of the Federal Reserve of New York aggregates the results of many models of the required MRP in the U.S. and tracks them over time. The study finds a very high MRP following the financial crisis.

The analysis estimates the MRP that results from a range of models each year from 1960 through the present.[38] The analysis then reports the average as well as the first principal component of results.[39] The analysis then finds that the models used to determine the risk premium are converging to provide estimates that are more comparable. They also find that the average annual estimate of the MRP was at an all-time high in 2013. These estimates show a persistent elevation of the MRP over the historical figure. Figure 6 below replicates Duarte and Rosa's summary findings.

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35 The FERC in its NETO Briefing Order seemingly endorsed a forward-looking MRP of the type estimated here.

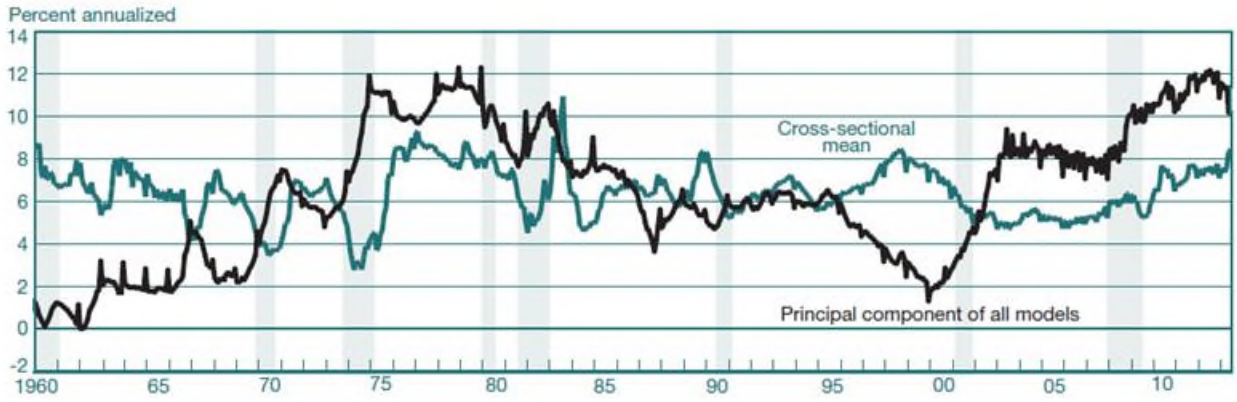
36 Affidavit of Trial Staff Witness Robert J. Keyton in Dockets Nos. EL11-66-001 et al., January 11, 2019, p. 28. The MRP over a 20-year Treasury bond was calculated using the spread between 30-year and 20-year treasury bond yields as of April 4, 2019 and the average since 1990, respectively.

37 FERC has issued a Notice of Inquiry to re-examine its policies on the appropriate inputs to and approach for measuring the ROE for public utilities: https://www.ferc.gov/media/news-releases/2019/2019-1/03-21-19-E-2.asp#.XOgrRaHsaHs.

38 Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models," Federal Reserve Bank of New York, December 2015 (Duarte & Rosa 2015).

39 Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

Figure 6
Duarte and Rosa's Chart 3
One-Year Ahead MRP and Cross-Sectional Mean of Models

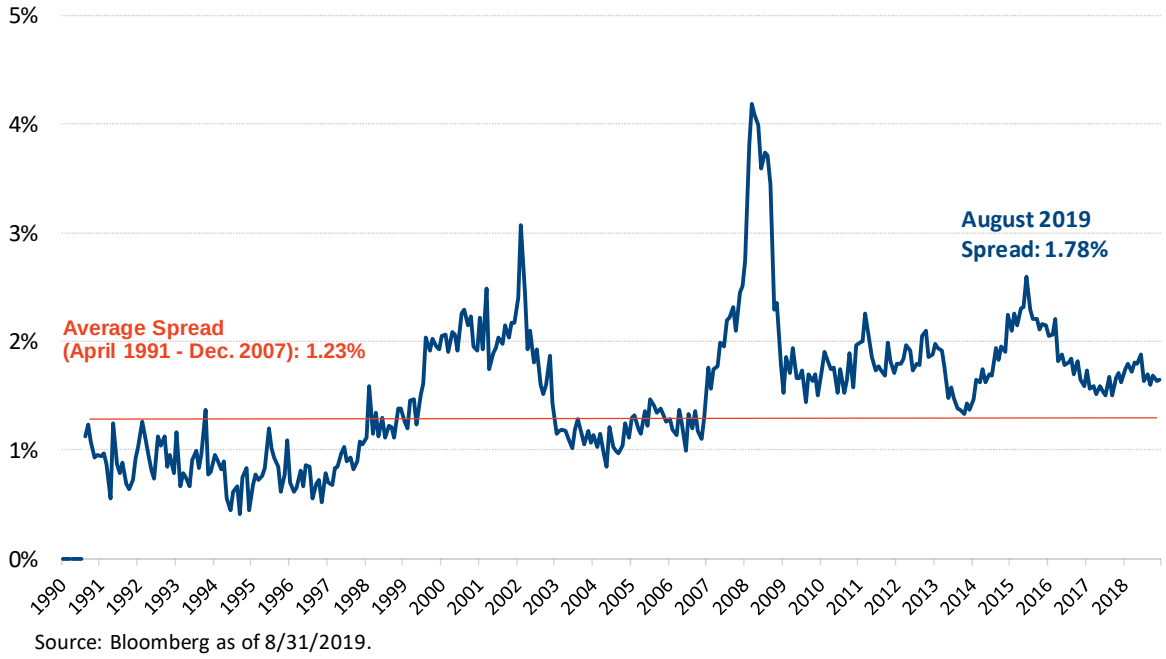


Q30. Is there any other market evidence concerning risk premiums?

A30. Yes. One observable risk premium is the spread between yields on risk-free Treasury bonds and yields on corporate bonds of the same maturity. Unlike U.S. government bonds, debt instruments issued by corporate entities come with some probability of default and have some associated level of systematic risk. To compensate for this risk, corporate bonds—including utility bonds—offer higher expected returns (as measured by the market yield) than do government bonds.

Figure 7 plots the yield spread for BBB-rated utility bonds compared to Treasury bonds for the longest period of available data. As the figure shows, utility yield spreads spiked dramatically with the onset of the financial crisis and have remained elevated to their pre-crisis average level.

Figure 7
Spread between 20-year BBB-rated Utility Bond and 20-year Treasury Bond Yields



Source: Bloomberg as of 8/31/2019.

Q31. What are the implications of elevated yield spreads to the cost of equity?

A31. The yield spread is simply one form of risk premium, albeit for assets (corporate bonds) that are relatively lower risk compared to equity securities (*i.e.*, stock). Consequently, one explanation for the elevated yield spread is that investors are requiring a higher premium to take on market risk than they did on average prior to the financial crisis.[40] This would indicate an elevated MRP compared to the historical average.

An alternative explanation for the elevated yield spread is that the yield on Treasury bills remains artificially low due to the lingering after-effects of the Fed's unprecedented monetary policy over the last decade. Under this explanation, the yield spread would be expected to return to its historical average level as the risk-free rate returns to more normal levels over an extended period of time.

[40] See "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, The Journal of Finance, February 2001, pp. 247-277.

As discussed in Appendix B, an increase in yield spread indicates an increase in the risk premium investors require to hold securities that are not risk free. Market Volatility

Q32. How does the stock market's volatility relate to the cost of capital?

A32. Academic research has found that investors expect higher risk premiums during more volatile periods,[41] indicating that the MRP may increase when market volatility is high, even when investors' level of risk aversion remains unchanged. This is relevant to estimating the Company's cost of equity because increased volatility suggests higher risk premiums and therefore higher market-required ROE.

A measure of the market's expectations for volatility is the VIX index, which measures the 30-day implied volatility of the S&P 500 index.[42] These indices are also referenced as the "market's fear gauge."[43] While the VIX has recently been trading below its long term historical average of approximately 19.2, it spiked substantially above that level in December 2018 and again in early August 2019, each time concurrent with a significant drop in the stock market.[44] The VIX averaged 11.1 in 2017, increased to average 16.6 in 2018, and has averaged 18.8 in August 2019 – close to its long-run average and up from the level in the last two years.

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[41] See, e.g., K. French, W. Schwert and R. Stambaugh (1987), "Expected Stock Returns and Volatility," *Journal of Financial Economics*, Vol. 19, p. 3:

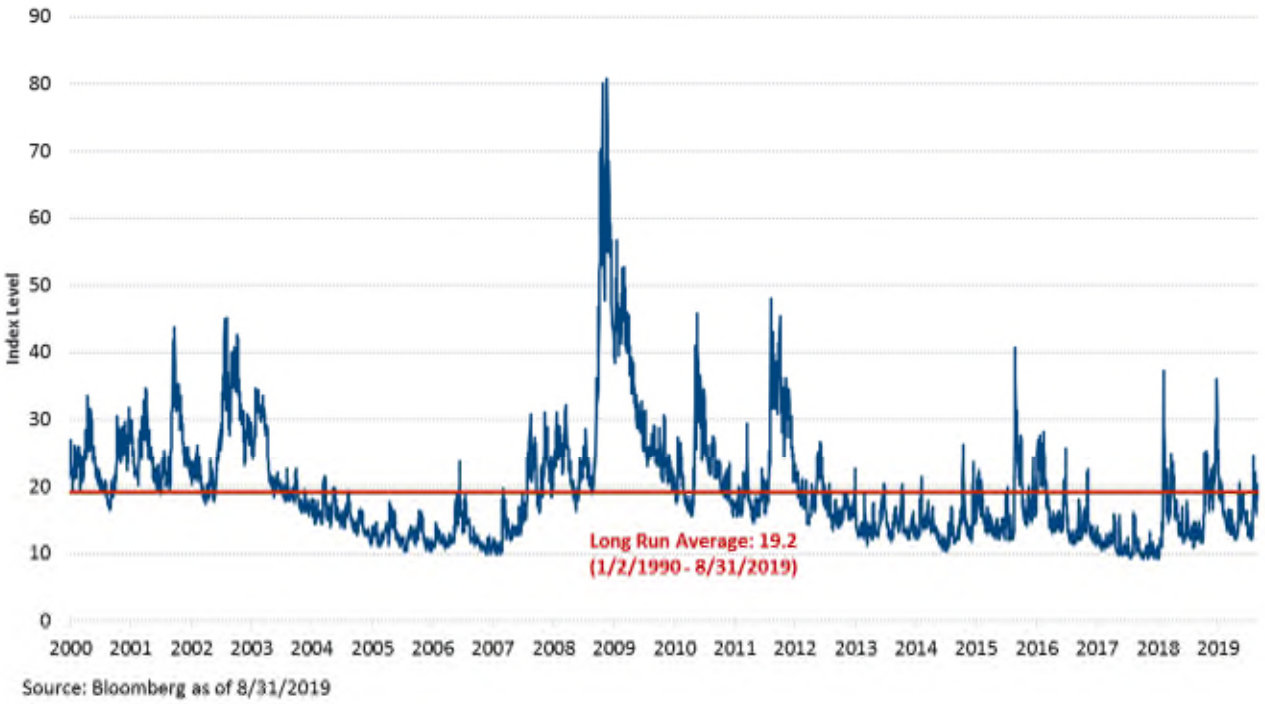
> We find evidence that the expected market risk premium (the expected return on a stock portfolio minus the Treasury bill yield) is positively related to the predictable volatility of stock returns. There is also evidence that unexpected stock returns are negatively related to the unexpected change in the volatility of stock returns. This negative relation provides indirect evidence of a positive relation between expected risk premiums and volatility.

[42] *See*, *e.g.*, Chicago Board Option Exchange at http://www.cboe.com/micro/VIX/vixintro.aspx

[43] CNBC, "VIX, the Market's Fear Gauge Plunges in Historic One-Week Move," July 5, 2016.

[44] See, for example, Yahoo Finance.

Figure 8
VIX Index



Q33. Do you look at any other indexes regarding market volatility?

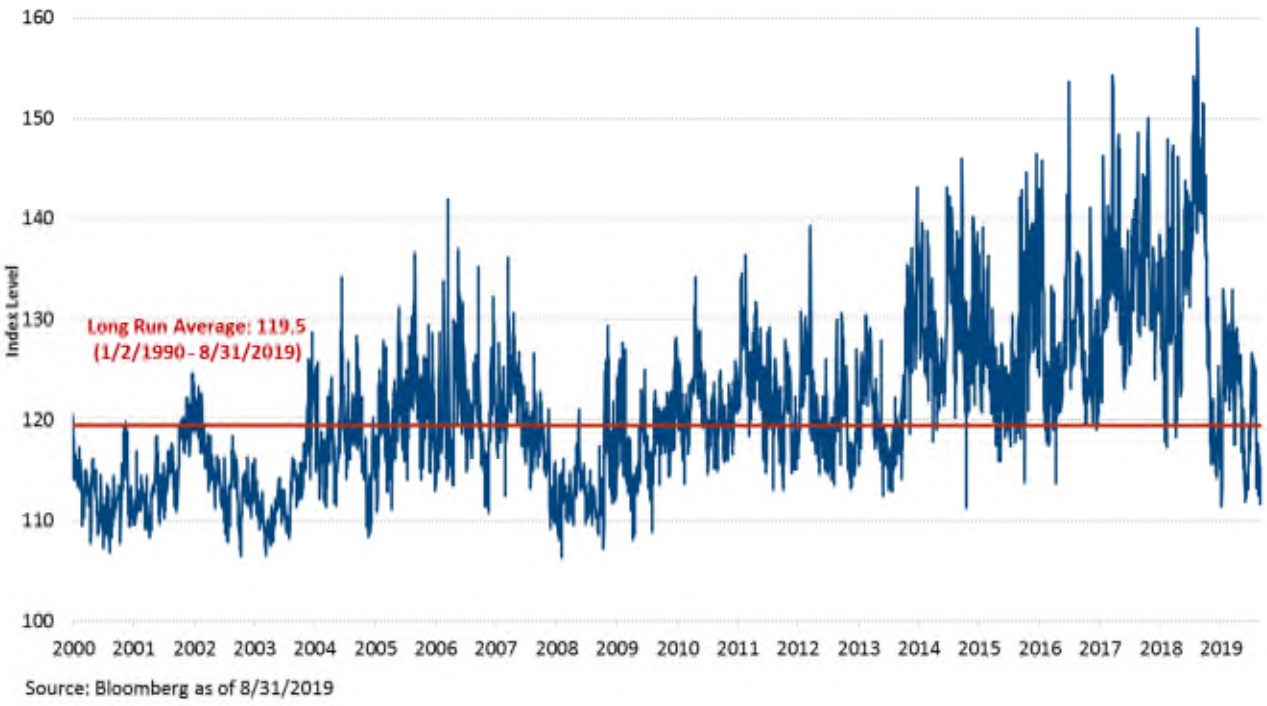
A33. Yes. The SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (*i.e.*, sudden substantial downturns),[45] offers a reason to be cautious of interpreting recent low VIX levels as an indicator of improved capital market certainty over the long term. A SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW increases, the probability of outlier returns becomes more significant. Figure 9 shows that the SKEW currently averaged approximately 121 to-date in 2019, while the index has averaged 119.5 since January 1990. This indicates that investors are willing to pay for protection against downside risk and thus are exhibiting signs of elevated risk aversion concerns of downside tail risk.

The SKEW was on an upward trend until late 2018 but has since oscillated around the long-run average of about 120. The SKEW averaged 134.8 in 2017, declined slightly to

[45] See, for example, http://www.cboe.com/products/vix-index-volatility/volatility-indicators/skew.

132.6 in 2018, and has been slightly above the long-run average at an average of 121.2 to-date in 2019.

Figure 9
SKEW Index



Q34. Are there reasons why capital markets may exhibit high volatility going forward?

A34. Yes. A few contributing factors in recent capital market volatility include notably the shut-down of the federal government, challenging tariff negotiations between the U.S. and its trading partners, the uncertainty regarding Brexit, which is expected to happen at the end of October 2019, substantial uncertainty in the Middle East, and other geopolitical events. Lastly, the slow-down in Europe and the lower-than-expected growth in the first few months of 2019 could result in market interruptions.

C. IMPLICATIONS OF THE TAX CUTS AND JOBS ACT OF 2017 ("TCJA")

Q35. How does implementation of the TCJA affect regulated utilities?

A35. The TCJA reduced the federal corporate marginal tax rate from 35% to 21%. Although the TCJA is likely to be a net positive for investors in unregulated companies, for the

Company, the vast majority (if not all) of the benefits will flow to customers. This is because the savings in income taxes will flow through to customers in the form of lower rates. At the same time, the implementation of the TCJA (including its treatment by utility regulators in a ratemaking context) will likely increase the risks facing regulated companies because they will experience (i) a near-term decrease in cash flows and (ii) an increase in the variability of after-tax earnings (and cash flows). This is a particularly important point for utilities, who are at risk for downgrades (such as DTE) or utilities with potentially large risks.

Q36. How does the lower corporate tax rate under the TCJA affect the expected volatility of cash flows for regulated companies?

A36. For regulated companies, as for unregulated corporate taxpayers, the change in the income tax allowance will result in greater volatility of net income (and cash flow) because the income tax provides a "buffer" against the impact of variations in expected costs and expected revenue on net income. In other words, the Company now absorbs more of the loss from negative impacts (and benefit from more of the gain from positive impacts) under a lower tax rate than it did under the higher tax rate. Consider for example the effect on net income of a 10% increase in operating expenses. All else equal, net income would decrease by about 20% for a 35% income tax rate, but would decrease by 24% for a 21% income tax rate. The change would be similar and symmetrical for a positive impact (such as a decrease in operating costs). See Figure 10 below illustrating an increase to operating expenses.

Figure 10
Impact of 10% Increase in Operating Costs on Income Statement
Illustrated for $1,000 of New Utility Plant Investment
Financed with 50% Equity / 50% Debt

		35% Tax Rate				21% Tax Rate			
		Base	+10% Operating Costs	Dollar Impact	Pct Change	Base	+10% Operating Costs	Dollar Impact	Pct Change
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Revenue	[a]	$285	$285	$0	0%	$272	$272	$0	0%
Operating Costs	[b]	$150	$165	$15	10%	$150	$165	$15	10%
EBITDA	[c]: [a] - [b]	$135	$120	-$15	-11%	$122	$107	-$15	-12%
Depreciation	[d]: 1,000 / 30	$33	$33	$0	0%	$33	$33	$0	0%
EBIT	[e]: [c] - [d]	$102	$87	-$15	-15%	$88	$73	-$15	-17%
Interest Expense	[f]: 500 * 5%	$25	$25	$0	0%	$25	$25	$0	0%
EBT	[g]: [e] - [f]	$77	$62	-$15	-20%	$63	$48	-$15	-24%
Tax Allowance	[h]: [g] x tax rate	$27	$22	-$5	-20%	$13	$10	-$3	-24%
Net Income	[i]: [g] - [h]	$50	$40	-$10	-20%	$50	$38	-$12	-24%

Notes:
[3]: [2] - [1]
[4]: [2] / [1] - 1
[7]: [6] - [5]
[8]: [6] / [5] - 1

Further, the amplified variability in net income due to the lower corporate tax rate is likely to amplify systematic risk, because variations in revenue are generally related to variations in the broader economy that affect the value of all risky assets, not just tax-paying corporations. Since systematic risk is the type of risk that affects the cost of capital, it is reasonable to expect that the TCJA will, all else equal, contribute to higher required returns for corporate equity holders, including those in regulated utilities.

Importantly, while this increase in variability of income applies to all corporate tax-paying entities, unlike unregulated corporations, regulated utilities do not benefit from after-tax higher profits under the new lower tax rate, because the revenue requirement is adjusted to pass the tax savings on to customers.[46]

[46] This discussion assumes that the revenue requirement has been adjusted to account for the lower corporate income tax rate.

Q37. How will the TCJA affect a regulated company's credit metrics?

A37. Credit metrics are negatively affected by regulatory ratemaking treatment of the TCJA, because such treatment causes a near-term reduction in the regulated utilities' cash flow and related cash flow metrics that are closely observed by debt rating agencies. As discussed further below, the expected refunds of excess deferred taxes and lower tax deferrals associated with new investment due to the lower tax rate and loss of bonus depreciation under the TCJA will reduce cash flow. This is especially true for utilities with a large capital investment program such as DTE Gas.[47] Yet the tax reform has no impact on the amount of assets needed for reliability and to serve customers, a portion of which will be debt-financed. Decreases in key cash flow metrics, such as the cash flow to debt ratios that inform the credit rating agencies' credit opinions, have negatively affected the credit profile of many regulated utilities, and will continue to do so.[48]

Q38. Please illustrate how implementation of the TCJA reduces utility cash flows.

A38. Figure 11 below illustrates the impact of TCJA on incremental after-tax cash flows generated by a new investment in utility rate base. It compares the pre-TCJA status quo (*i.e.*, a 35% corporate tax rate and 40% year-1 bonus depreciation that was scheduled to be permitted for new utility investment in 2019 under the prior tax code) with the new situation, namely 21% tax rate and only the standard year-1 Modified Accelerated Capital Recovery System ("MACRS") tax depreciation deduction.[49] As shown, the funds from

[47] See Schedule D5.18 and

[48] See Moody's Investor Service, Global Credit Research, "Moody's changes outlooks on 25 US regulated utilities primarily impacted by tax reform," January 19, 2018; Sector Comment, "Tax reform is credit negative for sector, but impact varies by company," January 24, 2018; Regulated Utilities - U.S., "2019 outlook shifts to negative due to weaker cash flows, continued high leverage," June 18, 2018; and Regulated Utilities - U.S., "2019 outlook negative amid growing debt and stagnant cash flow," November 8, 2018. See also S&P Global Ratings, Rating Direct, "U.S. Tax Reform: For Utilities' Credit Quality, Challenges Abound," January 24, 2018 and Fitch Ratings, Special Report, "Tax Reform Impact on the U.S. Utilities, Power & Gas Sector: Tax Reform Creates Near-Term Credit Pressure for Regulated Utilities and Holding Companies," January 24, 2018.

[49] For illustrative purposes, the figure posits a hypothetical $1 million investment in new utility assets with a 30-year economic life for depreciation purposes and qualifying for accelerated tax depreciation according to the 20-year MACRS schedule. The investment in rate base is assumed to be financed with 50.00% debt / 50.00% equity and receive a 10.00% allowed ROE.

Line No.

operations ("FFO")[50] measure of cash flow is dramatically lower under the new tax regime compared to what utilities would have forecasted for new rate base investments prior to the TCJA taking effect. In turn, the incremental impact of new capital expenditures on utilities' cash flow to debt ratios is diminished by the new law.[51]

Figure 11
TCJA Impact on Year-1 Incremental Cash Flow and Credit Metrics
Illustrated for $1,000 of New Utility Plant Investment
Financed with 50% Equity / 50% Debt

		No TCJA - 35% tax rate with bonus depreciation	TCJA - 21% tax rate without bonus depreciation	Difference
		[1]	[2]	[3] = [2] - [1]
Net Income	[a] = 500 * 10%	$50.0	$50.0	-
Depreciation	[b] = 1,000 / 30	$33.3	$33.3	-
Deferred income Taxes				
Tax Depreciation	[c]	$422.5	$37.5	($385.0)
Book Depreciation	[d] = [b]	$33.3	$33.3	-
Temporary Difference	[e] = [c] - [d]	$389.2	$4.2	($385.0)
Deferred Income Taxes	[f] = [e] * tax rate	$136.2	$0.9	($135.3)
Funds From Operations	[g] = [a] + [b] + [f]	$219.5	$84.2	($135.3)
FFO-to-Debt (%)	[h] = [g] / 500	43.9%	16.8%	-27.1%

Notes:
[1] [c] = 1,000 * 42.25%; Represents year-1 deduction from 20-year MACRS schedule with 40% bonus depreciation.
[2] [c] = 1,000 * 3.75%; Represents year-1 deduction from 20-year MACRS schedule.

I note that while Figure 11 focuses on the impact of TCJA for new investment, the combined effect of differences in on-going tax deferrals and EDIT amortization is to reduce cash flow and cash flow-to-debt metrics associated with many pre-existing rate base assets also. Indeed, Moody's has evaluated all components of the TCJA as a drag

[50] For purposes of this example, FFO is defined as the result of adding back depreciation expense and deferred taxes (which are non-cash expenses) to net income. All credit rating agencies consider an after-tax cash flow measure of this type for purposes of calculating cash flow to debt ratios.

[51] Under standard depreciated original cost ratemaking and absent the effects of accelerated tax depreciation, the incremental impact of a given rate base asset to the FFO-to-debt metric is lowest when the asset is new and improves as the asset depreciates; accelerated tax depreciation, and especially bonus depreciation, mitigates or even reverses this trend by providing more cash flow in early years.

on credit quality across the regulated utility industry, estimating that the average reduction in the ratio of cash flow to debt for utilities due to implementing the new tax law is 150-250 bps.[52]

Q39. What are the implications of the reduced cash flows and increased volatility of cash flows in the context of these proceedings?

A39. These effects suggest that it would be appropriate to increase either the allowed ROE or the amount of equity in the capital structure (or possibly both) to help compensate for the increased financial risk imposed on regulated utilities by the TCJA.

While the uncertainty surrounding the passage of the TCJA has been removed, it is unlikely that impacts on the cost of capital will immediately appear in the estimation models. The TCJA has not yet been in place for one complete fiscal year, and the regulatory treatments in various jurisdictions have been in effect for an even shorter period. A longer period of market data is needed before the cost of capital estimation models can be expected to fully reflect impacts of the TCJA on investors' required returns.[53]

Decreases in cash flow metrics and increased volatility of earnings both increase financial risk in ways that may not be reflected in the cost of capital model results. The impact of the TCJA is larger for a utility with a large capital expenditure program as the dollar difference between regulatory and tax treatment of depreciation is larger. I consider these impacts due to the TCJA along with the cost of capital model estimates in order to determine a reasonable range for the allowed ROE. These increases in financial

[52] Moody's Investor Service, "Moody's Changes Outlook on 25 US Regulated Utilities Primarily Impacted by Tax Reform," January 19, 2018. The average reflects bonus depreciation and the impact on cash flow and financing of both new and pre-existing assets. See also Moody's Investor Service, Regulated Utilities - U.S., "2019 outlook shifts to negative due to weaker cash flows, continued high leverage," June 18, 2018 and "2019 outlook negative amid growing debt and stagnant cash flow," November 8, 2018.

[53] For example, Value Line betas, which many analysts use in the Capital Asset Pricing Model rely on five years of data. Thus, a law passes in late 2017 will not be fully reflected in beta until late 2022 or later as the treatment of the deferred income taxes was or still is subject to regulatory review.

risk due to the TCJA warrant an increase in the allowed ROE for DTE Gas and further support my recommended ROE.

V. ESTIMATING THE COST OF EQUITY

A. PROXY GROUP SELECTION

Q40. How do you identify proxy companies of comparable business risk to DTE Electric?

A40. DTE Gas is primarily engaged in the regulated natural gas distribution business. The business risk associated with these endeavors depends on many factors, including the specific characteristics of the service territory and regulatory environment in which the provider of these services operates. Consequently, it is not possible to identify publicly traded proxy companies that replicate every aspect of DTE Gas' risk profile. However, selecting companies with business operations concentrated in regulated industries or having similar lines of business and/or business environments is an appropriate starting point for selecting one or more proxy groups of comparable risk to DTE gas. As a second step, I must evaluate DTE Gas or Michigan-specific risks to ensure that the Company's ROE was placed appropriately relative to the sample companies.

To this end, I have selected a sample of natural gas distribution utilities and water utilities. Jointly these companies comprise the "Full Sample." I also report results for the gas distribution utilities that are included in the Full Sample and refer to that sample as the Gas Sample. The proxy companies are similar to DTE Gas in that they are rate regulated by state utility commissions, provide customers a product through a network of pipeline assets, and rely on substantial capital to provide service; i.e., they are capital intensive as is DTE Gas.

It is important that a proxy group used to assess the cost of equity for DTE Gas (absent of any unique Michigan or Company characteristics) is regulated, because regulation tends to place substantial requirements and also protections on the companies. I also believe the physical characteristics of the industry – e.g., network, capital intensive, serving many different customers – is a characteristic of DTE Gas and of the selected natural gas distribution and water utilities. The network characteristic implies that assets

cannot readily be employed in a different capacity, capital intensity affects the operating risks through the split between fixed and variable costs, and the customer composition affects the demand risk. For example, natural gas and water utilities all face declining per-customer demand due to conservation.

Q41. Why are you including water utilities when evaluating the cost of capital for a natural gas distribution utility?

A41. For several reasons. First, the natural gas distribution industry is expected to undergo substantial changes as customers, regulators and the legislature focus on carbon reductions. This means that initiatives in a specific state influences stock prices and analysts' evaluations along with more fundamental operating and market conditions.[54] I therefore select a group of water utilities, where there are no carbon considerations, to assess whether the estimates from the gas LDCs are reasonable. Second, investors make comparisons across regulated companies, so it becomes important to consider whether the returns awarded DTE Gas are comparable not only to other natural gas utilities but also to other similar risk benchmarks – I consider a broader sample of natural gas and water utilities a reasonable such benchmark. Third, natural gas and water utilities generally share not only regulators but also the characteristics of being (a) capital-intensive, (b) network industries, and (c) having an obligation to serve and interfacing with the local community. I therefore believe these companies provide a useful benchmark when evaluating the cost of equity for DTE Gas.

Q42. Please summarize how you selected the members of the Full Sample and the Gas Sample.

A42. To identify companies suitable for inclusion in the Full Sample, I started with the universe of publicly traded companies in the natural gas and water utility industry as

[54] For example, currently no new customers will receive gas distribution services in part of New York state and the City of Berkeley in California recently banned natural gas. Sources: ConEdison Press Release, "About the Westchester Natural Gas Moratorium," (https://www.coned.com/en/save-money/convert-to-natural-gas/westchester-natural-gas-moratorium/about-the-westchester-natural-gas-moratorium) and San Francisco Chronicle, "Berkeley becomes first U.S. city to ban natural gas in new homes," July 21, 2019.

identified by *Value Line Investment Analyzer* (*"Value Line")*. I started with Value Line's list of publicly traded companies classified as gas LDCs or water utilities. Next, I reviewed business descriptions and financial reports of these companies and eliminated companies that had less than 50 percent of their assets dedicated to regulated utility activities in their industry; e.g., natural gas or water utility services.[55]

With this group of companies, I applied further screening criteria to eliminate companies that have had recent significant events that could affect the market data necessary to perform cost of capital estimation. Specifically, I identified companies that have cut their dividends or engaged in substantial merger and acquisition ("M&A") activities over the relevant estimation window.[56] I eliminated companies with such dividend cuts because the announcement of a cut may produce disturbances in the stock prices and growth rate expectations in addition to potentially being a signal of financial distress. I generally eliminated companies with significant M&A activities because such events typically affect a company's stock price in ways that are not representative of how investors perceive its business and financial risk characteristics. For example, a utility's stock price will commonly jump upon the announcement of an acquisition to match the acquirer's bid.

Further, I require companies have an investment grade credit rating[57] and fundamentally, requirement is that the proxy companies have the necessary data available for estimation.

Q43. What are the characteristics of the Gas and Water Utility Proxy Group?

A43. The Gas and Water Utility Proxy Group is comprised of gas and water utilities whose primary source of revenues and majority of assets are subject to regulation. The final proxy group consists of the nine gas and five water utilities listed in Figure 12 below.

55 I calculate the share of assets devoted to regulated activities using information from the companies' 10-Ks for the gas and water utilities.

56 As described in Sections V.B, the CAPM requires five years of historical data, while the DCF relies on current market data.

57 In some cases, a proxy company does not have a credit rating from any of the major rating agencies. However, if they were to be rated, they would receive an investment grade rating. In these instances, I assign the company the average credit rating of the rest of the proxy group.

Line
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All companies are engaged in the distribution of a commodity to end customers through a network of pipes and mains. While the product differ across gas and water utilities, they are all focused on distribution, a mix of residential, commercial and industrial customers and all are regulated. Further, the proxy group companies have credit ratings in the range of BBB to A+, which is consistent with DTE's credit rating albeit the average for the proxy companies is slightly higher.

Figure 12 reports the proxy companies' annual revenues for the most recent four quarters as of Q2, 2019 and also reports the market capitalization, credit rating, beta and growth rate. The annual revenue as well as the market cap was obtained from Bloomberg. The credit ratings are reported by Bloomberg. The growth rate estimate is a weighted average between estimates from Thomson Reuters and *Value Line*. Betas were obtained from *Value Line.*

Figure 12
Gas and Water Proxy Group

Company	Annual Revenue (Q2 2019) ($MM)	Regulated Assets	Market Cap. (Q2 2019) ($MM)	S&P Credit Rating	Long-Term Growth Estimate	Value Line Beta
	[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	$2,903	M	$12,430	A	6.6%	0.60
Chesapeake Utilities	$700	R	$1,538	A-	9.3%	0.65
New Jersey Resources	$2,760	R	$4,491	A-	6.6%	0.70
NiSource Inc.	$5,237	R	$10,787	BBB+	5.6%	0.55
Northwest Natural	$727	M	$2,094	A	6.9%	0.60
ONE Gas Inc.	$1,654	R	$4,782	A	6.7%	0.65
South Jersey Inds.	$1,796	R	$3,070	BBB	13.1%	0.80
Southwest Gas	$3,001	M	$4,830	BBB+	7.3%	0.70
Spire Inc.	$1,966	R	$4,288	A-	4.4%	0.65
Amer. States Water	$462	R	$2,735	A+	9.0%	0.65
Amer. Water Works	$3,521	R	$21,123	A	7.5%	0.60
California Water	$692	R	$2,414	A+	8.4%	0.70
Middlesex Water	$136	R	$992	A	3.3%	0.70
York Water Co. (The)	$50	R	$453	A-	11.5%	0.75

Sources and Notes:
[1]: Bloomberg as of August 30, 2019.
[2]: Key R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
D - Diversified (Less than 50% of assets regulated).
Source: Calculations based on EEI definitions and Company 10-Ks.
[3]: See Schedule No. BV-3 Panels A through I.
[4]: Bloomberg as of August 30, 2019.
[5]: See Schedule No. BV-5.

Q44. How do the proxy companies compare to DTE gas in terms of financial metrics?

A44. DTE Gas regulated operations expects to generate revenues of $175-$183 in 2019 according to DTE's investor presentation.[58] Compared to the annual revenues of the proxy companies, DTE Gas is smaller than all but two of the water utilities. DTE Gas' unsecured credit rating at BBB+ is towards the lower end of the comparable companies. Lastly, as noted above, DTE Gas is a regulated distribution company as is the proxy companies.

[58] https://s24.q4cdn.com/970999156/files/doc_quarterly_earnings/2019/q2/Q2.19-presentation-FINAL-(1).pdf

Q45. What regulatory capital structure did you use for DTE Gas?

A45. As recommended by DTE Gas, I use a capital structure including 52 percent equity in my recommendation.

B. THE CAPM BASED COST OF EQUITY ESTIMATES

Q46. Please briefly explain the CAPM.

A46. CAPM assumes the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 2 in Section III), in which the required expected return on an asset (above the risk-free return) is proportional to that asset's relative risk as measured by that asset's beta.

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is determined by the risk-free rate plus the stock's systematic risk (as measured by beta) multiplied by the market risk premium. Mathematically, the relationship is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \qquad (1)$$

- $\boldsymbol{r_S}$ 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 the investment S; and
- $\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model," which operates on the principle (corroborated by empirical data) that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment, whose returns do not vary relative to market returns, should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 2), whereas investments of the same risk as the overall market (*i.e.*, those that by definition have average systematic market risk) are

priced so as to expect to return the risk-free rate plus the MRP. Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the MRP.

1. Inputs to the CAPM

Q47. What inputs does your implementation of the CAPM require?

A47. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the MRP, as well as a measure of the stock's beta. There are several choices and sources of data that inform the selection of these inputs. I discuss these issues below. (Additional technical detail, along with a discussion of the finance theory underlying the CAPM is provided in Appendix B.)

Q48. What value did you use for the risk-free rate of interest?

A48. I use the yield on a 20-year U.S. Treasury bond as the risk-free asset for purposes of my analysis. I rely on a forecast of what Treasury bond yields will be in 2021. Specifically, *Blue Chip Economic Indicators* project that the yield on a ten-year Government Bond will be 3.1 percent by 2021.[59] I adjust this value upward by 50 basis points ("bps"), which is my estimate of the representative historical maturity premium for the 20-year over the ten-year Government Bond. This produces a basic risk-free rate of 3.6 percent for 2021.

I consider this a conservative estimate as the spread between the yield on A-rated (BBB-rated) utility bonds and the 20-year Treasury bond is elevated by approximately 40 (55) basis points relative to the spread's long-run average as shown in Appendix B, Figure B-1. Thus, an adjustment for yield spread might be warranted. However, because the forecasted risk-free rate has declined in recent months, I conservatively do not add such spread.

Alternatively, the increase in yield spread can be viewed as an increase in the return investors require to hold assets that are not risk-free; i.e., an increase in the Market Risk Premium ("MRP"). I consider this possibility in a second scenario, where I rely on a

[59] Blue Chip Economic Indicators, March 2019, p. 3.

forecasted MRP and in turn subtract 25 basis points from the risk-free rate reported by Blue Chip and adjusted for the maturity premium. I do this because the CBO as of August 2019 forecast a lower yield on the 10-year Treasury bond going forward than does Blue Chip Economic Indicators.[60] In this scenario, I consider the plausible elevation in the MRP using three benchmarks: (i) I evaluate what increase in the MRP the 41 bps increase in the yield spread indicates, (ii) look to Bloomberg's forecasted MRPs and (iii) look to the forecasted MRP using FERC's methodology. All three considerations shown an increase in the MRP over and above the historical average at between 38 basis points (Bloomberg) and over 243 basis points (FERC Method). Consequently, I consider an increase of 100 basis points in Scenario II, which is below that indicated by the increase in yield spread and the FERC methodology. This increase in the MRP is in turn consistent with a reduction in the risk-free rate of 25 basis points – details are in Appendix B, pp. 8-9.

Q49. What value did you use for the MRP?

A49. 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. Rather, it must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds a long historical period.[61] The average market risk premium from 1926 to the present (2018) is 6.91 percent.[62] I use this value of the MRP along with a risk-free rate of 3.60 percent in one of my CAPM scenarios.

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[60] This is a deviation from my prior practices and was done to ensure I took current forecasts into account as Blue Chip has yet to publish an update to its March 2019 forecasts. I.e., the use of the CBO forecast to reduce the risk-free forecast relative to that obtained from Blue Chip is conservative.

[61] The longest period for which Duff & Phelps reports data is 1926 to current. Based on financial textbooks such as Ross, Westerfield and Jaffe, "*Corporate Finance*," 10'th Edition, 2013, pp. 324-327, I use the longest period for which reliable estimates are available – in this case 1926 to 2018.

[62] Duff & Phelps, *Ibbotson SBBI 2019 Valuation Yearbook* 10-21.

I also use a forward-looking MRP of 7.91 percent, which I use in combination with a lower risk-free rate of 3.35 percent.

The 7.91 percent MRP was chosen by looking to forecasted MRPs and the increase in yield spread discussed above. Specifically, Bloomberg's forward-looking market-implied MRP is currently estimated at approximately 7.29 percent (when expressed relative to 20-year bond yields)[63] and was above the 6.91 percent long-term historical average.[64] At the same time, I recently estimated a MRP of 9.34 percent using the methodology in FERC's NETO Briefing Order.[65]

Lastly, the increase in yield spread can be used to provide a quantitative benchmark for the implied increase in MRP based on a paper by Edwin J. Elton, et al., which documents that the yield spread on corporate bonds is normally a combination of a default premium, a tax premium, and a systematic risk premium.[66] Of these components, it is the systematic risk premium that likely explains the vast majority of the yield spread increase. In other words, unless the risk-free rate is underestimated as described above, the market equity risk premium has increased relative to its "normal" level.[67] For example, assuming a beta of 0.25 for A rated debt[68] means that an increase in the MRP of one percentage point

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63 See Figure 5 above.

64 As noted earlier, the reliance on a forecasted MRP based on the methodology used in the NETO Remand Order would result in a higher MRP of about 9.34% over my forecasted risk-free rate, while the FERC Staff witness recommendation corresponds to an MRP of 7.9 to 8.15% over the 20-year Treasury Bond.

65 Attached as Exhibit D5.18.

66 "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, *The Journal of Finance*, February 2001, pp. 247-277.

67 In theory, some of the increase in yield spread for A rated debt may be due to an increase in default risk, but the increase in default risk for A rated debt is undoubtedly very small because utilities with A range rated debt have a low default risk. This means that the vast majority—if not all—of the increase in A rated yield spreads is due to a combination of the increased systematic risk premium and the downward pressure on the yields of government debt. Although there is no increase in the tax premium discussed in the Elton et al. paper due to coupon payments, there may be some increase due to a small tax effect resulting from the probability of increased capital gains taxes when the debt matures.

68 Elton, *et al*. estimates the average beta on BBB-rated corporate debt as 0.26 over the period of their study, and A-rated debt will have a slightly lower beta than BBB-rated debt. I note that 0.25 is a conservatively high estimate of the beta on A-rated utility debt. Most academic estimates, including those presented in *Berk & Demarzo* that I utilize for my Hamada adjustments are significantly lower: in the range of 0.0 – 0.1 percent and would result in a substantially higher MRP estimate.

translates into a ¼ percentage point increase in the risk premium on A rated debt (i.e., 0.25 (beta) times 1 percentage point (increase in MRP) = ¼ percentage point increase in yield spread). Thus, a 25 bps increase in the yield spread is therefore consistent with a 1.0 percentage point increase in the MRP ($\frac{0.25\%}{0.25} = 1.0\%$). Thus, there is evidence that the current MRP is higher than the historical MRP of 6.91 percent.[69]

The fact that recent forward-looking estimates of the MRP exceeded the historical average level is consistent with the broader body of evidence that risk premiums have remained elevated relative to their pre-financial crisis levels. (See Section IV above.)

Therefore, I believe the 6.91 percent long-term historical average MRP value I rely on is a low-end estimate of what the market risk premium will be during the period at issue in this proceeding. I similarly believe that the 7.91 percent I rely on for my Scenario 2, a 100 basis point increase relative to the MRP in Scenario 1, is a good approximation for the forward-looking MRP.

Q50. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A50. The parameters are displayed in Figure 13 below. As discussed above, I consider two scenarios; in each case, the risk-free interest rate represents Blue Chip Economic Indicators projection for the ten-year Treasury Yield to prevail in 2020, adjusted to a 20-year horizon. However, I consider that the elevated spread between the yield on A rated utility bonds and 20-year Treasury bonds could either be reflected predominantly in the risk-free rate (Scenario 1) on in the MRP (Scenario 1). The MRP is the long-term historical arithmetic average of annual realized premiums of U.S. stock market returns over long-term (approximately 20-year maturity) Treasury bond income returns from 1926 to 2018 as reported by Duff and Phelps in Scenario 1. In Scenario 2, I look to the forecasted yield from Bloomberg, recent forecasts using FERC's recently suggested

[69] While this analysis indicate an increase of upward 40/25 or 160 basis points in the MRP, I chose to increase the MRP by only 100 basis point and consistently with that reduced the risk-free rate by 25 basis points.

methodology, and looking to reflecting the yield spread in the MRP rather than in the risk-free rate.

Figure 13
Parameters in Risk Positioning Analyses

	Scenario 1	Scenario 2
Risk-Free Interest Rate	3.60%	3.35%
Market Risk Premium	6.91%	7.91%

Q51. What betas did you use for the companies in your proxy groups?

A51. I used *Value Line* betas, which are estimated using the most recent five years of weekly historical returns data.[70] The *Value Line* levered equity betas are reported in Figure 12 above. Importantly, as explained in Section III.B above, these betas—which are measured (by *Value Line*) using the market stock return data of the proxy companies—reflect the level of financial risk inherent in the proxy companies' market value leverage ratios over the estimation period. Because DTE Electric's regulatory capital structure includes a substantially higher proportion of debt financing compared to the proxy companies, the financial risk associated with an equity investment in DTE Electric's rate base is correspondingly greater than the financial risk borne by investors in the proxy companies' publicly traded stock.[71]

Consequently, standard textbook techniques are applied to unlever the *Value Line* betas reported in Figure 12 above and relever the resulting asset betas at DTE Gas' regulatory capital structure. See Exhibit A-14 Schedules D5.13 and D5.15.[72]

[70] See Value Line Glossary, accessible at http://www.valueline.com/Glossary/Glossary.aspx

[71] A further detailed discussion is contained in Appendix B, Section III.

[72] The Technical Appendix (Appendix B) to this testimony provides a detailed description of the standard textbook formulas used to implement the "Hamada" technique for unlevering measured equity betas based on the proxy companies' capital structures to calculate "asset betas" that measure the proxy companies' business risk independent of the financial risk impact of differing capital structures. The proxy group average asset betas are then relevered at the target capital structure (i.e., DTE's regulatory capital structure), with the precise relevered beta depending on the specific version of the unlevering/relevering formula employed.

2. The Empirical CAPM

Q52. What other equity risk premium model do you use?

A52. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[73] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 2, which results in a Security Market Line that more closely matches the results of empirical tests. This adjustment is portrayed in Figure 14 below. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

[73] *See* Figure B-2 in Appendix B for references to relevant academic articles.

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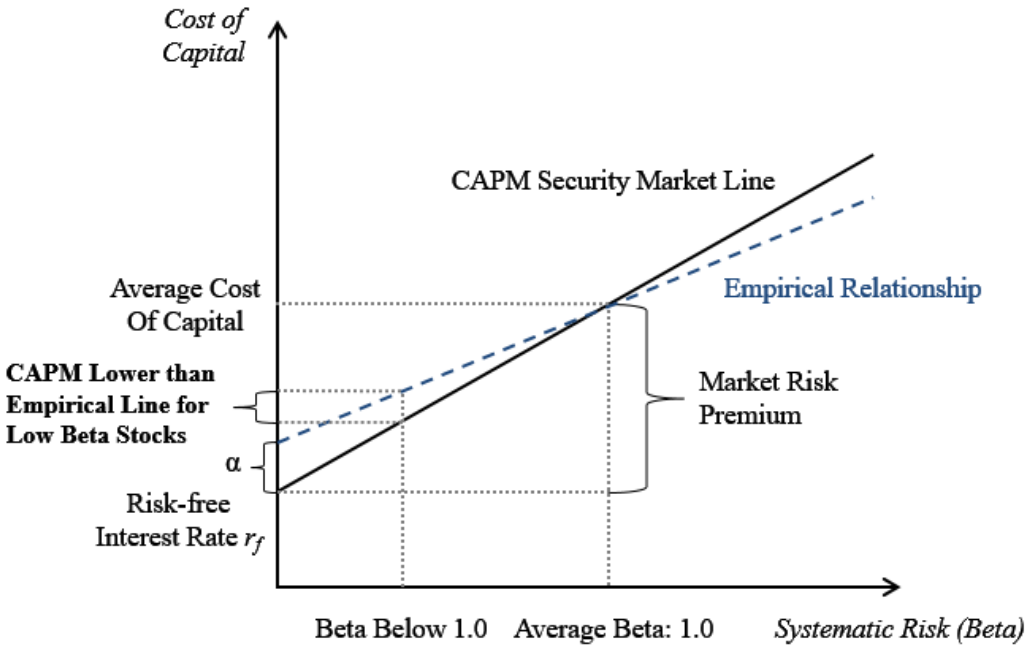
Figure 14
The Empirical Security Market Line



Q53. Why do you use the ECAPM?

A53. Academic research finds that the CAPM has not generally performed well as an empirical model. One of its short-comings is directly addressed by the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. In summary, these studies estimate alpha parameters that range between 1%[74] and 7.32%.[75] I apply an alpha parameter of 1.5% in my application of the ECAPM. Appendix B Section II.C provides further

[74] Black, Fischer. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

[75] Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

discussion of the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

3. Results from the CAPM Based Models

Q54. Please summarize the results of the CAPM-based models.

A54. The results of CAPM and ECAPM estimation for the two proxy groups are presented in Figure 15 below. The ranges of results for each model (CAPM and ECAPM) reflect the application of different specific versions of the textbook formulas used to account for the impact of different financial leverage on financial risk.

Figure 15
CAPM / ECAPM Summary at 52% Equity

Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Gas Sample		
Financial Risk Adjusted Method		
CAPM	9.7%	10.2%
ECAPM (α = 1.5%)	10.3%	10.8%
Hamada Adjustment Without Taxes		
CAPM	9.3%	9.8%
ECAPM (α = 1.5%)	9.5%	10.1%
Hamada Adjustment With Taxes		
CAPM	9.0%	9.6%
ECAPM (α = 1.5%)	9.4%	9.9%
Water Sample		
Financial Risk Adjusted Method		
CAPM	10.7%	11.3%
ECAPM (α = 1.5%)	11.4%	12.0%
Hamada Adjustment Without Taxes		
CAPM	10.1%	10.8%
ECAPM (α = 1.5%)	10.2%	10.9%
Hamada Adjustment With Taxes		
CAPM	9.7%	10.3%
ECAPM (α = 1.5%)	9.9%	10.5%

Sources and Notes:
[1]: Long-Term Risk Free Rate of 3.60%, Long-Term Market Risk Premium of 6.91%.
[2]: Long-Term Risk Free Rate of 3.35%, Long-Term Market Risk Premium of 7.91%.

Q55. How do you interpret the results of your CAPM and ECAPM Analyses?

A55. Looking to Figure 15 above, the results range from 9.0 percent to 12.0 percent with a majority of the results in the range of 9.5 to 10.75 percent.[76] As discussed above, the established academic evidence indicates that the traditional CAPM tends to understate the cost of equity for lower-than-average risk companies such as those in Figure 12

[76] I round to the nearest 0.25% when determining ranges of reasonable results. Clearly, there are numbers below 9% and numbers above 10.75% in the table, but if rounding to the nearest .25%, I have a small number of observations above and below the range (2 below and 4 above, while 18 are within the range).

above, so the ECAPM may be more applicable. In recognition of the decision in U-18999, I emphasize that the exclusion of figures above 10.75 percent eliminates the high end of the range that was determined applying the financial risk adjusted method to the water sample. Thus, considering the Hamada methodology only a range of 9.5 to 10.0 percent representative for the Gas Sample, while the Water Sample indicates a range of 9.75 to 10.75 percent. I consider both samples informative.

C. DCF BASED ESTIMATES

Q56. Can you describe the DCF model's approach to estimating the cost of equity?

A56. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. 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—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

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

Where,

$\boldsymbol{P_0}$ is the current market price of the stock;

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate r that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume that the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to directly estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \quad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model, in honor of its originator, Professor Myron J Gordon.

Q57. Are there other versions of the DCF model?

A57. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[77] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [78]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, with that growth then tapering over the next five years toward the growth rate of the overall economy (*i.e.*, the long-term GDP growth rate forecasted to be in effect ten years or more into the future). I note that the multi-stage DCF model likely understates the cost of

77 The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

78 See Appendix B, Section I for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

equity as it is plausible the payout ratio changes and a company reaches steady-state growth. The model ignores that possibility.

1. DCF Inputs and Results

Q58. What growth rate information do you use?

A58. The first step in my DCF analysis (either constant growth or multi-stage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates for companies in my proxy group. For the single-stage DCF and for the first stage of the multi-stage DCF, I use investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term U.S. GDP growth forecast of 4.0 from Blue Chip Economic Indicators.[79] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Q59. What are the pros and cons of the input data?

A59. Both the Gordon Growth and single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for three - five years. In the multi-stage version, I taper these growth rates toward a stable growth rate corresponding to a forecast of long-term GDP growth for all companies.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies distribute cash to shareholders via share repurchases, a DCF model that uses dividends as the payment to shareholders will under-estimate the cost of equity capital.

[79] See Blue Chip Economic Indicators, March 2019, p. 14.

Q60. Please summarize the DCF-based cost of equity estimates for the proxy groups.

A60. The results of the DCF based estimation for the proxy groups are displayed below in Figure 16.

Figure 16
DCF Model Results at 52% Equity

	Simple	Multi-stage
	[1]	[2]
Gas Sample	12.1%	8.7%
Water Sample	13.4%	8.1%

Q61. How do you interpret the results of your DCF analyses?

A61. The DCF models are estimated based on dividend yields that may be expected to increase as interest rates continue to rise in the coming months and years. As Price / Earnings ratios change with interest rates, so does the dividend yield (assuming a reasonable constant payout ratio). As a consequence, the dividend yield is more likely to be under estimated than over estimated going forward. At the same time, the Blue Chip forecasted GDP growth is well below the GDP growth the U.S. recently has experienced, so if the 2018 and first half of 2019 GDP growth pattern continues, the multi-stage model will incorporate a GDP growth that is too low.[80] Therefore, I believe the multi-stage DCF model is downward biased in that it suffers from both of these effects. As a result I acknowledge that the single-stage DCF model makes the strong assumption that current three-to-five year Earnings Per Share growth expectations will persist into perpetuity, I conclude that a reasonable low-end estimate is higher than the multi-stage DCF model's results, while the high end is lower than the single-stage DCF model's results. Looking

[80] Blue Chip's forecasted GDP growth was 4.0% at the time of estimation, while the realized nominal GDP growth for 2018 per the Bureau of Economic Analysis is 5.2% (real GDP of 2.9% plus inflation of 2.3%). The 2019 GDP growth to date has been approximately 4.9%. Source: https://www.bea.gov/system/files/2019-05/gdp1q19_2nd_0.pdf.

to the gas sample, I find a range of 9.25 to 11.0 percent reasonable, while the water sample indicates a higher range.[81]

D. RISK PREMIUM MODEL ESTIMATES

Q62. Did you estimate the cost of equity that results from an analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A62. Yes. In this type of analysis, sometimes called the "risk premium model," the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \quad (5)$$

Q63. What are the merits of this approach?

A63. First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied-upon figure is directly applicable to a rate base. Second, the allowed returns are readily observable to market participants, who will use this one data input in making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

[81] 9.25 percent is equivalent to the multi-stage result plus 50 bps, while 11.0 percent is equivalent to the single-stage result minus 100 bps. The average of the DCF results is 10.4 percent for the gas sample and 10.75 percent for the water sample. These are reasonable point estimate for the DCF model.

Line No.

Q64. How did you use rate case data to estimate the risk premiums for your analysis?

A64. The rate case data from 1990 through Q2 2019 is derived from Regulatory Research Associates.[82] Using this data, I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in electric utility and electric distribution rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[83] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium = A_0 + A_1 \times (Treausury\ Bond\ Yield) \quad (6)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and found that the regression has a high degree of explanatory power in a statistical sense. I report my results for the respective classifications of rate cases below in Figure 17.[84] I note that the results displayed in Figure 17 below shows that the risk premium model fits the data well as the R-squared is above 80% and R-squared is a measure of how well the data fits the model. An R-squared above 0.8 indicates a solid result.

Figure 17
Implied Risk Premium Model Estimates

	R Squared	Estimate of A_0	Estimate of A_1	Implied Cost of Equity Range	
	[1]	[2]	[3]	[4]	[5]
Natural Gas Utility	0.853	8.40%	-0.545	9.9%	10.0%

Sources and Notes
[1]-[3]: Estimated using SNL Rate Case data as of 7/31/2019 and Bloomberg Treasury yield data as of 8/30/2019.
[4]: Risk-free Rate of 3.35% (includes utility yield spread adjustment of -0.25%).
[5]: Risk-free Rate of 3.60% (includes utility yield spread adjustment of 0.00%).

82 SNL Financial as of September 2019.

83 I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

84 Exhibit A-14, Schedule D5.16 contains my risk premium analysis.

The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above the risk premium declined by less than the increase in Treasury bond yields. Therefore, the allowed ROE on average declined by less than 100 bps when the government bond yield declined by 100 bps. Based on this analysis, I find that the current market conditions are consistent with an ROE of 9.9 to 10.0 percent for natural gas distribution utilities.

Q65. What conclusions did you draw from you risk premium analysis?

A65. The results in Figure 17 indicate a ROE of 9.9 to 10.0 percent for an average gas distribution utility based on the risk premium model, which is consistent with the middle of my estimates. While the risk premium model based on historical allowed returns is not underpinned by fundamental finance principles in the manner of the CAPM or DCF models, I believe that this analysis, when properly designed and executed and placed in the proper context, is a valid and useful approach to estimating utility ROE. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision that granted an ROE used in the analysis was issued, it provides a useful benchmark for the cost of equity in any interest environment. Because it relies on the returns for regulated utilities, I believe this method provides a good way to directly assess whether the ROE is commensurate with that available to alternative regulated investments of similar risk.

Q66. Please summarize your results before considering where to place DTE Gas.

A66. Figure 18 below summarizes the reasonable ranges of results I obtained above with the risk premium results focused on natural distribution utilities and the CAPM results based on the Hamada as opposed to the financial risk adjusted methods.

Figure 18
Summary of Reasonable Ranges

	Gas Sample			Full Sample		
CAPM	9.25%	-	9.75%	9.50%	-	10.25%
ECAPM	9.50%		10.00%	9.50%		10.75%
DCF	9.25%	-	11.00%	9.25%	-	11.25%
Risk Premium	9.90%	-	10.00%	na	-	na
Average	9.48%	-	10.19%	9.42%	-	10.75%

VI. DTE GAS SPECIFIC CIRCUMSTANCES AND ROE RECOMMENDATION

A. BUSINESS RISK CHARACTERISTICS

Q67. Are there any differences in the regulatory environment in which the comparable companies and DTE Gas operates?

A67. Like many of the sample companies, DTE Gas benefits from certain regulatory policies that reduce regulatory lag, including a forward test year for rate cases, and an annual recovery mechanism for expenses such as fuel. DTE Gas also has a decoupling mechanism. However, many of these mechanisms are similar to those of the majority of the sample companies. For example, SNL reports that more than half of U.S. jurisdictions use decoupling mechanisms and all have a fuel recovery mechanism.[85]

Q68. Are there any specific area in which DTE Gas has higher risk than the sample?

A68. Yes. As discussed in, for example, the MBA text of Brealey, Myers and Allen, discuss how operating leverage – the proportion of fixed cost in its cost structure – affect business risk.[86] Additionally, undertaking construction projects is challenging and can add risk to the utility. Therefore, I examined the capital intensity and the capital expenditures of the sample companies and DTE Gas. Figure 19 below summarizes the capital expenditures since 2012 for DTE Gas and the median of the sample companies, while Figure 20 provides data for the individual sample companies.

[85] SNL, "RRA Regulatory Focus: Adjustment Clauses – A State-by-State Overview," September 28. 2018.

[86] Brealey, Myers & Allen, "Principles of Corporate Finance," 10th Edition, 2011, pp. 248-249

It is clear from the figures below that DTE Gas is engaged in a relatively larger capital expenditure program than the sample companies in recent years. This is confirmed in Exhibit A-14, Schedule D5.17, which shows revenues to property, plant, and equipment ("PP&E") for both DTE Gas and the sample companies. Here it is shown that DTE Gas is relatively more capital intensive meaning that it has lower revenue to total PP&E than the sample companies. Specifically, while DTE on average has revenue of $0.307 for each dollar of PP&E, the sample on average has revenue of $0.348 for each dollar of PP&E. Looking to the gas utilities, they have on average revenues of more than 42 cents for each dollar of PP&E as compared to DTE Gas' 30.7 cents.

Figure 19: Median Capital Expenditures for Sample and DTE

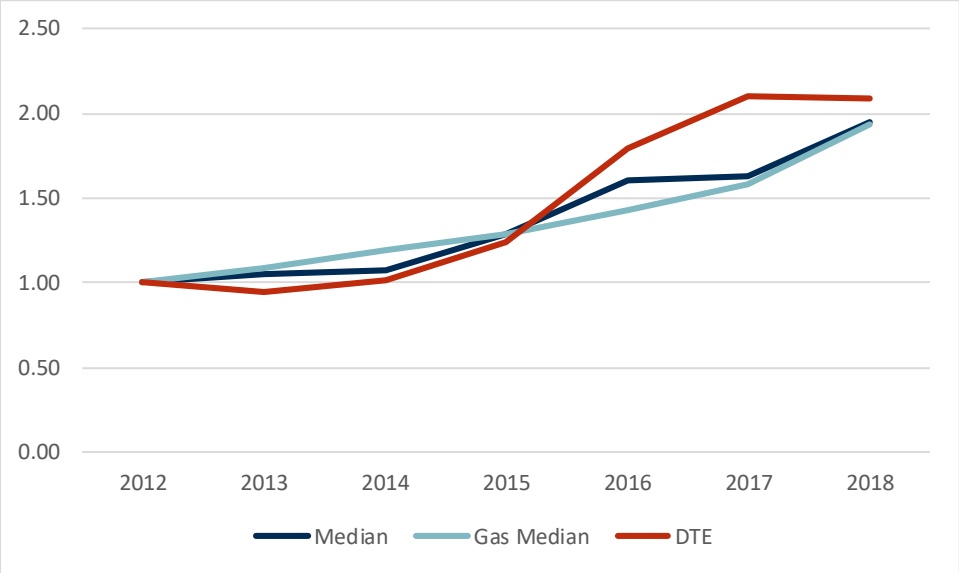
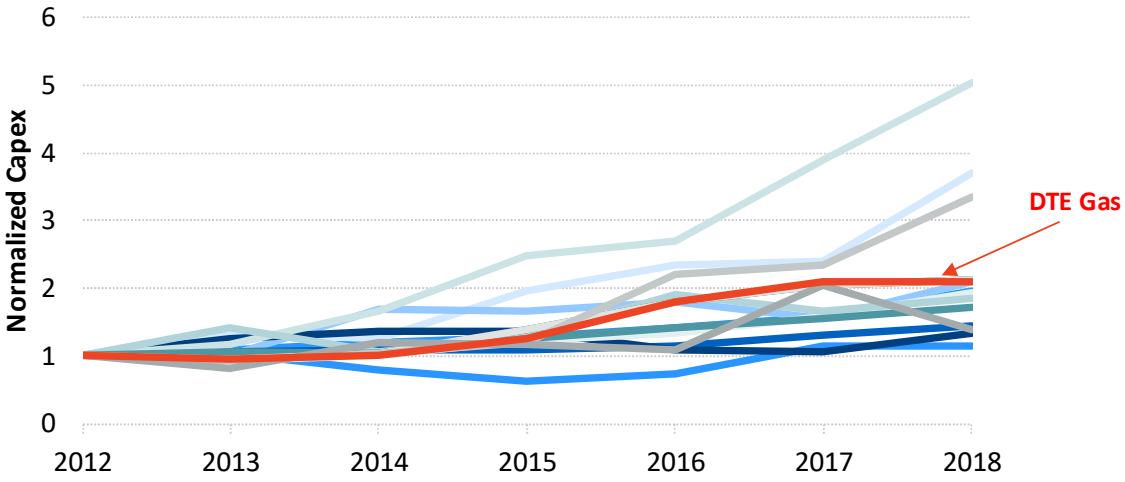


Figure 20: Detailed Capital Expenditure Summary



Source: DTE data and CapIQ.

Q69. How does the capital intensity and capital expenditure affect DTE Gas' business risk?

A69. All else equal the higher capital expenditures and capital intensity makes DTE Gas more risky than its peers.

Q70. How does the business risk of DTE Gas compare to that of the sample?

A70. Like the sample companies, DTE Gas' business is concentrated in regulated gas distribution industry. It also has a credit rating (BBB+) that is comparable to slightly below that of the sample companies.

Regulatory policy plays a role in the business risk of the Company. In the current environment of declining energy demand and an emphasis on decreasing carbon emissions, there is some uncertainty about DTE's future demand. Additionally, DTE Gas has relatively a higher capital intensity and capital expenditure program than the sample companies.

Q71. How does the state of the economy in DTE Gas' service territory affect the Company's business risk?

A71. The economy of Detroit has improved over the last few years. However, the risk of under-recovery of DTE Gas' fixed costs due to its reliance on volumetric charges to recover fixed costs is increased by the state of Michigan's economy relative to the other companies in the sample and this is magnified by DTE Gas' relatively higher PP&E to revenue.

Michigan's economy is heavily dependent upon the auto industry, and Detroit's economy in particular is currently weak. The City of Detroit ("City"), which was in bankruptcy until December 10, 2014, is recovering, but it continues to experience a high unemployment rate and according to recent census data, Detroit is among the poorest cities in the country.[87] The City has experienced falling population year-over-year since 2005.

The weak local economic conditions and declining population and industrial activity in the Company's service territory contribute to and exacerbate the effect of declining sales, which—in conjunction with a rate structure that relies on volumetric charges to recover

[87] https://www.mlive.com/news/2019/09/flint-and-detroit-among-nations-top-5-poorest-cities-new-census-data-shows.html

fixed costs—increases the downside risk that DTE Gas may not be able to earn its authorized return.

Q72. Can you please summarize your assessment of DTE Gas' business risk relative to the sample?

A72. Compared to the sample, DTE Gas is engaged in the same line of business, has a comparable credit rating and access to similar regulatory mechanisms. However, DTE Gas has relatively higher capital intensity, higher capital expenditure in recent years and operates in a challenging locality. As a result, DTE Gas is more risky than the average or median of the sample profile.

VII. COST OF CAPITAL RECOMMENDATION

Q73. Please summarize your conclusions regarding DTE Gas' risk and the necessary return.

A73. I find that DTE gas to be of higher than average risk relative to the sample companies and merits placement in the upper end of the reasonable range that I summarized in Figure 18 above. I therefore recommend that DTE Gas be placed in the upper end of the reasonable range.

Q74. What do you recommend for DTE Gas' cost of equity in this proceeding?

A74. I find a range of approximately 9.5 to 10.75 percent to be the reasonable range for DTE Gas and recommend that DTE Gas be placed towards the upper end of that range. Specifically, I recommend an allowed ROE of 10.5 percent. This recommendation is at the upper end of the reasonable range I obtained from the DCF, CAPM and Risk Premium models, considering both the Gas Sample and the Full Sample.

Q75. Does this conclude your direct testimony?

A75. Yes, it does.