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June 25, 2024

Lisa Felice  
Executive Secretary  
Michigan Public Service Commission  
7109 West Saginaw Highway  
Lansing, MI 48917

RE: In the matter of the Application of **DTE ELECTRIC COMPANY** for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority  
MPSC Case No. U-21534

Dear Ms. Felice:

Attached for electronic filing in the above captioned matter is DTE Electric Company's Revised Direct Testimony of Dr. Bente Villadsen and Revised Exhibit A-14, Schedule D5.18. Dominion Energy has been removed from the electric sample group in Revised Exhibit A-14, Schedule 5.18. Removal of Dominion Energy from the exhibit results in a change to Dr. Villadsen's direct testimony on p. 43, line 5: 9% changes to 8%. Redline versions of Dr. Villadsen's revised testimony and exhibit have been provided to the parties for ease of reference.

Also attached is the Proof of Service.

Very truly yours,

John A.  
Janiszewski

Digitally signed by John A.  
Janiszewski  
Date: 2024.06.25 12:50:27  
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John A. Janiszewski

JAJ/erb  
Attachments  
cc: Service List

**BEFORE THE  
MICHIGAN PUBLIC SERVICE COMMISSION**

**DTE ELECTRIC COMPANY**       )  
                                          )  
                                          ) **Case No. U-21534**  
                                          )  
                                          )

**REVISED DIRECT TESTIMONY  
OF  
DR. BENTE VILLADSEN**

**LIST OF TOPICS ADDRESSED:  
COST OF COMMON EQUITY CAPITAL**

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BEFORE THE  
MICHIGAN PUBLIC SERVICE COMMISSION

DTE ELECTRIC COMPANY                    )  
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                                                          )  
                                                          )

DIRECT TESTIMONY OF DR. BENTE VILLADSEN

1    **I.    INTRODUCTION AND PURPOSE**

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

3    A1.    My name is Bente Villadsen (she her hers). I am a Principal of The Brattle Group,  
4            whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts,  
5            02108.

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

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

12   **Q3.    Briefly describe your education and professional qualifications.**

13   A3.    I have 24 years of experience working with regulated utilities on cost of capital and  
14            related matters. My practice focuses on cost of capital, regulatory finance, and  
15            accounting issues. I am the co-author of the text, “Risk and Return for Regulated  
16           Industries”<sup>1</sup> and a frequent speaker on regulated finance at conferences and webinars.

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1    Bente Villadsen, Michael J. Vilbert, Dan Harris, A. Lawrence Kolbe, “*Risk and Return for Regulated Industries*,” Academic Press, 2017.

1 I have testified or filed expert reports on cost of capital in Alaska, Arizona, California,  
2 Hawaii, Illinois, Iowa, Michigan, New Mexico, New York, Ohio, Oregon, Virginia and  
3 Washington, as well as before the Bonneville Power Administration, Federal Energy  
4 Regulatory Commission, the Surface Transportation Board, the Alberta Utilities  
5 Commission, the Ontario Energy Board, Quebec's Régie de l'Énergie and Barbados'  
6 Fair Trading Commission. I have provided white papers on cost of capital to the British  
7 Columbia Utilities Commission, the Canadian Transportation Agency as well as to  
8 European and Australian regulators on cost of capital. I have testified or filed testimony  
9 on regulatory accounting issues before the Federal Energy Regulatory Commission  
10 ("FERC"), the Regulatory Commission of Alaska, the Michigan Public Service  
11 Commission, the Texas Public Utility Commission as well as in international and U.S.  
12 arbitrations and regularly provide advice to utilities on regulatory matters as well as  
13 risk management.

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

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

18 A4. DTE Electric Company ("DTE Electric", the "Company", or "DTEE") has asked me  
19 to estimate the cost of equity that the Michigan Public Service Commission (the  
20 "Commission") should allow DTE Electric an opportunity to earn on the equity-  
21 financed portion of its regulated utility rate base. My recommendation also considers  
22 the business and financial risk of the Company relative to the proxy companies to arrive  
23 at my recommendation for the allowed Return on Equity ("ROE").

1 **Q5. Are you sponsoring any exhibits?**

2 A5. Yes. I am sponsoring Exhibit A-14, Schedule D5.1 through Schedule D5.19, which  
3 contains the details of my analysis and supporting tables. Specifically, I sponsor the  
4 following exhibits:

| <u>Exhibit</u> | <u>Schedule</u> | <u>Description</u>                                                        |
|----------------|-----------------|---------------------------------------------------------------------------|
| A-14           | D5              | Cost of Common Equity                                                     |
| A-14           | D5.1            | Table of Contents                                                         |
| A-14           | D5.2            | Classification of Companies by Assets                                     |
| A-14           | D5.3            | Market Value of the Sample                                                |
| A-14           | D5.4            | Capital Structure Summary of the Electric Sample                          |
| A-14           | D5.5            | Estimated Growth Rates of the Electric Sample                             |
| A-14           | D5.6            | DCF Cost of Equity of the Electric Sample                                 |
| A-14           | D5.7            | Overall After-Tax DCF Cost of Capital of the Electric Sample              |
| A-14           | D5.8            | DCF Cost of Equity at DTE Electric's Proposed Capital Structure           |
| A-14           | D5.9            | Risk-Free Rates                                                           |
| A-14           | D5.10           | Risk Positioning Cost of Equity of the Electric Sample                    |
| A-14           | D5.11           | Overall After-Tax Risk Positioning Cost of Capital of the Electric Sample |

|      |       |                                                                                                    |
|------|-------|----------------------------------------------------------------------------------------------------|
| A-14 | D5.12 | Risk Positioning Cost of Equity at DTE Electric's Proposed Capital Structure                       |
| A-14 | D5.13 | Hamada Adjustment to Obtain Unlevered Asset Beta                                                   |
| A-14 | D5.14 | Electric Sample Average Asset Beta Relevered at DTE Electric's Proposed Capital Structure          |
| A-14 | D5.15 | Risk Positioning Cost of Equity using Hamada-Adjusted Betas                                        |
| A-14 | D5.16 | Risk Premiums Determined by Relationship Between Authorized ROEs and Long-Term Treasury Bond Rates |
| A-14 | D5.17 | FERC Market Risk Premium                                                                           |
| A-14 | D5.18 | Revised DTE Electric and Electric Sample's Generation and Capital Expenditures                     |
| A-14 | D5.19 | Available Regulatory Mechanisms                                                                    |

1   **Q6.   Were these Exhibits and the accompanying schedules prepared by you or under**  
2       **your supervision?**

3   A6.   Yes, they were.

4   **II.   SUMMARY OF CONCLUSIONS**

5   **Q7.   Can you summarize your primary conclusions and opinions on the appropriate**  
6       **allowed ROE and business risk characteristics for DTE Electric?**

7   A7.   Based on my estimation of the cost of equity for a sample of integrated electric utilities  
8       and my analysis of DTE Electric's business and financial risk relative to the electric

peer group, I find that that a comparable group of integrated electric utilities have a cost of equity in the range of 10.25 percent to 11.0 percent using data as of December 31, 2023. Given DTE Electric's higher than average business risk, allowing DTE Electric an opportunity to earn a ROE of 10.5 percent is conservative on its requested equity percentage of 50 percent. My recommendation is based on the following key observations:

- The estimated range determined by each of the implemented models is as follows:

**Figure 1: Summary of Electric Estimates at 50% Equity**

|              | Electric Sample |       |
|--------------|-----------------|-------|
|              | Low             | High  |
| CAPM / ECAPM | 10.8%           | 11.7% |
| DCF          | 9.4%            | 11.2% |
| Risk Premium | 10.5%           | 10.5% |

Based on these results, I find that the estimated cost of equity indicates a CAPM based ROE in the range 10.75 to 11.75 percent, a DCF-based ROE of 9.5 to 11.0 percent,<sup>2</sup> and a risk premium ROE of 10.5 percent.<sup>3</sup> Taking the average of the low and high results indicates a range of 10.2 percent to 11.1 percent and a midpoint of 10.65 percent.

Based on my analysis, I conclude as follows:

- DTE Electric has higher business risk than the comparable electric utilities because of (1) the lack of a revenue decoupling mechanism (2) the generation mix, which is relatively heavy into coal and nuclear, and (3) the higher than

<sup>2</sup> Looking to the single-stage DCF before any consideration of financial risk, I find an average of 10.5 percent and an average of 10.2 percent if the highest and lowest two observations are ignored.

<sup>3</sup> I do not believe that the lowest DCF estimate is reasonable due to the plausible need for substantial growth in the electricity sector to move towards a low carbon environment. However, the range derived from the average of the DCF, CAPM/ECAPM and risk premium models is, in my opinion, reasonable.

average need for infrastructure investments.<sup>4</sup> Hence the recommended ROE is conservative and a modest move towards today's indicated cost of equity.

- Treasury bond yields have increased since DTE Electric's last rate case in U-21297, so it is no surprise that the cost of equity is higher today than at the time of the U-21297 filing (February 10, 2023).<sup>5</sup>

**Q8. How is the remainder of your testimony organized?**

A8. Section III formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section III.A discusses conditions and trends in capital markets and their impact on the cost of capital. Specifically, I focus on the development in interest rates and inflation as well as the Federal Reserve's response to inflation pressures. Section V explains my analyses and presents the results. Section VI discusses DTE Electric's business risk characteristics, unique risks facing Michigan-based electric 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**

**Q9. How is the "cost of capital" defined?**

A9. The cost of capital is defined as the expected rate of return in capital markets on investments of equivalent risk. Cost of capital theory illustrates the direct relationship between risk and the expected rate of return – the higher the risk, the higher the cost of capital required. This relationship is represented in the "security market risk-return line" (or "Security Market Line" for short), which is depicted in Figure 2 below.

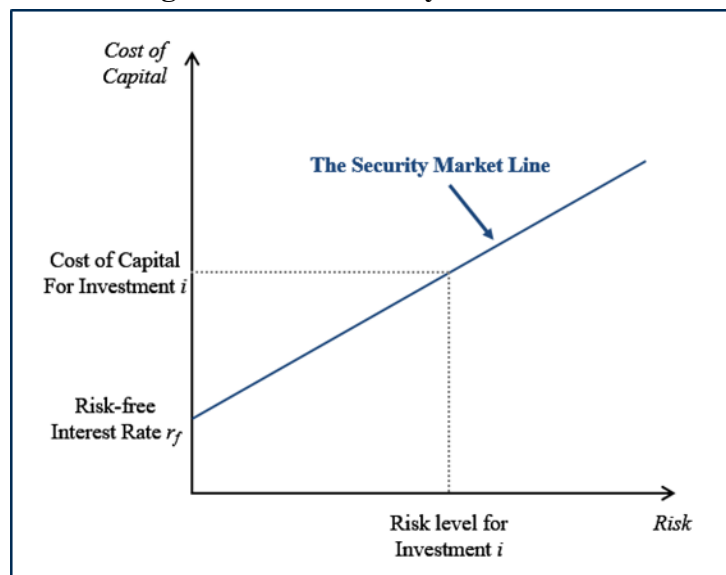
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<sup>4</sup> DTE Energy, "EEI Business Update," December 8, 2023, p. 18.

<sup>5</sup> Data relied upon in the direct testimony in U-21297 would have been obtained somewhat earlier than February 10, 2023.

The cost of capital is comprised of the cost of debt and equity. Specifically, when estimating the cost of equity for a given asset or business, two categories of risk are important: (1) business risk and (2) financial risk. Business risk reflects the degree to which the cash flows generated by a business (and its assets) vary in response to moves in the broader market. Financial risk reflects the risk from the level of debt within a business.

**Figure 2: The Security Market Line**



**Q10. What factors contribute to systematic risk for an equity investment?**

A10. 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.

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

4 **Q11. What are the guiding standards that define a just and reasonable allowed rate of**  
5 **return on rate-regulated utility investments?**

6 A11. The seminal guidance on this topic was provided by the U.S. Supreme Court in the  
7 *Hope* and *Bluefield* cases,<sup>6</sup> which found that:

- 8 • The return to the equity owner should be commensurate with returns on  
9 investments in other enterprises having corresponding risks;<sup>7</sup>
- 10 • The return should be reasonably sufficient to assure confidence in the  
11 financial soundness of the utility; and
- 12 • The return should be adequate, under efficient and economical  
13 management for the utility to maintain and support its credit and enable  
14 it to raise the money necessary for the proper discharge of its public  
15 duties.<sup>8</sup>

16 **Q12. How does the standard for just and reasonable rate of return relate to the cost of**  
17 **capital?**

18 A12. The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly  
19 aligned with the financial concept of the opportunity cost of capital.<sup>9</sup> The cost of capital  
20 is the rate of return investors can expect to earn in capital markets on alternative  
21 investments of equivalent risk.<sup>10</sup>

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<sup>6</sup> *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”).

<sup>7</sup> *Hope*, 320 U.S. at 603.

<sup>8</sup> *Bluefield*, 262 U.S. at 680.

<sup>9</sup> 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).

<sup>10</sup> 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

1 By investing in a regulated utility asset, investors are tying up some capital in that  
2 investment, thereby foregoing alternative investment opportunities. Hence, the  
3 investors are incurring an “opportunity cost” equal to the returns available on those  
4 alternative investments. The allowed return on equity needs to be at least as high as the  
5 expected return offered by alternative investments of equivalent risk or investors will  
6 choose these alternatives instead. If it is not, the utility’s ability to raise capital and  
7 fund its operations will be negatively impacted. This is a fundamental concept in cost  
8 of capital proceedings for regulated utilities such as DTE Electric.

9 **Q13. Please summarize how you considered risk when estimating the cost of capital.**

10 A13. To evaluate comparable business risk, I looked to a proxy group of regulated electric  
11 and natural gas utilities.<sup>11</sup> The electric utilities I considered have a high proportion of  
12 regulated assets and revenue, with the majority of the electric utilities having more than  
13 80% of assets subject to regulation (predominantly by state commissions).  
14 Additionally, all utilities I consider have a network of assets that are used to serve end  
15 customers and they are capital intensive (meaning that each dollar in revenue requires  
16 substantial investment in fixed assets).

17 **B. FINANCIAL RISK AND THE COST OF EQUITY**

18 **Q14. How does financial risk affect the estimation of a fair return on equity?**

19 A14. Regardless of the method used to calculate the cost of equity (versions of the CAPM,  
20 DCF and risk premium), an issue in regulatory proceedings is how to apply data from  
21 a benchmark set of comparable securities when estimating a fair return on equity for  
22 the target/regulated company.<sup>12</sup> It may be tempting to simply estimate the cost of  
23 equity capital for each of the proxy companies (using one of the above approaches) and

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asset (i.e., the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

<sup>11</sup> In past testimony on behalf of DTE Electric, I have included a gas LDC or water utility sample. Because of the substantial objection to the samples and because the samples have become smaller due to acquisitions or lack of data, I do not include such samples in this proceeding.

<sup>12</sup> This is also a common valuation problem in general business contexts.

1 average them. After all, the companies were chosen to be comparable in their business  
2 risk characteristics, so why would an investor necessarily prefer equity in one to the  
3 other (on average)?

4 The problem with this argument is that it ignores the fact that underlying asset risk (*i.e.*,  
5 the risk inherent in the lines of business in which the firm invests its assets) for each  
6 company is typically divided between debt and equity holders. The firm's debt and  
7 equity are therefore financial derivatives of the underlying asset return, each offering a  
8 differently structured claim on the cash flows generated by those assets. Even though  
9 the risk of the underlying assets may be comparable, a different capital structure splits  
10 that risk differently between debt and equity holders.

11 The relative structures of debt and equity claims are such that higher degrees of debt  
12 financing increase the variability of returns on equity, *even when the variability of asset*  
13 *returns remains constant*. Consequently, otherwise identical firms with different  
14 capital structures will impose different levels of risk on their equity holders. Stated  
15 differently, increased leverage adds financial risk to a company's equity.<sup>13</sup>

16 If the companies in a proxy group are truly comparable in terms of the systematic risks  
17 of the underlying assets, then the **overall cost of capital of each company** should be  
18 about the same across companies (except for sampling error), so long as they do not  
19 use extreme leverage or no leverage. This is because a firm's asset value (and return)  
20 is allocated between equity and debt holders. The expected return to the underlying  
21 asset is therefore equal to the value weighted average of the expected returns to equity  
22 and debt holders – which is the overall cost of capital or the expected return on the  
23 assets of the firm as a whole.<sup>14</sup>

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13 I refer to this effect in terms of financial risk because the additional risk to equity holders stems from how the company chooses to finance its assets. In this context financial risk is distinct from and independent of the business risk associated with the manner in which the firm deploys its cash flow generating assets. The impact of leverage on risk is conceptually no different than that faced by a homeowner who takes out a mortgage. The equity of a homeowner who finances his home with 90% debt is much riskier than the equity of one who only finances with 50% debt.

14 As this is on an after-tax basis, the cost of debt reflects the tax value of interest deductibility.

1 **Q15. What is the theoretical basis supporting the notion that the overall cost of capital**  
2 **for each company should be about the same, regardless of capital structure?**

3 A15. The notion that the overall cost of capital is constant across a broad middle range of  
4 capital structures is based upon the Modigliani-Miller theorem that choice of financing  
5 does not affect the firm's value. Franco Modigliani and Merton Miller eventually won  
6 Nobel Prizes in part for their work on the effects of debt.<sup>15</sup> Their 1958 paper made what  
7 is in retrospect a very simple point: if there are no taxes and no risk to the use of  
8 excessive debt, use of debt will have no effect on a company's operating cash flows  
9 (*i.e.*, the cash flows to investors as a group, debt and equity combined). If the operating  
10 cash flows are the same regardless of whether the company finances mostly with debt  
11 or mostly with equity, then the value of the firm cannot be affected at all by the debt  
12 ratio. In cost of capital terms, this means the overall cost of capital is constant regardless  
13 of the debt ratio, too.

14 Obviously, the simple and elegant Modigliani-Miller theorem makes some  
15 counterfactual assumptions: no taxes and no cost of financial distress from excessive  
16 debt. However, subsequent research, including some by Modigliani and Miller,<sup>16</sup>  
17 showed that while taxes and costs to financial distress affect a firm's incentives when  
18 choosing its capital structure as well as its overall cost of capital,<sup>17</sup> the latter can still  
19 be shown to be constant across a broad range of capital structures.<sup>18</sup>

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15 Franco Modigliani and Merton H. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, 48, pp. 261-297.

16 Franco Modigliani and Merton H. Miller (1963), "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review*, 53, pp. 433-443.

17 When a company uses a high level of debt financing, for example, there is significant risk of bankruptcy and all the costs associated with it. The so called costs of financial distress that occurs when a company is over-leveraged can increase its cost of capital. In contrast a company can generally decrease its cost of capital by taking on reasonable levels of debt, owing in part to the deductibility of interest from corporate taxes.

18 This is a simplified treatment of what is generally a complex and on-going area of academic investigation. The roles of taxes, market imperfections and constraints, etc. are areas of on-going research and differing assumptions can yield subtly different formulations for how to formulate the weighted average cost of capital that is constant over all (or most) capital structures.

1 This reasoning suggests that one could compute the overall cost of capital for each of  
2 the proxy companies and then average to produce an estimate of the overall cost of  
3 capital associated with the underlying asset risk. Assuming that the overall cost of  
4 capital is constant, one can then re-arrange the overall cost of capital formula to  
5 estimate what the implied cost of equity is at the target company's capital structure on  
6 a book value basis.<sup>19</sup>

7 **Q16. What other methods do you use to account for financial risk when determining**  
8 **the cost of equity?**

9 A16. An alternative approach to account for the impact of financial risk is to examine the  
10 impact of leverage on beta in the CAPM. The so-called Hamada method allows a  
11 financial analyst to adjust for differences in financial risk by first translating the equity  
12 beta obtained from market data into an asset beta (or a zero-debt beta) using the  
13 comparable companies leverage and second relever (or translating) the asset beta for  
14 the comparable companies into an equity beta for the target company using the  
15 regulated entity's capital structure.<sup>20</sup>

16 While there are several versions of the Hamada adjustment procedures as discussed in  
17 Appendix B, the need to consider leverage is ubiquitous among finance practitioners  
18 when using the CAPM to estimate discount rates.

19 **C. APPROACH TO ESTIMATING THE COST OF EQUITY**

20 **Q17. How do you approach your estimation of the cost of equity for DTE Electric?**

21 A17. To analyze the cost of equity for DTE Electric, I evaluate companies of comparable  
22 business risk by choosing a proxy group of publicly traded regulated electric utilities.  
23 I use three models to analyze the cost of equity for DTE Electric: (1) the Capital Asset  
24 Pricing Model (CAPM) as well as an Empirical version thereof, the ECAPM, (2) the

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19 Market value capital structures are used in estimating the overall cost of capital for the proxy companies.

20 Hamada, R.S., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stock",  
*The Journal of Finance*, 27(2), 1971, pp. 435-452.

1 Discounted Cash Flow (DCF) models (single-stage and multi-stage), and (3) the Risk  
2 Premium. Due to the continual changes in financial markets, I consider two  
3 implementations of the CAPM / ECAPM – based on a historical and a forward-looking  
4 MRP to determine a fair and reasonable ROE for DTE Electric. Section V further  
5 explains my analyses and results.

6 **Q18. How does your approach and the models you employ compare to what the**  
7 **Commission has considered in prior DTE Electric proceedings?**

8 A18. The Commission has in past decisions considered the DCF, CAPM, and Risk Premium  
9 models, as do I. Additionally, the Commission has recognized that “atypical market  
10 conditions” deserve consideration when setting the ROE.<sup>21</sup> The Commission also stated  
11 that it will “continue to monitor a variety of market factors in future applications,  
12 including market reactions to recent events and measures of volatility and uncertainty,  
13 as well as measures of investor confidence, and the utility’s risk profile.”<sup>22</sup> It is also  
14 evident that the Commission, like I, consider “the company’s unique circumstances and  
15 characteristics ...” as well as “regional economic and company-specific risks.”<sup>23</sup>  
16 Lastly, the Commission’s recent decision in U-21297 acknowledged that “the cost of  
17 equity in the utility sector has generally increased over the last year ...”<sup>24</sup>  
18 Consequently, I discuss the development in current capital market condition and the  
19 impacts they have on determining DTE Electric’s cost of equity capital in Sections IV  
20 and V below.

#### 21 **IV. CAPITAL MARKET CONDITIONS**

22 **Q19. What do you cover in this section?**

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21 Michigan Public Service Commission Order for Case No. U-18255, April 18, 2018, p. 33.

22 Michigan Public Service Commission Order for Case No. U-20561, May 8, 2020, pp. 177.

23 *Ibid.*, p. 176.

24 Michigan Public Service Commission, “Order in Case U-21297,” issued December 1, 2023 (“Order in U-21297”), p. 186.

1 A19. In this section, I address recent changes in capital market conditions and how these  
2 factors affect the cost of equity and its estimation. Specifically, I address (i) interest  
3 rate developments; (ii) investors perception of the market risk premium; (iii) inflation  
4 expectations; (iv) volatility in the market as exemplified by the S&P 500; and (v)  
5 developments in utility stock prices.<sup>25</sup>

6 **Q20. Why do you discuss capital market conditions in a testimony aimed at determining**  
7 **the DTE Electric's ROE?**

8 A20. Capital market conditions are important to cost of equity estimation methodologies and  
9 can affect the inputs to the cost of equity models. Inputs to the DCF models are affected  
10 by the economy in general as economic growth will affect growth rates and utility stock  
11 prices. Consequently, the capital market developments affect the growth rates, the  
12 dividend yield, and the assessment of estimates' reasonableness.

13 Similarly, the risk-free rate is an input to the risk premium model and CAPM, so that  
14 recent and expected future developments in government bond yields are important to  
15 assess the validity of any measure of the risk-free rate. The MRP is also an input to the  
16 CAPM, so factors that affect the MRP (e.g., volatility and changes in investors' risk  
17 perceptions) are vital for accurate determination of the ROE. Lastly, inflation has  
18 recently been substantially above what the U.S. experienced over a very long period  
19 and the inflation is expected to be above the Federal Reserve's two percent target for a  
20 least the next two years.<sup>26</sup> Uncertainty about inflation expectations creates uncertainty  
21 about the cost of capital as well as other aspects of utilities' costs.<sup>27</sup>

22 **Q21. Can you provide a summary of recent events that have impacted capital market**  
23 **conditions?**

---

25 In past testimony, I have discussed utility credit spreads. Utility credit spreads are currently only modestly elevated, so I do not attempt to account for this. However, inflation expectations remain a source of substantial concern and therefore merit consideration.

26 *Blue Chip Economic Indicators*, January 2024 expects 2024 inflation to be 2.6%, so while the inflation rate has modified, it remains- above the Federal Reserve's target rate of 2%.

27 Because the cost of capital is measured in nominal terms, inflation will influence the cost of capital.

1 A21. Since DTE Electric's last rate case was filed in February 2023 (Order dated December  
2 1, 2023)<sup>28</sup> key measures of debt cost such as Treasury yields have increased and utility  
3 bond yields and investors' perception of the risk premium they require to hold equity  
4 rather than debt has remained relatively constant. At the same time, inflation remains  
5 higher than in the recent past and inflation is expected to remain above the targeted 2  
6 percent through at least 2025. In response, the Federal Reserve has increased the  
7 Federal Funds rate 11 times since the beginning of 2022, 3 times since February 2023,  
8 while holding the rate constant in recent months. The details are shown in Figure 3  
9 below. Since the filing of DTE Electric's last rate case in February 2023, the Federal  
10 Funds rate has increased by 75 basis points, while the yield on BBB rated utility bonds  
11 increased during 2023 but as of now is comparable to that in late January / early  
12 February 2023.<sup>29</sup> The Federal Reserve's monetary policy responses are intended to  
13 achieve the Federal Reserve's goal of keeping "inflation at the rate of 2% over the  
14 longer run."<sup>30</sup> The January 31, 2024 meeting confirmed the Federal Reserve's position  
15 and kept the Federal Funds rate at 5.25 percent to 5.50 percent stating that "[t]he  
16 Committee does not expect it will be appropriate to reduce the target range until it has  
17 gained greater confidence that inflation is moving sustainable toward 2 percent."<sup>31</sup>  
18 Most recently, the Bureau of Labor Statistics on February 13, 2024 announced that the  
19 12-month inflation was 3.1 percent as of January 2024,<sup>32</sup> above the Federal Reserve's  
20 target rate of 2.0 percent.

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28 Order in U-21297.

29 Comparing the yield on BBB rated utility bonds as of January 31, 2024 (5.68%) to the yield in January and February 2023; 5.31% and 5.78%, respectively. Source: Bloomberg data as of February 13, 2024.

30 See, for example, Federal Reserve, Press Release, July 26, 2023, <https://www.federalreserve.gov/monetarypolicy/files/monetary20230726a1.pdf>

31 Federal Reserve, Press Release January 31, 2024.

32 Bureau of Labor Statistics, News Release, "CPI for all items rose 0.3% in January; shelter up," February 13, 2024.

**Figure 3: Developments in the Federal Funds Rate Since 2022**

| <b>FOMC Meeting</b> | <b>Change (bps)</b> | <b>Federal Funds Rate</b> |
|---------------------|---------------------|---------------------------|
| March 17, 2022      | +25                 | 0.25% - 0.50%             |
| May 5, 2022         | +50                 | 0.75% - 1.00%             |
| June 16, 2022       | +75                 | 1.50% - 1.75%             |
| July 28, 2022       | +75                 | 2.25% - 2.50%             |
| September 22, 2022  | +75                 | 3.00% - 3.25%             |
| November 2, 2022    | +75                 | 3.75% - 4.00%             |
| December 14, 2022   | +50                 | 4.25% - 4.50%             |
| February 1, 2023    | +25                 | 4.50% - 4.75%             |
| March 22, 2023      | +25                 | 4.75% - 5.00%             |
| May 3, 2023         | +25                 | 5.00% - 5.25%             |
| June 14, 2023       | +0                  | 5.00% - 5.25%             |
| July 26, 2023       | +25                 | 5.25% - 5.50%             |
| September 20, 2023  | +0                  | 5.25% - 5.50%             |
| November 1, 2023    | +0                  | 5.25% - 5.50%             |
| December 13, 2023   | +0                  | 5.25% - 5.50%             |
| January 31, 2024    | +0                  | 5.25% - 5.50%             |

Lastly, the risk of the electric utility industry as measured by, for example, the systematic risk (beta) has remained constant.<sup>33</sup> Thus, capital markets' data as well as utility specific risk characteristics indicate that the cost of equity is higher today than in the recent past.

## **A. Interest Rates**

### **Q22. How do interest rates affect the cost of equity?**

A22. The current interest rate environment affects the cost of equity estimation in several ways. Most directly, the CAPM takes as one of its inputs a measure of the risk-free rate (see Figure 2). All else equal, the estimated cost of equity using the CAPM increases (decreases) by one percentage point when the risk-free rate increases (decreases) by

<sup>33</sup> In U-21297, I found an average beta of 0.88 for my electric sample (Villadsen Direct in U-21297, Figure 7, p. 33). I now find a slightly higher beta, 0.93 (Figure 7 below).

1 one percentage point. Therefore, to the extent that prevailing government yields are  
2 affected by monetary policy, and rising geopolitical tensions, using current yields as  
3 the risk-free rate would affect the CAPM estimate in a manner that may not reflect the  
4 forward-looking cost of equity. Therefore, the allowed fair return on equity for DTE  
5 Electric should reflect the future interest rate environment, specifically the environment  
6 at the time the rates being set in this proceeding will be in effect.

7 **Q23. What are the relevant developments regarding interest rates?**

8 A23. Yields on 20-year U.S. Treasury Bonds were 3.95% at the time DTEE's filed its last  
9 rate case in February 2023.<sup>34</sup> Since then the yield on 20-year Treasury bonds has  
10 increased to approximately 4.32% at the end of 2023 for an increase of about 40 basis  
11 point.<sup>35</sup> Looking forward, professional forecasters as well as government agencies  
12 expect Treasury bond yields to remain relatively constant in the near-term and then  
13 decrease slightly over the next couple of years. However, they expect the yields to  
14 remain well above the low levels of the recent past. Blue Chip Economic Indicators  
15 (BCEI) as of January 2024 forecast the yield on 10-year Treasury bonds at 3.9% for  
16 2024 and 3.7% 2025 for an average of 3.8% over the next two years.<sup>36</sup> The 2024  
17 forecast increased to 4.0% in February 2024.<sup>37</sup> The 2024 and 2025 BCEI forecasts are  
18 40 to 60 basis points below the current 10-year Treasury bond yield (4.3%) indicating  
19 interest rate forecasts are currently lagging actual interest rates. Similarly,  
20 Congressional Budget Office's December 2023 economic forecasts expects the 2024

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34 Exhibit D5.9.

35 Ibid.

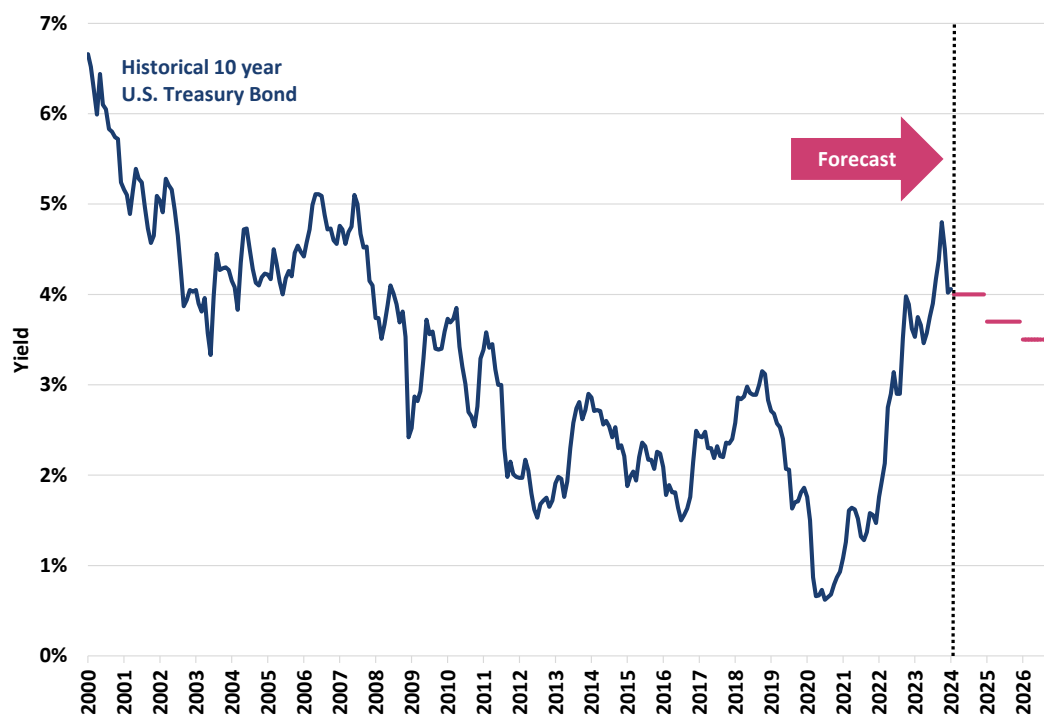
36 *Wolters Kluwer, Blue Chip Economic Indicators*, Vol. 49, No. 1, January 10, 2024, pp. 2-3.

37 *Wolters Kluwer, Blue Chip Economic Indicators*, Vol. 49, No. 2, February 9, 2024, pp. 2-3

1 10-year yield to be 4.8 percent.<sup>38</sup> Further, the materials released after the December  
2 2023 FOMC meeting indicate that the Federal Funds rate will be 4.6% in 2024.<sup>39</sup>

3 Figure 4 below shows the development in the 10-year Treasury bond yield as well as  
4 the forecast for the 10-year yield. Notably, the current yield as well as the forecasted  
5 yield is higher than in the recent past.

6 **Figure 4: Historical and Projected 10-year Treasury Bond Yields<sup>40</sup>**



7  
8 Lastly, I note that while the yield on Baa rated corporate bonds is expected to remain  
9 above 6.0 percent during 2024. This yield averaged 5.6 percent in February 2023,

38 The Congressional Budget Office expects the 10-year Treasury yield at 4.8 percent in Q4, 2024 ([51135-2023-12-Economic-Projections.xlsx \(live.com\)](#)). Other forecasts indicates a 20-year Treasury bond yield of 4.55 percent for June 2024 by World Government Bonds ([United States 20 Years Bond - Forecast \(worldgovernmentbonds.com\)](#));

39 Federal Reserve, "Summary of Economic Projections," December 13, 2023, p. 2, [Summary of Economic Projections, December 13, 2023 \(federalreserve.gov\)](#)

40 Bloomberg as of January 16, 2024 and *Blue Chip Economic Indicators*, January 10, 2024.

1 increased through most of 2023 and then declined to 5.6% again in December 2024.<sup>41</sup>  
2 Thus, indications are that the corporate bond yield will remain high through 2024.

3 **B. Yield Spreads**

4 **Q24. Why are bond yield spreads relevant to a cost of equity analysis?**

5 A24. Bond yield spreads (also called credit spreads) reflect the premium that investors  
6 demand to hold debt securities (specifically corporate or utility bonds) that are not risk  
7 free. Analogously, the MRP—which is a key input to the CAPM—represents the risk  
8 premium that investors require to hold a market portfolio of equities rather than risk-  
9 free government bonds.

10 If bond yields are influenced by some of the same underlying market forces that drive  
11 the systematic risk premium for equities, shifts in directly observable credit spreads can  
12 assist with inference about changes in the MRP, which itself must be estimated.<sup>42</sup> More  
13 specifically, if both credit spreads and equity premiums are determined in part of the  
14 general premium required by investors for bearing systematic risk, then an increase in  
15 credit spreads may indicate an increase in the forward-looking MRP.

16 **Q25. How does the current spread between utility and U.S. Government bond yields**  
17 **compare to historic spreads?**

18 A25. At present (January 2024), the spread between 20-year BBB-rated utility bond yields  
19 and 20-year U.S. government bond yields is 1.29%.<sup>43</sup> This compares to a long-term  
20 historic average spread of 1.23% prior to the financial crisis and 1.54% for the period

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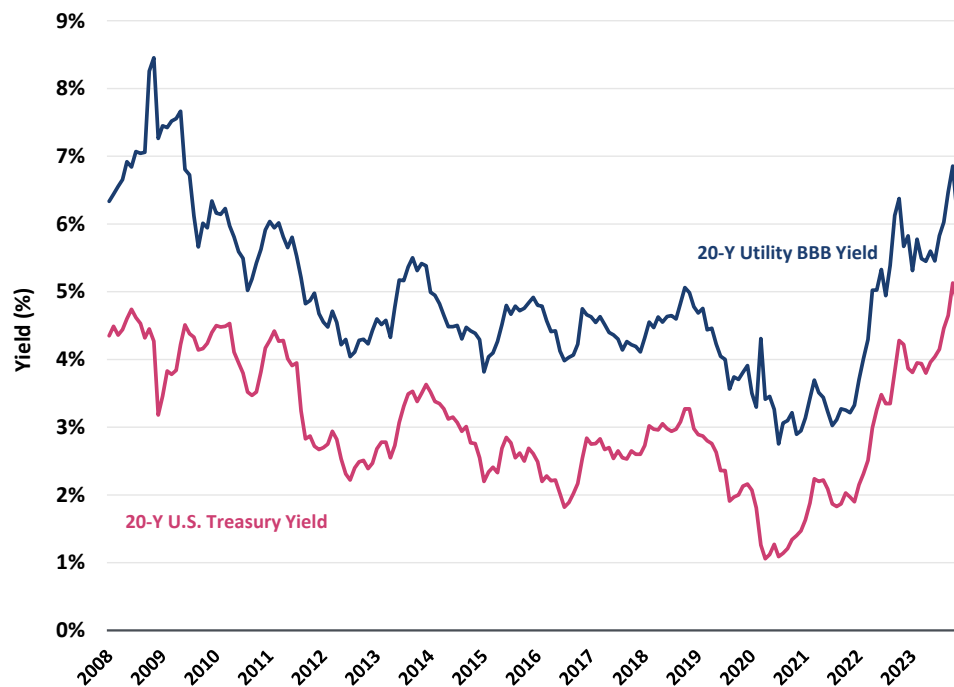
<sup>41</sup> Sources: Federal Reserve, FRED, Moody's Seasoned Baa Corporate Bond Yield, Percent, Monthly, Not Seasonally Adjusted and Blue Chip Financial Forecasts, December 28, 2023. I refer to the corporate yield as I do not know of sources that forecast the utility bond yield.

<sup>42</sup> This is the same issue as in cost of capital estimation more generally: the cost of debt can often be directly observed in the form of market bond yields, whereas the cost of equity must be estimated based on financial models.

<sup>43</sup> Bloomberg as of February 13, 2024. The data for December 2023 are similar.

1 1990 through 2023,<sup>44</sup> so currently the spread is comparable the long-run average.  
2 Importantly, the current (December 2023) yield on utility bonds remains higher than at  
3 any time since 2013.

4 **Figure 5: Yield on BBB-rated Utility Bonds and 20-Year Treasury Bonds<sup>45</sup>**



5  
6

## 7 C. Risk Premiums

### 8 Q26. How do risk premiums affect the cost of equity?

9 A26. Risk premiums provide an indication of the compensation investors expect to hold  
10 securities that are not risk-free. If an investor demands a larger risk premium, then the  
11 cost of equity will be larger. There are several indicators of risk premiums in addition  
12 to the yield spreads discussed above. For example, indicators such as stock market  
13 volatility (e.g., VIX) provide insights into the risk premium required by investors in the

44 *Ibid.*, Average for prior to the financial crisis is for the period April 1991 to 2007.

45 Bloomberg as of January 16, 2024.

1 coming 30 days. SKEW provides a useful indicator of volatility over the next 12  
2 months. Whereas the MRP measures the compensation required to hold a security over  
3 a long investment horizon, such as the period when rates set in this proceeding will be  
4 in effect. For this reason, the forecast MRP needs to be taken into consideration when  
5 determining the cost of equity in this proceeding.

6 **Q27. What is the current evidence regarding market volatility and investors' risk**  
7 **perception?**

8 A27. Measures of market volatility are slightly below long-term averages. For example, VIX  
9 is currently around 15 but was higher at about 22 at the end of October 2023 – these  
10 figures are a bit below the long-run average of about 19.5.<sup>46</sup> However, the SKEW  
11 index, which measures the market's willingness to pay for protection against negative  
12 "black swan" stock market events (i.e., sudden substantial downturns),<sup>47</sup> shows that  
13 investors remain cautious. A SKEW value of 100 indicates outlier returns are unlikely,  
14 but as the SKEW increases, the probability of outlier returns becomes more significant.  
15 The SKEW index is currently 148.<sup>48</sup> While the VIX shows close to historical volatility  
16 going forward, the SKEW indicates investors are cautious.

17 During the last several month, investors have seen several bank failures,<sup>49</sup> the on-going  
18 wars in Ukraine and Israel, and the unprecedented mix of monetary tightening (e.g., the  
19 raises to interest rates described above) and fiscal stimulus (e.g., the Inflation Reduction  
20 Act of 2022<sup>50</sup>). Consequently, the evidence regarding investors' risk perception is  
21 mixed.

22 **Q28. What is the Market Risk Premium?**

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46 Cboe, VIX, accessed January 17, 2024, [https://www.cboe.com/tradable\\_products/vix/](https://www.cboe.com/tradable_products/vix/)

47 Cboe, SKEW, accessed January 17, 2024, <https://www.cboe.com/us/indices/dashboard/skew/>

48 *Ibid.*

49 First Public Bank, Silicon Valley Bank, and Signature Bank collapsed in 2023.

50 Inflation Reduction Act, H.R. 5376, <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>

1 A28. In general, a risk premium is the amount of “excess” return—above the risk-free rate  
2 of return—that investors require to compensate them for taking on risk. As illustrated  
3 in Figure 2 above, the riskier the investment, the larger the risk premium investors will  
4 require.

5 The market risk premium (“MRP”) is the risk premium associated with investing in the  
6 market as a whole. Since the so-called “market portfolio” embodies the maximum  
7 possible degree of diversification for investors,<sup>51</sup> the MRP is a highly relevant  
8 benchmark indicating the level of risk compensation demanded by capital market  
9 participants. It is also a direct input necessary to estimating the cost of equity using the  
10 CAPM and other risk-positioning models.

11 **Q29. Please explain the current evidence on the MRP.**

12 A29. As of 2023, the historic MRP has declined slightly relative to the last few years due  
13 primarily to higher returns on government bonds. Specifically, for the period 1926  
14 through 2022, the average historic MRP was 7.17%.<sup>52</sup> At the same time, the forecast  
15 MRP from Bloomberg was 6.37%, relative to a 20-year Treasury bond, as of December  
16 29, 2023.<sup>53</sup> Using the FERC methodology, the forecasted MRP was 7.69% over the 20-  
17 year Treasury bond yield using IBES growth rates and 7.71% using Value Line growth  
18 rates.<sup>54</sup>

19 **D. Inflation Expectations and Impact**

20 **Q30. Why is inflation relevant to estimating the cost of equity for DTE Electric?**

---

51 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.

52 Kroll, U.S. Cost of Capital Navigator, January 2024.

53 Bloomberg data as of January 16, 2024.

54 Exhibit D5.17, estimated as of December 31, 2023.

1 A30. The return on equity that is being determined is expected to be in effect for a period  
2 time going forward and the ROE is measured in nominal terms—meaning that it  
3 includes the expected inflation. The Federal Reserve forecasts that inflation will be  
4 elevated through at least 2025,<sup>55</sup> while the BCEI expect inflation to be elevated through  
5 at least 2024.<sup>56</sup> Thus, for at least the next year inflation is expected to be above the  
6 Federal Reserve’s target level of 2% on average.

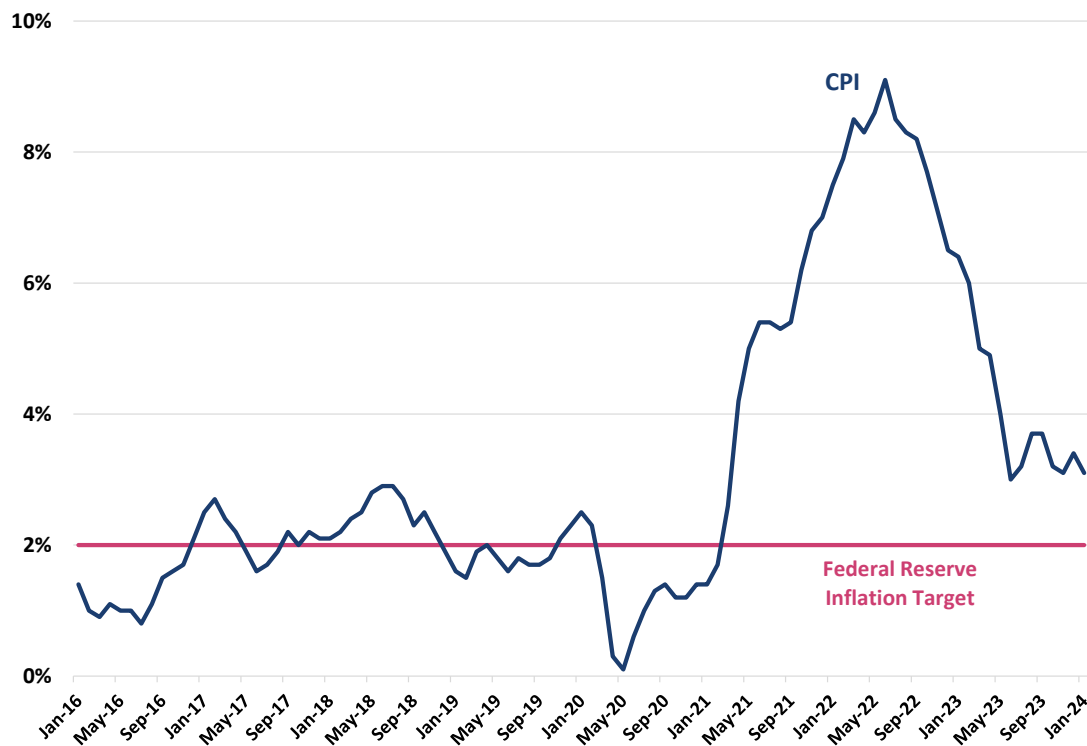
7 **Q31. What are the recent indicators of inflation for the U.S. economy?**

8 A31. Inflation, as measured by CPI, reached a recent high of 9.1% in June 2022. Since then,  
9 inflation has decreased to between 3.1% and 6.4% in 2023 with the most recent data  
10 for December 2023 and January 2024 being 3.4% and 3.1%, respectively (see Figure 6  
11 below). Thus, while the inflation rate has come down it remains well above the Federal  
12 Reserve’s target of 2.0% on average.

---

55 Federal Reserve, “Summary of Economic Projections,” September 20, 2023, p. 2. This view was affirmed in the FOMC’s December 2023 Summary of Economic Projections.

56 *Blue Chip Economic Indicators*, February 9, 2024, pp. 2-3. The January 2024 issue had the same inflation expectations.

Figure 6: Inflation as Measured by the Consumer Price Index<sup>57</sup>

Looking forward, recent surveys by economists, such as the *BCEI* survey, indicate that U.S. inflation will be 2.6% in 2024 and 2.2% in 2025.<sup>58</sup>

**Q32. Are there other factors that may impact the financial conditions for utilities such as DTE Electric?**

**A32.** Yes. The evolving situation in the Middle East has the potential to substantially impact economic policy, world markets and especially energy markets.<sup>59</sup> The unrest may cause investors to change their risk tolerance and hence the return they require to invest in

<sup>57</sup> Bureau of Labor Statistics.

<sup>58</sup> *Blue Chip Economic Indicators*, February 2024 pp. 2-3.

<sup>59</sup> I acknowledge there are many non-economic aspects to this conflict but discuss only the factors that may impact the cost of equity for utilities in the US.

1 assets that are not risk-free. Because the Middle East is a large supplier of energy, it  
2 could impact inflation and financial markets more broadly.

3 **Q33. Please summarize how economic developments discussed above have affected the**  
4 **return on equity and debt that investors require.**

5 A33. Utilities rely on investors in capital markets to provide funding to support their capital  
6 expenditure programs and efficient business operations. Investors consider the risk-  
7 return tradeoff in choosing how to allocate their capital among different investment  
8 opportunities. It is therefore important to consider how investors view the current  
9 economic conditions, including the plausible development in the risk-free rate,  
10 inflation, and other key indicators.

11 These investors have been affected by the development in interest rate and inflation  
12 that remains above the Federal Reserve's target, so there are reasons to believe that  
13 their return expectations reflect the increase in interest rates and higher than usual  
14 inflation.

## 15 **V. ESTIMATING THE COST OF EQUITY**

### 16 **A. APPROACH TO COST OF EQUITY ESTIMATION**

17 **Q34. Can you explain your approach to estimating the cost of equity for DTE Electric?**

18 A34. As discussed in Section IV, the financial and economic conditions are impacted by a  
19 variety of factors; including rising interest rates and high inflation.

20 In the remainder of Section V, I present the inputs, assumptions, and results from my  
21 cost of equity estimation methods.

### 22 **B. PROXY GROUP SELECTION**

23 **Q35. How do you identify sample companies of comparable business risk to DTE**  
24 **Electric?**

1 A35. DTE Electric is a regulated electric utility. The business risk associated with these  
2 business activities depend on several factors, including the specific characteristics of  
3 the service territory and regulatory environment in which the utility operates.  
4 Consequently, it is not possible to identify publicly traded companies that replicate  
5 every aspect of DTE Electric's business risk profile. However, an appropriate starting  
6 pointing to create proxy groups of comparable business risk to DTE Electric is to select  
7 other companies whose primary business operations are concentrated in regulated  
8 industries or companies that have similar lines of business and/or business  
9 environments. As a second step, I must evaluate DTE Electric or Michigan-specific  
10 risks to ensure that the Company's ROE is appropriately placed relative to the proxy  
11 samples.

12 To that end, I have selected a proxy group composed of regulated utility companies  
13 that focus on (i) the provision of electricity to end-users ("Electric Utility Proxy  
14 Group").<sup>60</sup> This proxy group is similar to DTE Electric in that they are rate regulated  
15 by state utility commissions, serve customers through a network of assets, and rely on  
16 substantial capital to provide service—that is, they are capital intensive like DTE  
17 Electric.

18 It is important that the proxy groups used to assess the cost of equity for DTE Electric  
19 (absent any unique Michigan or Company specific characteristics) are comprised of  
20 regulated entities, because regulation tends to place substantial requirements and  
21 protections on the companies. I also believe the physical characteristics of the  
22 industry—*e.g.*, network, capital intensive, serving many different customers—are  
23 characteristics of DTE Electric and of other highly regulated utilities. The network  
24 characteristic implies that assets cannot readily be employed in a different capacity; the  
25 capital intensive characteristic affects the operating risks through the split between  
26 fixed and variable costs; and the customer composition affects the demand risk.

---

60 To reduce the number of disagreements with Staff, I have eliminated the natural gas distribution utilities.

1 **Q36. How do you identify suitable utilities for inclusion in your proxy groups?**

2 A36. First, I start with the universe of publicly traded electric utilities reported by Value Line  
3 Investment Analyzer (“Value Line”). It is necessary to focus on publicly traded  
4 companies because non-traded entities do not have the necessary stock price data to  
5 utilize the financial models relied upon to estimate the cost of equity. Second, I narrow  
6 down this universe of electric, utilities identified by Value Line using the following  
7 screening criteria:

- 8 • Must be an investment grade utility,
- 9 • Must have a market capitalization greater than \$300 million (to avoid micro  
10 caps),
- 11 • Must pay dividends with no dividend cuts for three years,
- 12 • Cannot have engaged in substantial merger, acquisition, or divestiture activity  
13 for three years,

14 and

- 15 • Must have sufficient data for estimation.

16 Third, I review business descriptions and financial reports of these companies and  
17 eliminate those that have less than 50% of their assets dedicated to regulated utility  
18 activities. Within this group of companies, I apply further screening criteria to eliminate  
19 companies with recent significant events (*i.e.*, litigation) that could affect the market  
20 data necessary to perform cost of capital estimation.

21 To the degree that a subset or subsets of these utilities have risk characteristics that  
22 match those of DTE Electric to a larger degree, subset(s) will be created and analyzed.

23 **Q37. What are the results of your sample selection process?**

24 A37. The selection process produced a proxy group of 25 integrated, regulated electric  
25 utilities of which one (Exelon) lacks a beta from Value Line.<sup>61</sup>

26 **Q38. What are the characteristics of your Electric Utility Proxy Group?**

---

61 Relative to my direct testimony in U-21297, I eliminate Dominion Energy due to its large divestiture.

1 A38. The Electric Utility Proxy group is comprised of electric utilities, whose primary source  
2 of revenues and the majority of its assets are subject to regulation. The final proxy  
3 group consists of 25 electric utilities listed in Figure 7 below.<sup>62</sup> These companies own  
4 regulated electric utility subsidiaries and are classified by EEI as either “regulated”  
5 (having at least 80% of their assets dedicated to regulated utility operations) or “mostly  
6 regulated” having less than 80% regulated assets.<sup>63</sup> (These EEI categories are  
7 designated with an “R” or “M” in the Figure below). Therefore, the Electric Utility  
8 Proxy Group is broadly representative of the regulated electric industry from a business  
9 risk perspective.

10 The market capitalization, betas, and growth estimates for both cost of equity  
11 estimation dates are presented side-by-side. The annual revenue as well as the market  
12 capitalization was obtained from Bloomberg. The credit rating is reported by  
13 Bloomberg. The growth rate estimate is a weighted average between estimates from  
14 Thomas Reuters and *Value Line*. The betas were obtained from *Value Line* as of  
15 December 31, 2023. The categorization was based on the companies’ most recent 10-  
16 K.

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62 Relative to my testimony for DTE Electric in U-21297, I have eliminated Dominion Energy as Dominion sold substantial gas distribution assets to Enbridge Inc. in September 2023.

63 Edison Electric Institute (EEI), Financial Report, 2022. As of February 13, 2024, the 2023 data were not available. Note: I eliminate any companies with less than 50% of regulated assets. See Appendix B for further detail.

1

Figure 7: Electric Utility Sample

| Company                 | Annual Revenue<br>(Q4 2023)<br>(\$MM)<br>[1] | Regulated<br>Assets<br>[2] | Market Cap.<br>(Q4 2023)<br>(\$MM)<br>[3] | Value Line<br>Beta<br>[4] | S&P Credit<br>Rating<br>[5] | Long-Term<br>Growth<br>Estimate<br>[6] |
|-------------------------|----------------------------------------------|----------------------------|-------------------------------------------|---------------------------|-----------------------------|----------------------------------------|
| ALLETE                  | \$1,856                                      | MR                         | \$3,509                                   | 0.95                      | BBB                         | 5.8%                                   |
| Alliant Energy          | \$4,143                                      | R                          | \$13,077                                  | 0.90                      | A-                          | 6.9%                                   |
| Amer. Elec. Power       | \$19,747                                     | R                          | \$42,680                                  | 0.80                      | A-                          | 5.2%                                   |
| Ameren Corp.            | \$7,942                                      | R                          | \$19,455                                  | 0.90                      | BBB+                        | 5.6%                                   |
| Avista Corp.            | \$1,614                                      | R                          | \$2,744                                   | 0.95                      | BBB                         | 5.9%                                   |
| Black Hills             | \$2,147                                      | R                          | \$3,700                                   | 1.00                      | BBB+                        | 4.7%                                   |
| CMS Energy Corp.        | \$7,185                                      | R                          | \$16,914                                  | 0.85                      | BBB+                        | 6.9%                                   |
| CenterPoint Energy      | \$8,374                                      | R                          | \$18,194                                  | 1.15                      | BBB+                        | 5.0%                                   |
| Duke Energy             | \$29,842                                     | R                          | \$74,426                                  | 0.90                      | BBB+                        | 6.4%                                   |
| Edison Int'l            | \$17,334                                     | R                          | \$26,793                                  | 1.00                      | BBB                         | 5.1%                                   |
| Entergy Corp.           | \$13,018                                     | R                          | \$21,439                                  | 0.95                      | BBB+                        | 0.9%                                   |
| Evergy Inc.             | \$5,990                                      | R                          | \$11,915                                  | 0.95                      | BBB+                        | 5.1%                                   |
| Exelon Corp.            | \$22,341                                     | R                          | \$36,500                                  | n/a                       | BBB+                        | 9.0%                                   |
| IDACORP Inc.            | \$1,865                                      | R                          | \$4,978                                   | 0.85                      | BBB                         | 4.3%                                   |
| MGE Energy              | \$686                                        | R                          | \$2,620                                   | 0.75                      | AA-                         | 4.5%                                   |
| NextEra Energy          | \$28,409                                     | MR                         | \$124,492                                 | 1.00                      | A-                          | 8.2%                                   |
| NorthWestern Corp.      | \$1,387                                      | R                          | \$3,151                                   | 0.95                      | BBB                         | 4.2%                                   |
| OGE Energy              | \$3,053                                      | R                          | \$7,074                                   | 1.05                      | BBB+                        | 11.3%                                  |
| Otter Tail Corp.        | \$1,393                                      | R                          | \$3,428                                   | 0.95                      | BBB                         | -13.1%                                 |
| Pinnacle West Capital   | \$5,342                                      | R                          | \$8,270                                   | 0.95                      | BBB+                        | 6.6%                                   |
| Public Serv. Enterprise | \$11,088                                     | R                          | \$30,750                                  | 0.95                      | BBB+                        | 5.4%                                   |
| Sempra Energy           | \$16,563                                     | R                          | \$23,414                                  | 1.00                      | BBB+                        | 7.5%                                   |
| Southern Co.            | \$26,188                                     | R                          | \$77,031                                  | 0.95                      | BBB+                        | 7.9%                                   |
| WEC Energy Group        | \$8,633                                      | R                          | \$26,358                                  | 0.85                      | A-                          | 5.8%                                   |
| Xcel Energy Inc.        | \$14,426                                     | R                          | \$34,132                                  | 0.85                      | A-                          | 6.2%                                   |
| <b>Electric Sample</b>  | <b>\$10,423</b>                              | <b>R</b>                   | <b>\$25,482</b>                           | <b>0.93</b>               | <b>BBB+</b>                 | <b>5.3%</b>                            |

2

3 **Q39. How does the proxy group compare to DTE Electric in terms of financial metrics?**

4 A39. DTE Electric's regulated electric operations generated an annual revenue of 6,397 MM  
5 in 2022,<sup>64</sup> which is lower than the average annual revenues for the Electric Utility proxy  
6 groups. DTE Electric's S&P senior unsecured credit rating is BBB, which is similar to  
7 the Electric Utility proxy group average. DTE Electric is a regulated entity as are all of  
8 my proxy companies. The proxy groups, like DTE Electric, operate a capital-intensive  
9 network of assets, which are subject to state regulation. I discuss below further the  
10 similarities and differences between DTE and the proxy group focusing on the

<sup>64</sup> DTE 2022 10-K, p. 32.

1 composition of generation, capital needs, and the availability of regulatory  
2 mechanisms.

3 **C. FINANCIAL RISK ADJUSTMENT**

4 **Q40. Can you explain the difference between the data relied upon to estimate the cost**  
5 **of equity and the regulatory rate base to which the cost of equity is applied?**

6 A40. Both the CAPM and the DCF models rely on market data to estimate the cost of equity  
7 for the sample companies, so the results reflect the value of the capital that investors  
8 hold during the estimation period (market values). The allowed return on equity is  
9 applied to rate base, which is determined using historical cost and hence reflect the  
10 (net) book values of assets.

11 **Q41. Why is this difference important to the estimation of the cost of equity?**

12 A41. Taking the level of financial risk or leverage into account is necessary to reflect the fact  
13 that different capital structure ratios have different levels of financial risk. Specifically,  
14 all else equal, higher levels of debt financing increases the risk faced by equity  
15 investors. Therefore, investors require higher ROEs from companies with more debt  
16 than from comparable business risk companies with less debt. To reflect the effect of  
17 capital structure on the cost of equity, I adjust the cost of equity estimates I obtain from  
18 applying the models to the market data of the proxy companies. I do so using two  
19 different approaches: (1) the overall cost of capital approach and (2) the Hamada  
20 approach. I provide further details of these two approaches in Appendix B.<sup>65</sup>

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65 In recognition of the Commission's past decision to not rely on the overall cost of capital approach, my CAPM / ECAPM recommended range is based on the Hamada approach. This approach cannot be applied to the DCF model.

**D. CAPM/ ECAPM APPROACH AND COST OF EQUITY ESTIMATES****1. CAPM Approach****Q42. Can you briefly explain the CAPM?**

A42. The CAPM is a “risk-positioning model” that models the direct relationship between risk and return illustrated in the Security Market Line (see Figure 2 above). 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 multiplied by the market risk premium (MRP). Mathematically, the relationship is shown by the following formula:

**Formula 1**

$$r_s = r_f + \beta_s \times MRP$$

where  $r_s$  is the cost of capital for investment  $S$ ;

$r_f$  is the risk-free interest rate;

$\beta_s$  is the beta risk measure for the investment  $S$ ; and

$MRP$  is the market equity risk premium.

**2. ECAPM Approach****Q43. Can you briefly explain the ECAPM?**

A43. Another risk-positioning model is the Empirical CAPM (ECAPM), which builds upon the CAPM. Empirical research has found 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. The ECAPM corrects for this by adjusting the CAPM using the formula below:

**Formula 2**

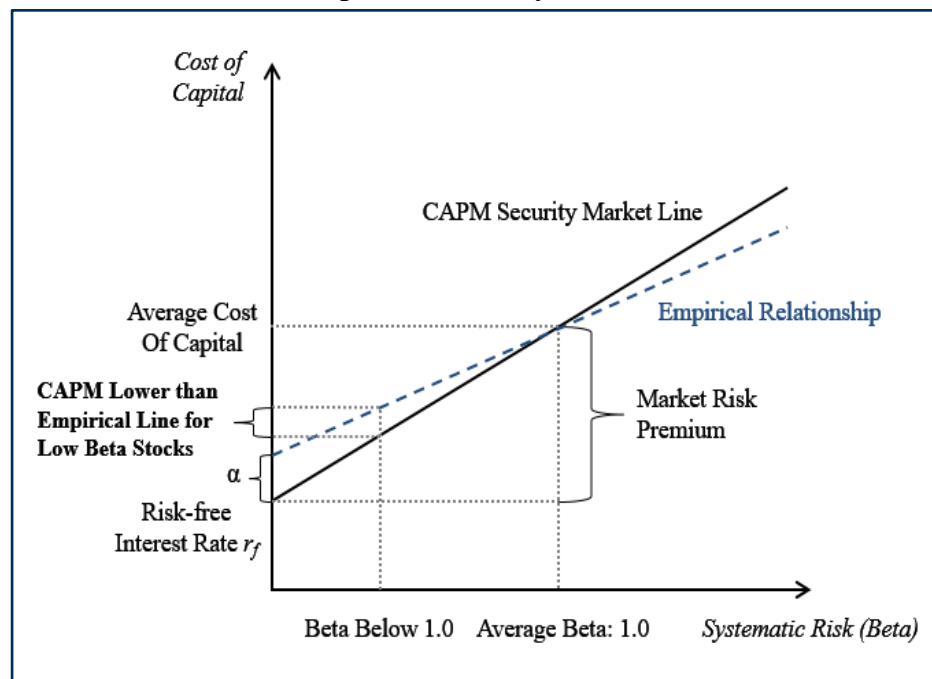
$$r_s = r_f + \alpha + \beta_s \times (MRP - \alpha)$$

where  $\alpha$  is the “alpha” adjustment of the risk-return line, a constant; and

$r_s$ ,  $r_f$ ,  $\beta_s$ , and  $MRP$  are defined in Formula 1 above.

The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 8, which results in a Security Market Line that more closely matches the results of empirical tests. The impact on the Security Market Line is illustrated in Figure 8 below. In the ECAPM implementation, I use an alpha of 1.5 based on academic research documenting the magnitude of alpha.<sup>66</sup>

**Figure 8**  
**The Empirical Security Market Line**



### 3. CAPM/ ECAPM Cost of Equity Estimates

**Q44. Can you summarize the parameters of the scenarios you considered when conducting your CAPM and ECAPM analyses?**

<sup>66</sup> See Black, Fisher. 1993. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18; Black, Fisher, Michael C. Jensen, and Myron Scholes. 1972. The Capital Asset Pricing Model: Some Empirical Tests. *Studies in the Theory of Capital Markets*, edited by Michael C. Jensen, pp. 79-121. New York: Praeger; Fama, Eugene F. and James D. MacBeth. 1972. Risk, Returns and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3): pp. 607-636; Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): pp. 427-465; Fama, Eugene F. and Kenneth R. French. 2004. The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives* 18 (3): pp. 25-46.

A44. I performed each CAPM/ ECAPM analysis using two scenarios to obtain a range of cost of equity estimates. Specifically, I rely on a forecasted risk-free rate and (i) a historical MRP or (ii) a forecasted MRP.

In Scenario I, I use the average forecasted risk-free rate for 2024-2025, which I determined as the 10-year forecast by Blue Chip Economic Indicators plus 50 basis points, which is the average maturity premium of a 20-year government bond yield over the 10-year government bond yield.<sup>67</sup> This gives me a risk-free rate of 4.30 percent, which is comparable to the December 2023 yield of approximately 4.32 percent.<sup>68</sup> In Scenario I, I combine this risk-free rate with the historical average MRP as provided by Duff & Phelps.<sup>69</sup> In Scenario II, I use Bloomberg's forecasted MRP (over the 20-year Treasury bond yield) for a MRP of 6.37 percent.<sup>70</sup>

**Figure 9**  
**Scenarios in CAPM/ ECAPM Analysis**

|                         | Scenario 1 | Scenario 2 |
|-------------------------|------------|------------|
| Risk-Free Interest Rate | 4.30%      | 4.30%      |
| Market Risk Premium     | 7.17%      | 6.37%      |

I note that relative to the time of DTEE's filing in U-21297, the forecasted risk-free rate and the actual risk-free rate have increased as has the forecasted MRP, while the historical MRP has declined very modestly.

<sup>67</sup> *Blue Chip Economic Indicators*, January 10, 2024. I use the 20-year government bond yield because the historical MRP is calculated over an approximately 20-year government bond yield. The February 2024 issue of *Blue Chip Economic Indicators* show a slightly higher forecast for the 2024 risk-free rate at 4.0 percent as compared to the 3.9 percent in January 2024.

<sup>68</sup> Bloomberg as of December 31, 2023.

<sup>69</sup> The MRP of 7.17% is sourced from Duff & Phelps, *Cost of Capital Navigator*.

<sup>70</sup> Bloomberg as of December 31, 2023. Bloomberg calculates the MRP over the 10-year government bond yield as 6.87%. I subtract 50 basis points as that is my estimate of the average maturity premium of the 20-year government bond over the 10-year government bond.

1 **Q45. Can you summarize the results from your CAPM and ECAPM analyses?**

2 A45. The results from the CAPM and ECAPM models are presented in Figure 10 below.

3 **Figure 10: CAPM/ ECAPM Cost of Equity Estimates**  
 4 **Electric Sample**

| Estimated Return on Equity             | Scenario 1<br>[1] | Scenario 2<br>[2] |
|----------------------------------------|-------------------|-------------------|
| <b>Electric Sample</b>                 |                   |                   |
| <i>Hamada Adjustment Without Taxes</i> |                   |                   |
| CAPM                                   | 11.7%             | 10.9%             |
| ECAPM ( $\alpha = 1.5\%$ )             | 11.7%             | 10.8%             |
| <i>Hamada Adjustment With Taxes</i>    |                   |                   |
| CAPM                                   | 11.7%             | 10.9%             |
| ECAPM ( $\alpha = 1.5\%$ )             | 11.7%             | 10.9%             |

5

6 **Q46. How do you interpret the result of your CAPM and ECAPM analyses?**

7 A46. First, there is very little difference between the CAPM and ECAPM results at this point  
 8 in time. Second, the Electric Utility Sample's results are consistent with a cost of equity  
 9 in the range of 10.75 percent to 11.75 percent (rounding to the nearest  $\frac{1}{4}$  percent).<sup>71</sup>  
 10 Relative to the results reported in the U-21297 matter, the range is narrower and the  
 11 lower bound has increased.<sup>72</sup>

12 **E. DCF APPROACH AND COST OF EQUITY ESTIMATES**

13 **Q47. Can you describe the discounted cash flow approach to estimating the cost of**  
 14 **equity?**

71 I note that I do not report the results from the financial risk adjustment method for the CAPM method and ignore them in my recommendation as the Commission in the past has been critical of the approach.

72 I note that prior to applying the Hamada method, the average ROE from the CAPM model is 11.0 percent using the historical average MRP and 10.2 percent using the forecasted MRP for an average of 10.6 percent.

A47. The DCF model estimates the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. There are two variations of the DCF model, the single-stage DCF and multi-stage DCF, as explained below.

### 1. Single-Stage DCF Approach

Q48. Can you please briefly describe the single-stage DCF and the inputs used to determine the cost of equity?

A48. Yes. The single-stage DCF model assumes that the current market price of a stock is equal to the present value of the dividends that its owners expect to receive. The expected stream of future dividends is discounted at a risk-appropriate rate to arrive at the present value of the dividends, represented by the current stock price. In this application of the DCF, the risk-appropriate rate is the cost of equity. Mathematically, the DCF model is shown in the formula below:

#### Formula 3

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

where  $P_0$  is the current market price of the stock;

$D_t$  is the dividend expected at the end of period  $t$ ;

$T$  is the last period in which a dividend is to be received; and

$r$  is the cost of equity capital.

Formula 3 implies that if one knows the current market price of a stock and its expected stream of future dividends, then it is possible to solve for the cost of equity  $r$ . The single-stage DCF model assumes that the stream of future dividends will grow at a constant rate into perpetuity. This assumption allows Formula 3 to be algebraically rearranged into the formula below to directly estimate the cost of equity:

#### Formula 4

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

where  $D_0$  is the current dividend; and

1             $g$  is the constant growth rate of the current dividend.

2            Another variation of the DCF model relaxes the restrictive constant growth rate  
3            assumption and instead, allows the dividend to grow at different rates at different points  
4            in time. This variation is known as the multi-stage DCF model and is further explained  
5            below.

6            **2. Multi-Stage DCF Approach**

7            **Q49. Can you briefly describe the multi-stage DCF and the inputs used to determine**  
8            **the cost of equity?**

9            A49. The multi-stage DCF accommodates different dividend growth rates at different points  
10           in time. Specifically, in the implementation of the multi-stage DCF, I assume three  
11           different growth rate phases. In the first phase, companies grow their dividend for five  
12           years at the forecasted company-specific rate of earnings growth. In the second phase,  
13           the company-specific growth rate incrementally steps down (or steps up) to the overall  
14           growth rate of the economy, represented by the long-term GDP growth rate. Finally, in  
15           the third phase, companies grow their dividend at the long-term GDP growth rate into  
16           perpetuity.

17           I calculate both the single- and multi-stage DCF using growth rates from *Value Line*  
18           and *IBES* as well as GDP forecasts from Blue Chip Economic Indicators in the case of  
19           the multi-stage DCF. The growth rates utilized in the DCF implementations are shown  
20           in Figure 7 above.

21           **3. DCF Cost of Equity Estimates**

22           **Q50. What are the results from your DCF based cost of equity estimates for your**  
23           **samples?**

24           A50. The financial risk adjusted single- and multi-stage DCF cost of equity estimates are  
25           presented in Figure 11 below.

Figure 11: DCF Cost of Equity Estimate

|                 | Simple | Multi-stage |
|-----------------|--------|-------------|
| Electric Sample | 11.2%  | 9.4%        |

In addition to the results above, I note that the average of the simple DCF calculations before any financial risk considerations is 10.5 percent.<sup>73</sup>

**Q51. How do you interpret the results from your DCF analyses?**

A51. The range of estimates obtained from the DCF methods range from 9.4 percent to 11.2 percent (9.5% to 11.25% rounding to the nearest ¼ percent). Relative to the results I obtained in my direct testimony for U-21297 both the lower and upper bound has increased by 0.50 percent. I view the multi-stage results as unrepresentative because they (1) are out of line with other results (2) may fail to capture the substantial growth needed in the electric sector to accomplish the transition to low-carbon economy, which may require a higher growth for a prolonged period of time. I also consider the very high end unrepresentative. Consequently, I consider the narrower range of 10.0 to 11.0 percent for the Electric Sample and note the results from the simple DCF without adjustments fall at the middle of that range.

**F. RISK PREMIUM APPROACH AND COST OF EQUITY ESTIMATE**

**Q52. Can you briefly describe the Risk Premium approach to estimating the cost of equity?**

A52. The Risk Premium approach adds a “risk premium” to the current risk-free rate to estimate the current cost of equity, as shown in Formula 5 below.

<sup>73</sup> Schedule D5.6, Panel A. The calculation ignores results below the yield on BBB rated debt.

## Formula 5

$$\text{Cost of Equity} = r_f + \text{Risk Premium}$$

The risk premium component of Formula 5 is estimated using the allowed ROEs and prevailing risk-free rates from past utility rate cases. In our implementation, I calculate the risk premium as the difference between allowed ROEs and the prevailing quarterly 20-year Treasury bond yield over the period 1990-Q4, 2023.<sup>74</sup> This difference represents the compensation for risk allowed by regulators. I use the statistical technique of ordinary least squares (OLS) regression to estimate the parameters of the linear equation:

## Formula 6

$$\text{Risk Premium} = A_0 + A_1 \times (r_f)$$

where  $A_0$  and  $A_1$  are parameters to be estimated by the regression technique; and

$r_f$  is the risk-free rate as measured by the 20-year Treasury bond yield.

**Q53. How are the parameters to the Risk Premium approach estimated?**

A53. The parameters estimated by regression analysis (*i.e.*, OLS) are shown in Figure 12 below. Additionally, the regression analysis finds that the risk-free rate has a high degree of statistical explanatory power in capturing changes in the risk premium. The negative coefficient  $A_1$  reflects the empirical fact that regulators grant lower risk premiums—and by extension, lower allowed ROEs—when the risk-free rate is higher. This is consistent with the observation that investors require a higher risk premium to hold equities over government bonds as bond yields decline. I then use the parameters from the regression analysis,  $A_0$  and  $A_1$ , to estimate the cost of equity using the risk-free rate of 4.30 percent. As the prevailing risk-free rate of 4.32 percent is virtually similar, I do not report results from using that figure.

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<sup>74</sup> 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.

1 **Q54. Can you describe the results from your Risk Premium model?**

2 A54. Applying the calculated risk premium and a risk-free rate of 4.30% to Formula 5 above  
3 results in an estimated cost of equity of 10.5% for electric utilities. These results are  
4 depicted in Figure 12 below.

5 **Figure 12: Implied Risk Premium Model Estimate: Electric Utilities**

|                  | R Squared | Estimate of<br>Intercept (A0) | Estimate of Slope<br>(A1) | Implied Cost of<br>Equity Range |
|------------------|-----------|-------------------------------|---------------------------|---------------------------------|
|                  | [1]       | [2]                           | [3]                       | [4]                             |
| Electric Utility | 85.6%     | 8.6%                          | -56.3%                    | 10.5%                           |

6

7 **Q55. How do you interpret the results from your Risk Premium model?**

8 A55. Based on the Risk Premium model using the forecasted interest rate indications, an  
9 average ROE for the average electric utility is 10.5 percent. This range is consistent  
10 with the estimates obtained from the CAPM and the DCF model for the Electric Utility  
11 Sample. I note that the R-squared is 85.6%, so that the regression has a high degree of  
12 explanatory power.

13 **G. SUMMARY RESULTS**

14 **Q56. Can you briefly summarize the results from the various models you employed to**  
15 **estimate the cost of equity for DTE Electric.**

16 A56. Based on the discussions above, I obtain the following estimates for my proxy groups.

**Figure 13: ROE Estimates**

|              | Electric Sample |       | Reasonable Range |        |
|--------------|-----------------|-------|------------------|--------|
|              | Low             | High  | Low              | High   |
| CAPM / ECAPM | 10.8%           | 11.7% | 10.75%           | 11.75% |
| DCF          | 9.4%            | 11.2% | 9.50%            | 11.00% |
| Risk Premium | 10.5%           | 10.5% | 10.50%           | 10.50% |
| Average      | 10.2%           | 11.1% | 10.25%           | 11.08% |
| Midpoint     | 10.70%          |       | 10.67%           |        |

The average of the low and high is 10.2 percent and 11.1 percent, respectively with the reasonable range being close at approximately 10.25 to 11.0 percent for the electric sample.

I note that DTE Electric's requested ROE of 10.5 percent is below the midpoint of my estimates by within the range of my reasonable estimates. Consequently, I view the requested ROE as conservative and especially so given DTEE's risk profile, which indicates the company has higher business risk than the comparable companies.

## **VI. DTE ELECTRIC SPECIFIC CIRCUMSTANCES AND ROE RECOMMENDATION**

### **A. REGULATORY ENVIRONMENT**

**Q57. Are there any differences in the regulatory environment in which the comparable companies and DTE Electric operates?**

**A57.** Like many of the sample companies, DTE Electric benefits from certain regulatory policies that reduce regulatory lag, including a forward test year for rate cases, and an annual Power Supply Cost Recovery ("PSCR") clause for expenses such as fuel, capacity, energy, transmission, and purchased power.<sup>75</sup> Subject to Commission review,

<sup>75</sup> S&P Global Market Intelligence, Commission Details for the Michigan Public Service Commission, accessed November 8, 2022, <https://platform.mi.spglobal.com/interactivex/CommissionDetails.aspx?Printable=1&id=4081574&Type=1&State=MI>.

1 the Company is permitted to include construction work in progress (“CWIP”) for  
2 pollution control measures and significant new infrastructure projects in rate base.<sup>76</sup>  
3 Cost-tracking mechanisms such as these are also in effect in states affecting several of  
4 the sample companies.<sup>77</sup> However, unlike some of the sample companies, DTE Electric  
5 does not currently have a revenue decoupling mechanism (since a 2012 Court of  
6 Appeals ruling reversed Michigan Public Service Commission approval for such a  
7 program that DTE Electric had implemented) or lost revenue adjustment mechanism  
8 (“LRAM”) in place, as some sample companies do.<sup>78</sup>

9 A more complete listing of regulatory mechanisms available to DTE and the companies  
10 in the electric proxy group is included in Exhibit D5.19. I discuss the findings from this  
11 comparison below.

12 **Q58. Are there any differences to the sample?**

13 A58. Yes. First, as noted above, Michigan does not have a decoupling or decoupling-like  
14 mechanism for electric utilities. Combined with the partial electric choice in Michigan,  
15 this could create a downward risk for DTE Electric. Second, DTE Electric relies to a  
16 larger degree than many of the comparators on nuclear generation (about 19 percent).  
17 Nuclear generation is associated with certain risks. Third, a relatively large proportion  
18 of DTE Electric’s generation is coal based (approximately 45 percent in 2023)<sup>79</sup>  
19 meaning that if Michigan’s Healthy Climate Plan’s goal of 50 percent renewable by

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<sup>76</sup> *Id.*

<sup>77</sup> Lillian Federico, “Alternative ratemaking plans in the U.S.,” S&P Global Market Intelligence, Regulatory Research Associates. April 16, 2020, accessed April 21, 2020, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#news/article?id=58062563&KeyProductLinkType=6>. Checked for updates July 31, 2021.

<sup>78</sup> *Edison Electric Institute*, “Alternative Regulation for Evolving Utility Challenges: An Updated Survey,” January 2013. Many of the companies in my comparable sample have a decoupling mechanism in place. This means that these companies benefit from regulatory provisions allowing them to recover their fixed costs independent of volumetric charges: if the utilities’ customers use less electricity than was forecast, the decoupling mechanism ensures that the utilities can recover their cost despite the decrease in variable revenues.

<sup>79</sup> DTE, “DTE Business Update,” December 8, 2023.

1 2030 is to be reached,<sup>80</sup> then DTEE will need to replace substantial parts of its  
2 generation fleet – leading to the need for large investments, which create execution  
3 risks as well as increases the proportion of fixed expenses, which all else equal,  
4 increases risk. Additionally, DTE Electric has a higher than average for the proxy  
5 companies reliance on nuclear power (19% versus the sample average of 8%).<sup>81</sup>

6 Looking to the regulatory mechanisms that are available to companies in the sample  
7 and DTE Electric, I note (in addition to DTEE’s lack of a decoupling mechanism) that  
8 DTEE similar to most other electric utilities’ operating entities has an electric fuel  
9 purchase power adjustment clause. Similar to nearly half of the regulated operating  
10 entities, DTEE has access to a renewable/non-traditional generation rider, but unlike  
11 about 40 percent of the operating entities owned by the sample companies, DTEE does  
12 not have access to delivery infrastructure or environmental compliance riders.<sup>82</sup>  
13 Overall, I do not see any major differences in access to regulatory mechanisms other  
14 than the lack of an electric decoupling mechanism in Michigan.

15 **Q59. Please elaborate on the impact of Fermi 2 ownership on the Company’s risk**  
16 **profile.**

17 A59. Although empirical tests of the effects of the ownership of nuclear generating plants on  
18 the cost of capital are inconclusive, the cost of capital is affected by business risk which  
19 is the risk remaining after diversifiable risk is removed from total risk.

20 The additional risk of the Fermi 2 Nuclear Generation Plant is likely to be largely  
21 diversifiable, but it is also asymmetric. Asymmetric risk refers to a downside risk for  
22 which there is no corresponding upside to balance the risk.

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80 *Forbes*, “Michigan 2050 Carbon Neutrality Goal Could Be An Economic Engine – If It Avoids A Rush to Gas,” February 9, 2022.

81 Source: Schedule D5.18 Revised

82 Source: Schedule D5.19

1 **Q60. If the risk of Fermi 2 does not affect the cost of capital, what do you recommend**  
2 **that the Commission do?**

3 A60. First, the Commission should recognize that the risk of nuclear power plants is  
4 asymmetric. The Commission should remove the asymmetric risk if there is an event  
5 at the plant because the Company has not been previously compensated through its cost  
6 of capital for potential loss. Second, the empirical tests of the effect of nuclear power  
7 plants on the cost of capital are likely too “weak” in the sense that is extremely difficult  
8 to develop a test likely to detect the effects of nuclear generating assets on the cost of  
9 capital for a company. That is because there are so many other factors that affect the  
10 cost of capital. For example, nuclear plants are generally owned by holding companies  
11 with many other types of assets and are affected by varying regulatory policies. It may  
12 well be that nuclear generating plants increase the cost of capital even though empirical  
13 tests have not been able to detect it. I regard ownership of Fermi 2 as one more factor  
14 indicating that the Company is riskier than the sample on average.

15 **Q61. Did you consider DTE Electric’s capital expenditures relative to those of the**  
16 **sample?**

17 A61. Yes. As shown in Schedule D5.18 Revised, DTE Electric’s capital expenditures are  
18 higher than of the average company in the Electric Sample. Specifically, the  
19 average capital expenditure to net plant is above the average or median of the sample.  
20 A higher capital expenditure introduces relatively higher fixed costs, which cannot  
21 readily be eliminated should circumstances change. Thus, all else equal, higher  
22 capital expenditures increases business risk.

23 **Q62. Can you summarize your assessment of DTE Electric’s business risk relative to**  
24 **the sample companies?**

25 A62. In consideration of the factors mentioned above, I believe DTE Electric is of higher  
26 than average business risk relative to the sample companies.

**VII. COST OF CAPITAL RECOMMENDATION**

**Q63. What do you recommend for DTE Electric's cost of equity in this proceeding?**

A63. The cost of equity estimates from my analyses were summarized in Figure 13 above and repeated below in Figure 14.

**Figure 14: Summary ROE Results**

|              | Electric Sample |       |
|--------------|-----------------|-------|
|              | Low             | High  |
| CAPM / ECAPM | 10.8%           | 11.7% |
| DCF          | 9.4%            | 11.2% |
| Risk Premium | 10.5%           | 10.5% |
| Average      | 10.2%           | 11.1% |

\* The single-stage DCF average is 10.5% ignoring financial risk.

Based on the figures above, it is evident that the current cost of equity is higher than in DTE Electric's last rate case, when a ROE of 9.9 percent was allowed. The average of the low and high estimates results in a range of 10.2 to 11.1 percent, so that the average of the lowest estimates are above the most recently allowed ROE. The midpoint of the range is 10.65 percent. The increase in the cost of equity is predominantly caused by a higher risk-free rate and an increase in the forecasted MRP, while other parameters have remained relatively stable.

Based on the data above I recommend that DTE Electric be allowed a ROE of 10.5 percent on the 50 percent equity financed rate base. The recommendation is conservative based on my finding that the midpoint of the range I estimate for the comparable sample is above 10.5 percent and DTE Electric has higher business risk than the electric sample group.

**Q64. Does this conclude your testimony?**

A64. Yes.

## APPENDIX A: RESUME OF DR. BENTE VILLADSEN

**Dr. Bente Villadsen's** work concentrates in the areas of regulatory finance and accounting. Her recent work has focused on accounting issues, damages, cost of capital and regulatory finance. Dr. Villadsen has testified on cost of capital and accounting, analyzed credit issues in the utility industry, risk management practices as well the impact of regulatory initiatives such as energy efficiency and de-coupling on cost of capital and earnings. Among her recent advisory work is assisting entities in the acquisition of regulated utilities regarding issues such the return on equity, capital structure, recovery of costs and capital expenditures, growth opportunities, and regulatory environments as well as the precedence for regulatory approval in mergers or acquisitions. Dr. Villadsen's accounting work has pertained to disclosure issues and principles including impairment testing, fair value accounting, leases, accounting for hybrid securities, accounting for equity investments, cash flow estimation as well as overhead allocation. Dr. Villadsen has estimated damages in the U.S. as well as internationally for companies in the construction, telecommunications, energy, cement, and rail road industry. She has filed testimony and testified in federal and state court, in international and U.S. arbitrations and before state and federal regulatory commissions on accounting issues, damages, discount rates and cost of capital for regulated entities.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management with a concentration in accounting. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining The Brattle Group, Dr. Villadsen was a faculty member at Washington University in St. Louis, University of Michigan, and University of Iowa.

She has taught financial and managerial accounting as well as econometrics, quantitative methods, and economics of information to undergraduate or graduate students. Dr. Villadsen served as the president of the Society of Utility Regulatory Financial Analysts for 2016-2018.

### AREAS OF EXPERTISE

- Regulatory Finance
  - Cost of Capital
  - Cost of Service (including prudence)
  - Energy Efficiency, De-coupling and the Impact on Utilities Financials
  - Relationship between regulation and credit worthiness
  - Risk Management
  - Regulatory Advisory in Mergers & Acquisitions
- Accounting and Corporate Finance
  - Application of Accounting Standards
  - Disclosure Issues
  - Forensics
  - Credit Issues in the Utility Industry

- Damages and Valuation (incl. international arbitration)
  - Utility valuation
  - Lost Profit for construction, oil&gas, utilities
  - Valuation of construction contract
  - Damages from the choice of inaccurate accounting methodology

## EXPERIENCE

### Regulatory Finance

- Dr. Villadsen has testified on cost of capital and capital structure for many regulated entities including electric and gas utilities, pipelines, railroads, water utilities and barges in many jurisdictions including at the FERC, the Surface Transportation Board, the states of Alaska, Arizona, California, Hawaii, Illinois, Iowa, Michigan, New Mexico, New York, Ohio, Oregon, Virginia and Washington as well as in the provinces of Alberta, Ontario, and Quebec.
- On behalf of the Association of American Railroads, Dr. Villadsen appeared as an expert before the Surface Transportation Board (STB) and submitted expert reports on the determination of the cost of equity for U.S. freight railroads. The STB agreed to continue to use two estimation methods with the parameters suggested.
- On behalf of two taxpayers, Dr. Villadsen has testified on the methodology used to estimate the discount rate for the income approach to property valuation in Utah district court.
- For several electric, gas and transmission utilities as well as pipelines in Alberta, Canada, Dr. Villadsen filed evidence and appeared as an expert on the cost of equity and appropriate capital structure for 2015-17. Her evidence was heard by the Alberta Utilities Commission.
- On behalf of gas distribution and storage utilities in Quebec, Dr. Villadsen provided expert testimony on the appropriate cost of equity and capital structure for of Énergir, Gazifère, and Intragaz before Régie de l'énergie du Québec.
- For Barbados Light & Power, she provided testimony on the appropriate weighted average cost of capital including the cost of equity, the cost of debt, and capital structure. The matter was heard by the Barbados Fair Trading Commission.
- For potential acquirers of electric, natural gas, and water utilities, Dr. Villadsen has conducted regulatory due diligence in the form of an assessment of the regulatory environment in the jurisdictions at issue including the ability to earn the allowed return and recover costs associated with operations or capital expenditures. Her evaluations also involved an assessment of needed capital expenditures and the recovery of such expenditure through rates or specific

adjustment clauses. Her prior work includes more than 15 US states, the FERC, and several Canadian provinces.

- She has worked on formula rates for transmission companies at FERC; including matters where specific issues such as the determination of the rate base, the treatment of leases, and the recovery of transaction costs have been litigated.
- Dr. Villadsen has estimated the cost of capital and recommended an appropriate capital structure for natural gas and liquids pipelines in Canada, Mexico, and the US. using the jurisdictions' preferred estimation technique as well as other standard techniques. This work has been used in negotiations with shippers as well as before regulators.
- For the Ontario Energy Board Staff, Dr. Villadsen submitted evidence on the appropriate capital structure for a power generator that is engaged in a nuclear refurbishment program.
- Dr. Villadsen has advised many acquirers and potential acquirers of regulated utilities regarding the return on equity, capital structure, recovery of costs and capital expenditures, growth opportunities, and regulatory environments as well as the precedence for regulatory approval in mergers or acquisitions. Her work has pertained to many jurisdiction in the U.S. and Canada including more than 20 states and three provinces as well as the Federal Energy Regulatory Commission. She has worked on electric, natural gas, pipeline, transmission, and water utility acquisitions.
- She has estimated the cost of equity on behalf of entities such as Anchorage Municipal Light and Power, Arizona Public Service, Portland General Electric, Anchorage Water and Wastewater, NW Natural, Nicor, Consolidated Edison, Southern California Edison, American Water, California Water, and EPCOR in state regulatory proceedings. She has also submitted testimony before the FERC on behalf of electric transmission and natural gas pipelines as well as Bonneville Power Authority. Much of her testimony involves not only cost of capital estimation but also capital structure, the impact on credit metrics and various regulatory mechanisms such as revenue stabilization, riders and trackers.
- In Australia, she has submitted led and co-authored a report on cost of equity and debt estimation methods for the Australian Pipeline Industry Association. The equity report was filed with the Australian Energy Regulator as part of the APIA's response to the Australian Energy Regulator's development of rate of return guidelines and both reports were filed with the Economic Regulation Authority by the Dampier Bunbury Pipeline. She has also submitted

a report on aspects of the WACC calculation for Aurizon Network to the Queensland Competition Authority.

- In Canada, Dr. Villadsen has co-authored reports for the British Columbia Utilities Commission and the Canadian Transportation Agency regarding cost of capital methodologies. Her work consisted partly of summarizing and evaluating the pros and cons of methods and partly of surveying Canadian and world-wide practices regarding cost of capital estimation.
- Dr. Villadsen worked with utilities to estimate the magnitude of the financial risk inherent in long-term gas contracts. In doing so, she relied on the rating agency of Standard & Poor's published methodology for determining the risk when measuring credit ratios.
- She has worked on behalf of infrastructure funds, pension funds, utilities and others on understanding and evaluating the regulatory environment in which electric, natural gas, or water utilities operate for the purpose of enhancing investors ability to understand potential investments. She has also provided advise and testimony in the approval phase of acquisitions.
- On behalf of utilities that are providers of last resort, she has provided estimates of the proper compensation for providing the state-mandated services to wholesale generators.
- In connection with the AWC Companies application to construct a backbone electric transmission project off the Mid-Atlantic Coast, Dr. Villadsen submitted testimony before the Federal Energy Regulatory Commission on the treatment the accounting and regulatory treatment of regulatory assets, pre-construction costs, construction work in progress, and capitalization issues.
- On behalf of ITC Holdings, she filed testimony with the Federal Energy Regulatory Commission regarding capital structure issues.
- For a FERC-regulated entity, Dr. Villadsen undertook an assessment of the company's classification of specific long-term commitments, leases, regulatory assets, asset retirement obligations, and contributions / distributions to owners in the company's FERC Form 1.
- Testimony on the impact of transaction specific changes to pension plans and other rate base issues on behalf of Balfour Beatty Infrastructure Partners before the Michigan Public Service Commission.
- On behalf of financial institutions, Dr. Villadsen has led several teams that provided regulatory guidance regarding state, provincial or federal regulatory issues for integrated electric utilities,

transmission assets and generation facilities. The work was requested in connection with the institutions evaluation of potential investments.

- For a natural gas utility facing concerns over mark to market losses on long term gas hedges, Dr. Villadsen helped develop a program for basing a portion of hedge targets on trends in market volatility rather than on just price movements and volume goals. The approach was refined and approved in a series of workshops involving the utility, the state regulatory staff, and active intervener groups. These workshops evolved into a forum for quarterly updates on market trends and hedging positions.
- She has advised the private equity arm of three large financial institutions as well as two infrastructure companies, a sovereign fund and pension fund in connection with their acquisition of regulated transmission, distribution or integrated electric assets in the U.S. and Canada. For these clients, Dr. Villadsen evaluated the regulatory climate and the treatment of acquisition specific changes affecting the regulated entity, capital expenditures, specific cost items and the impact of regulatory initiatives such as the FERC's incentive return or specific states' approaches to the recovery of capital expenditures riders and trackers. She has also reviewed the assumptions or worked directly with the acquirer's financial model.
- On behalf of a provider of electric power to a larger industrial company, Dr. Villadsen assisted in the evaluation of the credit terms and regulatory provisions for the long-term power contract.
- For several large electric utility, Dr. Villadsen reviewed the hedging strategies for electricity and gas and modeled the risk mitigation of hedges entered into. She also studies the prevalence and merits of using swaps to hedge gas costs. This work was used in connection with prudence reviews of hedging costs in Colorado, Oregon, Utah, West Virginia, and Wyoming.
- She estimated the cost of capital for major U.S. and Canadian utilities, pipelines, and railroads. The work has been used in connection with the companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, the Surface Transportation Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies, water utilities, railroads and other parties. For the owner of Heathrow and Gatwick Airport facilities, she has assisted in estimating the cost of capital of U.K. based airports. The resulting report was filed with the U.K. Competition Commission.

- For a Canadian pipeline, Dr. Villadsen co-authored an expert report regarding the cost of equity capital and the magnitude of asset retirement obligations. This work was used in arbitration between the pipeline owner and its shippers.
- In a matter pertaining to regulatory cost allocation, Dr. Villadsen assisted counsel in collecting necessary internal documents, reviewing internal accounting records and using this information to assess the reasonableness of the cost allocation.
- She has been engaged to estimate the cost of capital or appropriate discount rate to apply to segments of operations such as the power production segment for utilities.
- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.
- Dr. Villadsen has been part of a team assessing the impact of conservation initiatives, energy efficiency, and decoupling of volumes and revenues on electric utilities financial performance. Specifically, she has estimated the impact of specific regulatory proposals on the affected utilities earnings and cash flow.
- On behalf of Progress Energy, she evaluated the impact of a depreciation proposal on an electric utility's financial metric and also investigated the accounting and regulatory precedent for the proposal.
- For a large integrated utility in the U.S., Dr. Villadsen has for several years participated in a large range of issues regarding the company's rate filing, including the company's cost of capital, incentive based rates, fuel adjustment clauses, and regulatory accounting issues pertaining to depreciation, pensions, and compensation.
- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluating the impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.
- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.

- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).
- For several infrastructure companies, Dr. Villadsen has provided advice regarding the regulatory issues such as the allowed return on equity, capital structure, the determination of rate base and revenue requirement, the recovery of pension, capital expenditure, fuel, and other costs as well as the ability to earn the allowed return on equity. Her work has spanned 14 U.S. states as well as Canada, Europe, and South America. She has been involved in the electric, natural gas, water, and toll road industry.
- For an electric utility, Dr. Villadsen provided guidance regarding the regulatory accounts needed as the utility was separated into separate generation, transmission, and distribution entities with each their accounting records.

#### **Accounting and Corporate Finance**

- For an electric utility subject to international arbitration, Dr. Villadsen submitted expert testimony on the application of IFRS as it pertains to receivables, the classification of liabilities and contingencies.
- In international arbitration, she submitted an expert report on IFRS' requirements regarding carve out financials, impairment, the allocation of costs to segments, and disclosure issues.
- On behalf of a construction company in arbitration with a sovereign, Dr. Villadsen filed an expert report report quantifying damages in the form of lost profit and consequential damages.
- In arbitration before the International Chamber of Commerce Dr. Villadsen testified regarding the true-up clauses in a sales and purchase agreement, she testified on the distinction between accruals and cash flow measures as well as on the measurement of specific expenses and cash flows.
- On behalf of a taxpayer, Dr. Villadsen recently testified in federal court on the impact of discount rates on the economic value of alternative scenarios in a lease transaction.
- On behalf of a taxpayer, Dr. Villaden has provided an expert report on the nature of the cost of equity used in regulatory proceedings as well as the interest rate regime in 2014.
- In an arbitration matter before the International Centre for Settlement of Investment Disputes, she provided expert reports and oral testimony on the allocation of corporate overhead costs

and damages in the form of lost profit. Dr. Villadsen also reviewed internal book keeping records to assess how various inter-company transactions were handled.

- Dr. Villadsen provided expert reports and testimony in an international arbitration under the International Chamber of Commerce on the proper application of US GAAP in determining shareholders' equity. Among other accounting issues, she testified on impairment of long-lived assets, lease accounting, the equity method of accounting, and the measurement of investing activities.
- In a proceeding before the International Chamber of Commerce, she provided expert testimony on the interpretation of certain accounting terms related to the distinction of accruals and cash flow.
- In an arbitration before the American Arbitration Association, she provided expert reports on the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities in a contract dispute between two major oil companies. For the purpose of determining whether the classification was appropriate, Dr. Villadsen had to review the company's internal book keeping records.
- In U.S. District Court, Dr. Villadsen filed testimony regarding the information required to determine accounting income losses associated with a breach of contract and cash flow modeling.
- Dr. Villadsen recently assisted counsel in a litigation matter regarding the determination of fair values of financial assets, where there was a limited market for comparable assets. She researched how the designation of these assets to levels under the FASB guidelines affect the value investors assign to these assets.
- She has worked extensively on litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts, the application of accounting principles, and disclosure requirements regarding derivatives.
- Dr. Villadsen evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.

- In a confidential retention matter, Dr. Villadsen assisted attorneys for the FDIC evaluate the books for a financial investment institution that had acquired substantial Mortgage Backed Securities. The dispute evolved around the degree to which the financial institution had impaired the assets due to possible put backs and the magnitude and estimation of the financial institution's contingencies at the time of it acquired the securities.
- In connection with a securities litigation matter she provided expert consulting support and litigation consulting on forensic accounting. Specifically, she reviewed internal documents, financial disclosure and audit workpapers to determine (1) how the balance's sheets trading assets had been valued, (2) whether the valuation was following GAAP, (3) was properly documented, (4) was recorded consistently internally and externally, and (5) whether the auditor had looked at and documented the valuation was in accordance with GAAP.
- In a securities fraud matter, Dr. Villadsen evaluated a company's revenue recognition methods and other accounting issues related to allegations of improper treatment of non-cash trades and round trip trades.
- For a multi-national corporation with divisions in several countries and industries, Dr. Villadsen estimated the appropriate discount rate to value the divisions. She also assisted the company in determining the proper manner in which to allocate capital to the various divisions, when the company faced capital constraints.
- Dr. Villadsen evaluated the performance of segments of regulated entities. She also reviewed and evaluated the methods used for overhead allocation.
- She has worked on accounting issues in connection with several tax matters. The focus of her work has been the application of accounting principles to evaluate intra-company transactions, the accounting treatment of security sales, and the classification of debt and equity instruments.
- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.
- In connection with a bankruptcy proceeding, Dr. Villadsen provided litigation support for attorneys and an expert regarding corporate governance.

## Damages and Valuation

- For the Alaska Industrial Development and Export Authority, Dr. Villadsen co-authored a report that estimated the range of recent acquisition and trading multiples for natural gas utilities.
- On behalf of a taxpayer, Dr. Villadsen testified on the economic value of alternative scenarios in a lease transaction regarding infrastructure assets.
- For a foreign construction company involved in an international arbitration, she estimated the damages in the form of lost profit on the breach of a contract between a sovereign state and a construction company. As part of her analysis, Dr. Villadsen relied on statistical analyses of cost structures and assessed the impact of delays.
- In an international arbitration, Dr. Villadsen estimated the damages to a telecommunication equipment company from misrepresentation regarding the product quality and accounting performance of an acquired company. She also evaluated the IPO market during the period to assess the possibility of the merged company to undertake a successful IPO.
- On behalf of pension plan participants, Dr. Villadsen used an event study estimated the stock price drop of a company that had engaged in accounting fraud. Her testimony conducted an event study to assess the impact of news regarding the accounting misstatements.
- In connection with a FINRA arbitration matter, Dr. Villadsen estimated the value of a portfolio of warrants and options in the energy sector and provided support to counsel on finance and accounting issues.
- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.
- Dr. Villadsen was part of a team estimating the damages that may have been caused by a flawed assumption in the determination of the fair value of mortgage related instruments. She provided litigation support to the testifying expert and attorneys.

- For an electric utility, Dr. Villadsen estimated the loss in firm value from the breach of a power purchase contract during the height of the Western electric power crisis. As part of the assignment, Dr. Villadsen evaluated the creditworthiness of the utility before and after the breach of contract.
- Dr. Villadsen modeled the cash flows of several companies with and without specific power contract to estimate the impact on cash flow and ultimately the creditworthiness and value of the utilities in question.

## BOOKS

*“Risk and Return for Regulated Industries,”* (with Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe) Elsevier, May 2017.

## PUBLICATIONS AND REPORTS

“International Rate of Return Methods – Recent Developments,” (with Toby Brown and Andrew W. Thompson), prepared for Energy Networks Australia and submitted to the *Australian Energy Regulator*, September 2022.

“A Review of International Approaches to Regulated Rates of Return,” (with J. Anthony, T. Brown, L. Figurelli, D. Harris, and N. Nguyen) published by the *Australian Energy Regulator*, September 2020.

“Global Impacts and Implications of COVID-19 on Utility Finance,” (with R. Mudge, F. Graves, J. Figueroa, T. Counts, L. Mwalenga, and S. Pant), *The Brattle Group*, July 2020.

“Impact of New Tax Law on Utilities’ Deferred Taxes,” (with Mike Tolleth and Elliott Metzler), *CRRRI 37<sup>th</sup> Annual Eastern Conference*, June, 2018.

“Implications of the New Tax Law for Regulated Utilities,” *The Brattle Group*, January 2018.

“Using Electric and Gas Forwards to Manage Market Risks: When a power purchase agreement with a utility is not possible, standard forward contracts can act as viable hedging instruments,” *North American Windpower*, May 2017, pp. 34-37.

*“Managing Price Risk for Merchant Renewable Investments: Role of Market Interactions and Dynamics on Effective Hedging Strategies,”* (with Onur Aydin and Frank Graves), Brattle Whitepaper, January 2017.

“Aurizon Network 2016 Access Undertaking: Aspects of the WACC,” (with Mike Tolleth), filed with the *Queensland Competition Authority*, Australia, November 2016.

“Report on Gas LDC multiples,” with Michael J. Vilbert, *Alaska Industrial Development and Export Authority*, May 2015.

“Aurizon Network 2014 Draft Access Undertaking: Comments on Aspects of the WACC,” prepared for Aurizon Network and submitted to the *Queensland Competition Authority*, December 2014

“*Brattle Review of AE Planning Methods and Austin Task Force Report.*” (with Frank C. Graves) September 24, 2014.

Report on “Cost of Capital for Telecom Italia’s Regulated Business” with Stewart C. Myers and Francesco Lo Passo before the *Communications Regulatory Authority of Italy* (“AGCOM”), March 2014. *Submitted in Italian.*

“Alternative Regulation and Ratemaking Approaches for Water Companies: Supporting the Capital Investment Needs of the 21st Century,” (with J. Wharton and H. Bishop), prepared for the *National Association of Water Companies*, October 2013.

“Estimating the Cost of Debt,” (with T. Brown), prepared for the Dampier Bunbury Pipeline and filed with the *Economic Regulation Authority*, Western Australia, March 2013.

“Estimating the Cost of Equity for Regulated Companies,” (with P.R. Carpenter, M.J. Vilbert, T. Brown, and P. Kumar), prepared for the Australian Pipeline Industry Association and filed with the *Australian Energy Regulator* and the *Economic Regulation Authority*, Western Australia, February 2013.

“Calculating the Equity Risk Premium and the Risk Free Rate,” (with Dan Harris and Francesco LoPasso), prepared for *NMa and Opta, the Netherlands*, November 2012.

“Shale Gas and Pipeline Risk: Earnings Erosion in a More Competitive World,” (with Paul R. Carpenter, A. Lawrence Kolbe, and Steven H. Levine), *Public Utilities Fortnightly*, April 2012.

“Survey of Cost of Capital Practices in Canada,” (with Michael J. Vilbert and Toby Brown), prepared for *British Columbia Utilities Commission*, May 2012.

“Public Sector Discount Rates” (with Frank Graves, Bin Zhou), *Brattle* white paper, September 2011

“FASB Accounting Rules and Implications for Natural Gas Purchase Agreements,” (with Fiona Wang), *American Clean Skies Foundation*, February 2011.

“IFRS and You: How the New Standards Affect Utility Balance Sheets,” (with Amit Koshal and Wyatt Toolson), *Public Utilities Fortnightly*, December 2010.

“Corporate Pension Plans: New Developments and Litigation,” (with George Oldfield and Urvashi Malhotra), Finance Newsletter, Issue 01, *The Brattle Group*, November 2010.

“Review of Regulatory Cost of Capital Methodologies,” (with Michael J. Vilbert and Matthew Aharonian), *Canadian Transportation Agency*, September 2010.

“Building Sustainable Efficiency Businesses: Evaluating Business Models,” (with Joe Wharton and Peter Fox-Penner), *Edison Electric Institute*, August 2008.

“Understanding Debt Imputation Issues,” (with Michael J. Vilbert and Joe Wharton and *The Brattle Group* listed as an author), *Edison Electric Institute*, June 2008.

“Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low,” *Public Utilities Fortnightly*, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

“The Effect of Debt on the Cost of Equity in a Regulatory Setting,” (with A. Lawrence Kolbe and Michael J. Vilbert, and with “*The Brattle Group*” listed as author), *Edison Electric Institute*, April 2005.

“Communication and Delegation in Collusive Agencies,” *Journal of Accounting and Economics*, Vol. 19, 1995.

“Beta Distributed Market Shares in a Spatial Model with an Application to the Market for Audit Services” (with M. Hviid), *Review of Industrial Organization*, Vol. 10, 1995.

## SELECTED PRESENTATIONS

“Financing Infrastructure Investments in an Era of Deep Uncertainty: In Need of Updating the Regulatory Toolbox – an International Perspective,” webinar sponsored by *Utilitalia*, September 26, 2023.

“Current Issues in Cost of Capital” presented to *EEI Members*, July, 2018-19, 2021-23, Madison, WI.

“The Future of Gas: Options and Regulatory Strategies in a Carbon-Constrained Future,” (with Ahmad Faruqui, Josh Figueroa, Long Lam), Presented to Executive Team at Gas Utility, June 2021.

“FERC’s new ROE methodology for pipelines and electric transmission,” (with Michael J. Vilbert) *UBS Fireside Chat*, June 24, 2020.

“Managing Price Risk for Merchant Renewable Investments,” (with Onur Aydin) *EIA Electricity Pricing Workgroup* (webinar), April 30, 2019.

“Decoupling and its Impact on Cost of Capital” presented to *SURFA Members and Friends*, February 27, 2019.

“Introduction to Capital Structure & Liability Management”, *the American Gas Association/Edison Electric Institute “Introduction and Advanced Public Utility Accounting Courses”*, August 2018-2019, August 2022-2023.

“Issues Cost of Capital,” *the American Gas Association/Edison Electric Institute “Advanced Public Utility Accounting Courses Advanced Public Utility Accounting Course,”* August 2023.

“Lessons from the U.S. and Australia” presented at *Seminar on the Cost of Capital in Regulated Industries: Time for a Fresh Perspective?* Brussels, October 2017.

“Should Regulated Utilities Hedge Fuel Cost and if so, How?” presented at *SURFA’s 49 Financial Forum*, April 20-21, 2017.

“Transmission: The Interplay Between FERC Rate Setting at the Wholesale Level and Allocation to Retail Customers,” (with Mariko Geronimo Aydin) presented at *Law Seminars International: Electric Utility Rate Cases*, March 16-17, 2017.

“Capital Structure and Liability Management,” *American Gas Association and Edison Electric Institute Public Utility Accounting Course*, August 2015-2017.

“Current Issues in Cost of Capital,” *Edison Electric Institute Advanced Rate School*, July 2013-2017.

“Alternative Regulation and Rate Making Approaches for Water Companies,” *Society of Depreciation Professionals Annual Conference*, September 2014.

“Capital Investments and Alternative Regulation,” *National Association of Water Companies Annual Policy Forum*, December 2013.

“Accounting for Power Plant,” *SNL’s Inside Utility Accounting Seminar*, Charlotte, NC, October 2012.

“GAAP / IFRS Convergence,” *SNL’s Inside Utility Accounting Seminar*, Charlotte, NC, October 2012.

“International Innovations in Rate of Return Determination,” *Society of Utility Financial and Regulatory Analysts’ Financial Forum*, April 2012.

“Utility Accounting and Financial Analysis: The Impact of Regulatory Initiatives on Accounting and Credit Metrics,” 1.5 day seminar, EUCI, Atlanta, May 2012.

“Cost of Capital Working Group Eforum,” *Edison Electric Institute webinar*, April 2012.

“Issues Facing the Global Water Utility Industry” Presented to Sensus’ Executive Retreat, Raleigh, NC, July 2010.

“Regulatory Issues from GAAP to IFRS,” *NASUCA 2009 Annual Meeting*, Chicago, November 2009.

“Subprime Mortgage-Related Litigation: What to Look for and Where to Look,” *Law Seminars International: Damages in Securities Litigation*, Boston, May 2008.

“Evaluating Alternative Business / Incentive Models,” (with Joe Wharton). *EEI Workshop, Making a Business of Energy Efficiency: Sustainable Business Models for Utilities*, Washington DC, December 2007.

“Deferred Income Taxes and IRS’s NOPR: Who should benefit?” *NASUCA Annual Meeting*, Anaheim, CA, November 2007.

“Discussion of ‘Are Performance Measures Other Than Price Important to CEO Incentives?’” *Annual Meeting of the American Accounting Association*, 2000.

“Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach,” (with R.T. Boylan) *Business and Management Assurance Services Conference*, Austin 2000.

## TESTIMONY

Affidavit on the Cost of Capital Mechanism on behalf of Pacific Gas & Electric Company, San Diego Gas & Electric, Southern California Gas, and Southern California Edison before the *California Public Utilities Commission*, Application 22-04-008 and related matters, January 2024.

Direct testimony on the cost of equity on behalf of DTE Gas before the *Michigan Public Service Commission*, Case No. U-21291, January 2024.

Direct testimony on the cost of equity on behalf of Orange & Rockland Utilities before the *New York Public Service Commission* (with Josh Figueroa), Case No. 24-E-0060, January 2024.

Direct testimony on the cost of equity on behalf of Northern Border Pipeline Company before the *Federal Energy Regulatory Commission*, Docket No. RP-24-287, December 2023.

Direct testimony on the cost of equity and capital structure on behalf of Anchorage Water Utility and Anchorage Wastewater Utility before the *Regulatory Commission of Alaska*, TA178-122 and TA180-126, December 2023.

Direct and Supplemental Direct testimony on the cost of equity on behalf of Interstate Power and Light before the *Iowa Utilities Board*, Docket No. RPU-2023-0003, October 2023, January 2024.

Direct prepared testimony on the cost of equity on behalf of GTN before the *Federal Energy Regulatory Commission*, Docket No. RP23-1099, September 2023.

Rehearing testimony, Rebuttal Rehearing testimony and hearing appearance on fixed ROE for advanced ratemaking on behalf of Interstate Power and Light before the *Iowa Utilities Board*, Docket No. RPU-2021-0003, July 2023, August 2023.

Expert report on IFRS accounting and forensics in the matter of an *arbitration in London, UK*, under the Arbitration Act 1996, at the instruction Allen & Overy (with Richard Caldwell), June 2023.

Rebuttal Testimony on decoupling in general rate case on behalf of California-American Water Company before the *California Public Utilities Commission*, A.22-07-001, May 2023.

Reply Evidence and Hearing Appearance on cost of equity, capital structure and formula approach behalf of ATCO Utilities, FortisAlberta, and Apex on Cost of Capital before the *Alberta Utilities Commission*, Proceeding 27084, February 2023, April 2023, May 2023.

Direct, Rebuttal and Surrebuttal Testimony on behalf of Portland General Electric on Cost of Capital before the *Public Utility Commission of Oregon*, UE-416, February, July, September 2023.

Direct and Rebuttal Testimony on behalf of DTE Electric on Cost of Capital before the *Michigan Public Service Commission*, Docket No. U-21297, February 2023, July 2023.

Direct Testimony, Rebuttal Testimony and Surrebuttal Testimony on behalf of Northern Illinois Gas Company (Nicor) on Cost of Capital before the *Illinois Commerce Commission*, Docket No. 23-0066, January 2023, May 2023, July 2023.

Direct and Rebuttal Testimony on behalf of Consolidated Edison's Steam Utility on Cost of Capital before the *New York Public Service Commission*, Docket No. 22-S-0659, November 2022, April 2023.

Direct and Rebuttal Testimony on Cost of Capital on behalf of Virginia Natural Gas before the *Virginia State Corporation Commission*, Docket No. 2022-00052, August 2022, May 2023.

Direct and Rebuttal Testimony on 2023 Cost of Capital on behalf of Southern California Edison before the *California Public Utilities Commission*, Application A.22-04-009 (U-338), April 2022, August 2022.

Written Evidence on Cost of Equity on behalf of ATCO, APEX, and Fortis Alberta before the *Alberta Utilities Commission*, Proceeding No. 27084, February 2022.

Prepared Direct Testimony on Cost of Equity on behalf of ANR Pipeline before the *Federal Energy Regulatory Commission*, Docket No. RP22-501-000, January 2022.

Direct Testimony and Rebuttal Testimony on Cost of Capital and Capital Structure on behalf of Consolidated Edison Company of New York before *New York Public Service Commission*, Case No. 22-E-0064 and 22-G-0065, January, June 2022.

Opening and Rebuttal Testimony, Hearing appearance on the Cost of Capital Mechanism on behalf of Southern California Edison before the *Public Utilities Commission of California*, Application A.21-08-013, January, February 2022.

Direct Testimony and Rebuttal Testimony on Cost of Equity on behalf of DTE Electric Company before the *Michigan Public Service Commission*, Case No. U-20836, January, June 2022.

Direct and Rebuttal Testimony on the Cost of Equity and Capital Structure on behalf of Anchorage Water and Wastewater Utility before the *Regulatory Commission of Alaska*, TA-172-122 and TA-172-126, December 2021, October 2022.

Direct Testimony on the Cost of Equity on behalf of Northwest Natural before the *Public Utility Commission of Oregon* (with Josh Figueroa), Docket No. UG-435, December 2021

Direct Testimony and Hearing Appearance on Cost of Equity and Capital Structure on behalf of Énergir, Gazifère, and Intragaz before *Régie de l'énergie du Québec*, R-4156-2021, November 2021, June 2022.

Direct Testimony, Rebuttal Testimony, and Hearing appearance on Cost of Equity for Advanced Ratemaking on behalf of Interstate Power and Light Company, *Iowa Utilities Board*, RPU-2021-0003, November 2021, June and August 2022.

Expert Report and Hearing appearance on Cost of Equity and the Weighted Average Cost of Capital on behalf of Barbados Light and Power Company, *Barbados Fair Trading Commission*, September 2021, October 2022.

Direct Testimony on California's Cost of Capital Mechanism and Cost of Equity on behalf of Southern California Edison, *California Public Utilities Commission*, Application A.21-08-013, August 2021.

Expert Report on Contingent Liabilities and Materiality under IFRS on behalf of of Norilsk Nickel Mauritius, *LCIA Arbitration* No. 163506, August 2021.

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## APPENDIX B; Technical Appendix to the Direct Testimony of Bente Villadsen

This technical appendix contains methodological details related to my implementations of the DCF and CAPM / ECAPM models. It also contains a discussion of both the basic finance principles and the specific standard formulations of the financial leverage adjustments employed to determine the cost of equity for a company with the level of financial risk inherent in DTE Electric's requested regulatory capital structure.

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## I. DCF Models

### A. DCF ESTIMATION OF COST OF EQUITY

The DCF method for estimating the cost of equity capital assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow stream:

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

where  $P_0$  is the current market price of the stock;  $D_t$  is the dividend cash flow expected at the end of period  $t$ ;  $r$  is the cost of equity capital; and  $T$  is the last period in which a dividend cash flow is to be received. The formula simply says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received. Since the current market price is known, it is possible to infer the cost of equity that corresponds to that price and a forecasted pattern of expected future dividends. In terms of Equation (1), if  $P_0$  is known and  $D_1, D_2, \dots, D_T$  are estimated, an analyst can “solve for” the cost of equity capital  $r$ .

### B. DETAILS OF THE DCF MODEL

Perhaps the most widely known and used application of the DCF method assumes that the expected rate of dividend growth remains constant forever. In the so-called Gordon Growth Model, the relationship expressed in Equation (1) is such that the present value equation can be rearranged algebraically into a formula for estimating the cost of equity. Specifically, if investors expect a dividend stream that will grow forever at a steady rate, then the market price of the stock will be given by

$$P_0 = \frac{D_1}{r - g} \quad (2)$$

where  $D_1$  is the dividend expected at the end of the first period,  $g$  is the perpetual growth rate, and  $P_0$  and  $r$  are the market price and the cost of capital, as before. Equation (2) is a simplified version of Equation (1) that can be solved algebraically to yield the well-known “DCF formula” for the cost of equity capital,

$$r = \frac{D_1}{P_0} + g = \frac{D_0 \times (1 + g)}{P_0} + g \quad (3)$$

There are other versions of the DCF model that relax this restrictive assumption and posit a more complex or nuanced pattern of expected future dividend payments. For example, if there is reason to believe that investors do *not* expect a company's dividends to grow at a steady rate forever, but rather have different growth rate expectations in the near term (e.g., over the next five or ten years), compared to the distant future (e.g., a period *starting* ten years from the present moment), a “multi-stage” growth pattern can be modeled in the present value formula (Equation (1)).

### 1. Dividends, Cash Flows, and Share Repurchases

In addition to the DCF model described above, there are many alternative formulations. Notable among these are versions of the model that use cash flows rather than dividends in the present value formula (Equation (1)).<sup>1</sup>

Because investors are interested in cash flow, it is technically important to capture *all* cash flows that are distributed to shareholders when estimating the cost of equity using the DCF method. In some circumstances, investors may expect to receive cash in forms other than dividends. An important example concerns the fact that many companies distribute cash to shareholders through share buybacks in addition to dividends. To the extent such repurchases are expected by investors, but not captured in the forecasted pattern of future dividends; a dividend-based implementation of the DCF model will underestimate the cost of equity.

Similarly, if investors have reason to suspect that a company's dividend payments will not reflect a full distribution of its available cash free cash flows in the period they were generated, it may be appropriate replace the forecasted dividends with estimated free cash flows to equity in the present value formula (Equation (1)). Focusing on *available* cash rather than that actually distributed in the form of dividends can help account for instances when near-term investing and financing activities (e.g., capital expenditures or asset sales, debt issuances or retirements, or share repurchases) may cause dividend growth patterns to diverge from growth in earnings.

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<sup>1</sup> For an example in a regulatory context, the U.S. Surface Transportation Board uses a cash flow based model with three stages to estimate the cost of equity for the railroads. See Surface Transportation Board Decision, “STB Ex Parte No. 664 (Sub-No. 1),” Decided January 23, 2009. Confirmed in EP-664 (Sub-No. 2), October 31, 2016 and EP 664 (Sub-No. 4), June 23, 2020.

Many utility companies such as those included in my proxy group have long histories of paying a dividend. In fact, as mentioned in Section I of this Appendix, one of my standard requirements for inclusion in my proxy group is that a company pays dividends for 5-years without a gap or a dividend cut (on per share basis) in the last six months. Additionally, although some utility companies have engaged in share repurchase programs, the companies in my proxy group do not distribute substantial cash flows by means other than dividends.

## **C. DCF MODEL INPUTS**

### **1. Dividends and Prices**

As described above, DCF models are forward-looking, comparing the *current* price of a stock to its expected *future* dividends to estimate the required expected return demanded by the market for that stock (i.e., the cost of equity). Therefore, the models demand the current market price and currently prevailing forecasts of future dividends as inputs.

The stock price input I employ for each proxy group company is the average of the closing stock prices for the 15 trading days ending on the date of my analysis. This guards against biases that may arise on a single trading day, yet is consistent with using current stock prices.

### **2. Company Specific Growth Rates**

#### **a. Analysts' Forecasted Growth Rates**

Finding the right growth rate(s) is usually the “hard part” of applying the DCF model, which is sometimes criticized due to what has been called “optimism bias” in the earnings growth rate forecasts of security analysts. Optimism bias is defined as tendency for analysts to forecast earnings growth rates that are higher than are actually achieved. Any optimism bias might be related to incentives faced by analysts that provide rewards not strictly based upon the accuracy of the forecasts. To the extent optimism bias is present in the analysts' earnings forecasts the cost of capital estimates from the DCF model would be too high.

While academic researchers during the 1990s as well as in early 2000s found evidence of analysts' optimism bias, there is some evidence that regulatory reforms have eliminated the issue. A more recent paper by Hovakimina and Saenyasiri (2010) found that recent efforts to curb analysts' incentive to provide optimistic forecasts have worked, so that “the median forecast bias essentially

disappeared.”<sup>2</sup> Thus, some recent research indicates that the analyst bias may be a problem of the past.

The findings of several academic studies<sup>3</sup> show that analyst earnings forecasts turn out to be too optimistic for stocks that are more difficult to value, for instance, stocks of smaller firms, firms with high volatility or turnover, younger firms, or firms whose prospects are uncertain. Coincidentally, stocks with greater analyst disagreement have higher analyst optimism bias—all of these describe companies that are more volatile and/or less transparent—none of which is applicable to the majority of utility companies with wide analyst coverage and information transparency. Consequently, optimism bias is not expected to be an issue for utilities.

### **b. Sources for Forecasted Growth Rates**

For the reasons described above, I rely on analyst forecasts of earnings growth for the company-specific growth rate inputs to my implementations of the single- and multi-stage DCF models. Most companies in my proxy group have coverage from equity analysts reporting to Thomson Reuters IBES, so I use the consensus 3-5 year EPS growth rate provided by that service. I supplement these consensus values with growth rates based on EPS estimates from *Value Line*.<sup>4</sup>

## **II. CAPM and ECAPM**

### **A. THE CAPITAL ASSET PRICING MODEL (CAPM)**

The Capital Asset Pricing Model (CAPM) is a theoretical model stating that 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 my Direct Testimony), in which

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<sup>2</sup> A. Hovakimian and E. Saenyasiri, “Conflicts of Interest and Analyst Behavior: Evidence from Recent Changes in Regulation,” *Financial Analysts Journal*, vol. 66, 2010.

<sup>3</sup> These studies include the following: (i) Hribar, P, McInnis, J. “Investor Sentiment and Analysts’ Earnings Forecast Errors,” *Management Science* Vol. 58, No. 2 (February 2012): pp. 293-307; (ii) Scherbina, A. (2004), “Analyst Disagreement, Forecast Bias and Stock Returns,” downloaded from Harvard Business School Working Knowledge: <http://hbswk.hbs.edu/item/5418.html>; and (iii) Michel, J-S., Pandes J.A. (2012), “Are Analysts Really Too Optimistic?” downloaded from <http://www.efmaefm.org>.

<sup>4</sup> Specifically, I compute the growth rate implied by *Value Line*’s current year EPS estimate and its projected 3-5 year EPS estimate. I then average this in with the IBES consensus estimate as an additional independent estimate, giving it a weight of 1 and weighting the IBES consensus according to the number of analysts who contributed estimates.

the required expected return on an asset is proportional to that asset's risk relative to the market as measured by its "beta". More precisely, the CAPM states that the cost of capital for an investment  $S$  (e.g., a particular common stock), is given by the following equation:

$$r_s = r_f + \beta_s \times MRP \quad (4)$$

where  $r_s$  is the required return on investment  $S$ ;

$r_f$  is the risk-free interest rate;

$\beta_s$  is the beta risk measure for the investment  $S$ ; and

$MRP$  is the market equity risk premium.

The CAPM is based on portfolio theory, and recognizes two fundamental principles of finance: (1) investors seek to minimize the possible variance of their returns for a given level of expected returns (or alternatively, they demand higher *expected* returns when there is greater uncertainty about those returns), and (2) investors can reduce the variability of their returns by diversifying—constructing portfolios of many assets that do not all go up or down at the same time or to the same degree. Under the assumptions of the CAPM, the market participants will construct portfolios of risky investments that minimize risk for a given return so that the aggregate holdings of all investors represent the "market portfolio." The risk-return trade-off faced by investors then concerns their exposure to the risk inherent in the market portfolio, as they weight their investment capital between the portfolio of risky assets and the risk-free asset.

Because of the effects of diversification, the relevant measure of risk for an individual security is its *contribution* to the risk of the market portfolio. Therefore, beta ( $\beta$ ) is defined to capture the sensitivity of the security's returns to the market's returns. Formally,

$$\beta_s = \frac{\text{covariance}(r_s, R_m)}{\text{variance}(R_m)} \quad (5)$$

where  $R_m$  is the return on the market portfolio.

Beta is usually calculated by statistically comparing (using regression analysis) the excess (positive or negative) of the return on the individual security over the government bond rate with the excess of the return on a market index such as the S&P 500 over a government bond rate.

The basic idea behind beta is the risk that cannot be diversified away in large portfolios is what matters to investors. Beta is a measure of the risks that *cannot* be eliminated by diversification. It is this non-diversifiable risk, or "systematic risk", for which investors require compensation in the

form of higher expected returns. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk; its returns vary to the same degree as those on the market as a whole. According to the CAPM, the required return demanded by investors (i.e., the cost of equity) for investing in that stock will match the expected return on the market as a whole. Similarly, stocks with betas above 1.0 have more than average risk, and so have a cost of equity greater than the expected market return; those with betas below 1.0 have less than average risk, and are expected to earn lower than market levels of return.

## **B. INPUTS TO THE CAPM**

### **1. The Risk-free Interest Rate**

The precise meaning of a “risk-free” asset according to the finance theory underlying the CAPM is an investment whose return is guaranteed, with no possibility that it will vary around its expected value in response to the movements of the broader market. (Equivalently, the CAPM beta of a risk-free asset is zero). In developed economies like the U.S., government debt is generally considered to have no default risk. In this sense they are “risk-free”; however, unless they are held to maturity, the rate of return on government bonds may in fact vary around their stated or expected yields.<sup>5</sup>

The theoretical CAPM is a single period model, meaning that it posits a relationship between risk and return over a single “holding period” of an investment. Because investors can rebalance their portfolios over short horizons, many academic studies and practical applications of the CAPM use the short-term government bond as the measure of the risk-free rate of return. However, regulators frequently use a version based on a measure of the long-term risk-free rate; e.g., a long-term government bond. I rely on the 20-year Treasury bond as a measure of the risk-free asset in this proceeding.<sup>6</sup> I use the term “risk-free rate” as describing the yield on the 20-year Treasury bond.

However, I do not believe the *current* yield on long-term Treasury bonds is a good estimate for the risk-free rate that will prevail over the time period relevant to this proceeding. Instead, I believe it is more important to use the yield that is expected to prevail during the rate period.<sup>7</sup> For this reason I average Blue Chip’s forecast of 3.9% and 3.7% for the yield on a 10-year Treasury bond for 2024 and 2025, respectively.<sup>8</sup> I adjust this average (3.80%) upward by 50 basis points, which

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<sup>5</sup> This is due to interest rate fluctuations that can change the market value of previously issued debt in relation to the yield on new issuances

<sup>6</sup> The use of a 20-year government bond is consistent with the measurement of the Ibbotson MRP and permits us to use a series that has been in consistent circulation since the 1990’s (the 30-year government bond was not issued from 2002 to 2006).

<sup>7</sup> At the end of the technical appendix, I provide a version of the CAPM results which use current bond yields.

<sup>8</sup> Wolters Kluwer, Blue Chip Economic Indicators, vol. 49, January 10, 2024, pp. 2-3.

is my estimate of the maturity premium for the 20-year over the 10-year Treasury bond. This provides me with an estimate of the risk free rate of 4.30%.

## **2. The Market Equity Risk Premium**

### ***a. Historical Average Market Risk Premium***

Like the cost of capital itself, the market risk premium is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable, and must be inferred or forecasted based on known market information.

One commonly use method for estimating the MRP is to measure the historical average premium of market returns over the income returns on risk-free government bonds over some long historical period. When such a calculation is performed using the traditional industry standard Ibbotson data, the result is an arithmetic average of the annual observed premiums of U.S. stock market returns over income returns on long-term (approximate average maturity of 20-years) U.S. Treasury bonds from 1926 to the present is 7.17%.<sup>9</sup>

### ***b. Forward Looking Market Equity Risk Premium***

An alternative approach to estimating the MRP eschews historical averages in favor of using current market information and forecasts to infer the expected return on the market as a whole, which can then be compared to prevailing government bond yields to estimate the equity risk premium. Bloomberg performs such estimates of country-specific MRPs by implementing the DCF model on the market as a whole—using forecast market-wide dividend yields and current level on market indexes; for the U.S. Bloomberg performs a multi-stage DCF using dividend-paying stocks in the S&P 500 to infer the expected market return.

When calculated relative to 20-year Treasury bond yields, Bloomberg's estimate of the forward-looking market-implied MRP over the month leading up to my analysis was 6.37% over the 20-year Treasury bond yield.<sup>10</sup> I note that this is a conservative estimate as the FERC-relied upon methodology to determine the MRP as of December 31, 2023 results in an MRP 7.87% and 7.90% as shown in Schedule D5.17. I therefore consider the historical estimate of 7.17 percent to be more reasonable.

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<sup>9</sup> Kroll Cost of Capital Navigator, U.S. Cost of Capital Module, accessed January 5, 2024, value as of December 31, 2022.

<sup>10</sup> Bloomberg, as of December 31, 2024.

## C. THE EMPIRICAL CAPM

### 1. Description of the ECAPM

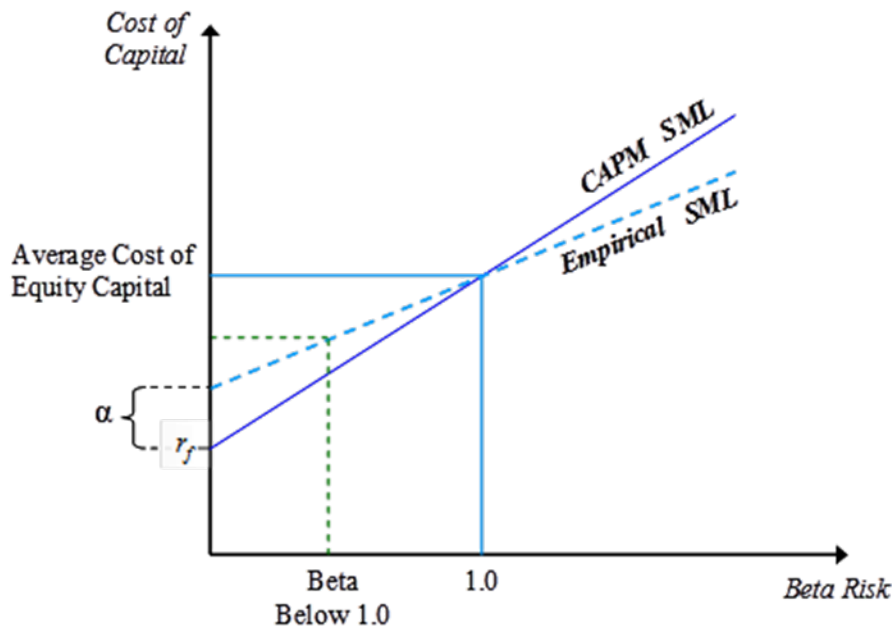
Empirical research has shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted. A number of variations on the original 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 Empirical CAPM (ECAPM) makes use of these empirical findings. It estimates the cost of capital with the equation,

$$r_S = r_f + \alpha + \beta_S \times (MRP - \alpha) \quad (6)$$

where  $\alpha$  is the “alpha” adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see Equation (4)). The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line, which results in a Security Market Line that more closely matches the results of empirical tests. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

**Figure B-2**  
**The Empirical Security Market Line**



## 2. Academic Evidence on the Alpha Term in the ECAPM

Figure B-3 below summarizes the empirical results of tests of the CAPM, including their estimates of the “alpha” parameter necessary to improve the accuracy of the CAPM’s predictions of realized returns.

**Figure B-3**

### EMPIRICAL EVIDENCE ON THE ALPHA FACTOR IN ECAPM\*

| AUTHOR                                              | RANGE OF ALPHA         | PERIOD RELIED UPON |
|-----------------------------------------------------|------------------------|--------------------|
| Black (1993) <sup>1</sup>                           | 1% for betas 0 to 0.80 | 1931-1991          |
| Black, Jensen and Scholes (1972) <sup>2</sup>       | 4.31%                  | 1931-1965          |
| Fama and McBeth (1972)                              | 5.76%                  | 1935-1968          |
| Fama and French (1992) <sup>3</sup>                 | 7.32%                  | 1941-1990          |
| Fama and French (2004) <sup>4</sup>                 | N/A                    |                    |
| Litzenberger and Ramaswamy (1979) <sup>5</sup>      | 5.32%                  | 1936-1977          |
| Litzenberger, Ramaswamy and Sosin (1980)            | 1.63% to 3.91%         | 1926-1978          |
| Pettengill, Sundaram and Mathur (1995) <sup>6</sup> | 4.6%                   | 1936-1990          |

\* The figures reported in this table are for the longest estimation period available and, when applicable, use the authors’ recommended estimation technique. Many of the articles cited also estimate alpha for sub-periods and those alphas may vary.

<sup>1</sup>Black estimates alpha in a one step procedure rather than in an un-biased two-step procedure.

<sup>2</sup>Estimate a negative alpha for the subperiod 1931-39 which contain the depression years 1931-33 and 1937-39.

<sup>3</sup>Calculated using Ibbotson’s data for the 30-day treasury yield.

<sup>4</sup>The article does not provide a specific estimate of alpha; however, it supports the general finding that the CAPM underestimates returns for low-beta stocks and overestimates returns for high-beta stocks.

<sup>5</sup>Relies on Lizenberger and Ramaswamy’s before-tax estimation results. Comparable after-tax alpha estimate is 4.4%.

<sup>6</sup>Pettengill, Sundaram and Mathur rely on total returns for the period 1936 through 1990 and use 90-day treasuries. The 4.6% figure is calculated using auction averages 90-day treasuries back to 1941 as no other series were found this far back.

#### Sources:

Black, Fischer. 1993. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

Black, F., Michael C. Jensen, and Myron Scholes. 1972. The Capital Asset Pricing Model: Some Empirical Tests, from *Studies in the theory of Capital Markets*. In *Studies in the Theory of Capital Markets*, edited by Michael C. Jensen, 79-121. New York: Praeger.

Fama, Eugene F. and James D. MacBeth. 1972. Risk, Returns and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3): 607-636.

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

Fama, Eugene F. and Kenneth R. French. 2004. The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives* 18 (3): 25-46.

Litzenberger, Robert H. and Krishna Ramaswamy. 1979. The Effect of Personal Taxes and Dividends on Capital Asset Prices, Theory and Empirical Evidence. *Journal of Financial Economics* XX (June): 163-195.

Litzenberger, Robert H. and Krishna Ramaswamy and Howard Sosin. 1980. On the CAPM Approach to Estimation of a Public Utility’s Cost of Equity Capital. *The Journal of Finance* 35 (2): 369-387.

### III. Financial Risk and the Cost of Equity

A common issue in regulatory proceedings is how to apply data from a benchmark set of comparable securities when estimating a fair return on equity for the target/regulated company.<sup>11</sup> It may be tempting to simply estimate the cost of equity capital for each of the proxy companies (using one of the above approaches) and average them. After-all, the companies were chosen to be comparable in their business risk characteristics, so why would an investor necessarily prefer equity in one to the other (on average)?

The problem with this argument is that it ignores the fact that underlying asset risk (i.e., the risk inherent in the lines of business in which the firm invests its assets) for each company is typically divided between debt and equity holders. The firm's debt and equity are therefore financial derivatives of the underlying asset return, each offering a differently structured claim on the cash flows generated by those assets. Even though the risk of the underlying assets may be comparable, a different capital structure splits that risk differently between debt and equity holders. The relative structures of debt and equity claims are such that higher degrees of debt financing increase the variability of returns on equity, *even when the variability of asset returns remains constant*. As a consequence, otherwise identical firms with different capital structures will impose different levels of risk on their equity holders. Stated differently, increased leverage adds financial risk to a company's equity.<sup>12</sup>

#### A. THE EFFECT OF FINANCIAL LEVERAGE ON THE COST OF EQUITY

To develop an intuition for the manner in which financial leverage affects the risk of equity, it is helpful to consider a concrete example. Figure B-4 and Figure B-5 below demonstrate the impact of leverage on the risk and return for equity by comparing equity's risk when a company uses no debt to finance its assets, and when it uses a 50-50 capital structure (i.e., it finances 50 percent of its assets with equity, 50 percent with debt). For illustrative purposes, the figures assume that the cash flows will be either \$5 or \$15 and that these two possibilities have the same chance of occurring (e.g., the chance that either occurs is  $\frac{1}{2}$ ).

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<sup>11</sup> This is also a common valuation problem in general business contexts.

<sup>12</sup> I refer to this effect in terms of *financial risk* because the additional risk to equity holders stems from how the company chooses to finance its assets. In this context financial risk is distinct from and independent of the *business risk* associated with the manner in which the firm deploys its cash flow generating assets. The impact of leverage on risk is conceptually no different than that faced by a homeowner who takes out a mortgage. The equity of a homeowner who finances his home with 90% debt is much riskier than the equity of one who only finances with 50% debt.

Figure B-4: All Equity Capital Structure

|                        | Asset<br>Cash<br>Flow | Debt<br>Service | Equity<br>Dividend | ROE                 |
|------------------------|-----------------------|-----------------|--------------------|---------------------|
| $\swarrow \frac{1}{2}$ | \$15                  | \$0             | \$15               | $15/100 = 15\%$     |
| $\searrow \frac{1}{2}$ | \$5                   | \$0             | \$5                | $5/100 = 5\%$       |
|                        |                       |                 |                    | $E(ROE) = 10\%$     |
|                        |                       |                 |                    | $\sigma(ROE) = 5\%$ |

Figure B-5: 50/50 Capital Structure

|                        | Asset<br>cash<br>flow | Debt<br>Service | Equity<br>Dividend | ROE                  |
|------------------------|-----------------------|-----------------|--------------------|----------------------|
| $\swarrow \frac{1}{2}$ | \$15                  | \$2.50          | \$12.50            | $12.50/50 = 25\%$    |
| $\searrow \frac{1}{2}$ | \$5                   | \$2.50          | \$2.50             | $2.50/50 = 5\%$      |
|                        |                       |                 |                    | $E(ROE) = 15\%$      |
|                        |                       |                 |                    | $\sigma(ROE) = 10\%$ |

In the figures,  $E(ROE)$  indicates the mean return and  $\sigma(ROE)$  represents the standard deviation. This simple example illustrates that the introduction of debt increases both the mean (expected) return to equity holders and the variance of that return, even though the firm's expected cash flows—which are a property of the line of business in which its assets are invested—are unaffected by the firm's financing choices. The “magic” of financial leverage is not magic at all—leveraged equity investors can only earn a higher return because they take on greater risk.

## B. METHODS TO ACCOUNT FOR FINANCIAL RISK

### 1. Cost of Equity Implied by the Overall Cost of Capital

If the companies in a proxy group are truly comparable in terms of the systematic risks of the underlying assets, then the overall cost of capital of each company should be about the same across companies (except for sampling error), so long as they do not use extreme leverage or no leverage. The intuition here is as follows. A firm's asset value (and return) is allocated between equity and debt holders.<sup>13</sup> The expected return to the underlying asset is therefore equal to the value weighted

<sup>13</sup> Other claimants can be added to the weighted average if they exist. For example, when a firm's capital structure contains preferred equity, the term  $\frac{P}{V} \times r_p$  is added to the expression for the overall cost of capital shown in Equation (7), where  $P$  refers to the market value of preferred equity,  $r_p$  is the cost of preferred equity and  $V = E + D + P$ . In my analysis, I attribute the same implied yield to the cost of preferred equity as to the cost of debt.

average of the expected returns to equity and debt holders – which is the overall cost of capital ( $r^*$ ), or the expected return on the assets of the firm as a whole.<sup>14</sup>

$$r^* = \frac{E}{V} \times r_E + \frac{D}{V} \times r_D(1 - \tau_c) \quad (7)$$

where  $r_D$  is the market cost of debt,  
 $r_E$  is the market cost of equity,  
 $\tau_c$  is the corporate income tax rate,  
 $D$  is the market value of the firm's debt,  
 $E$  is the market value of the firm's equity, and  
 $V = E + D$  is the total market value of the firm.

Since the overall cost of capital is the cost of capital for the underlying asset risk, and this is comparable across companies, it is reasonable to believe that the overall cost of capital of the underlying companies should also be comparable, so long as capital structures do not involve unusual leverage ratios compared to other companies in the industry.<sup>15</sup>

The notion that the overall cost of capital is constant across a broad middle range of capital structures is based upon the Modigliani-Miller theorem that choice of financing does not affect the firm's value. Franco Modigliani and Merton Miller eventually won Nobel Prizes in part for their work on the effects of debt.<sup>16</sup> Their 1958 paper made what is in retrospect a very simple point: if there are no taxes and no risk to the use of excessive debt, use of debt will have no effect on a company's operating cash flows (i.e., the cash flows to investors as a group, debt and equity combined). If the operating cash flows are the same regardless of whether the company finances mostly with debt or mostly with equity, then the value of the firm cannot be affected at all by the

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<sup>14</sup> As this is on an after-tax basis, the cost of debt reflects the tax value of interest deductibility. Note that the precise formulation of the weighted average formula representing the required return on the firm's *assets* independent of financing (sometimes called the *unlevered* cost of capital) depends on specific assumptions made regarding the value of tax shields from tax-deductible corporate debt, the role of personal income tax, and the cost of financial distress. See Taggart, Robert A., "Consistent Valuation and Cost of Capital Expressions with Corporate and Personal Taxes," *Financial Management*, 1991; 20(3) for a detailed discussion of these assumptions and formulations. Equation (7) represents the overall weighted average cost of capital to the firm, which can be assumed to be constant across a relatively broad range of capital structures.

<sup>15</sup> Empirically, companies within the same industry tend to have similar capital structures, while typical capital structures may vary between industries, so whether a leverage ratio is "unusual" depends upon the company's line of business.

<sup>16</sup> Franco Modigliani and Merton H. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, 48, pp. 261-297.

debt ratio. In cost of capital terms, this means the overall cost of capital is constant regardless of the debt ratio, too.

Obviously, the simple and elegant Modigliani-Miller theorem makes some counterfactual assumptions: no taxes and no cost of financial distress from excessive debt. However, subsequent research, including some by Modigliani and Miller,<sup>17</sup> showed that while taxes and costs to financial distress affect a firm's incentives when choosing its capital structure as well as its overall cost of capital,<sup>18</sup> the latter can still be shown to be constant across a broad range of capital structures.<sup>19</sup>

This reasoning suggests that one could compute the overall cost of capital for each of the proxy companies and then average to produce an estimate of the overall cost of capital associated with the underlying asset risk. Assuming that the overall cost of capital is constant, one can then rearrange the overall cost of capital formula to estimate what the implied cost of equity is at the target company's capital structure on a book value basis.<sup>20</sup>

## **2. Unlevering and Relevering Betas in the CAPM (Hamada Adjustment)**

An alternative approach to account for the impact of financial risk is to examine the impact of leverage on beta. Notice that this means working within the CAPM framework as the methodology cannot be applied directly to the DCF models.

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<sup>17</sup> Franco Modigliani and Merton H. Miller (1963), "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review*, 53, pp. 433-443.

<sup>18</sup> When a company uses a high level of debt financing, for example, there is significant risk of bankruptcy and all the costs associated with it. The so called costs of financial distress that occurs when a company is over-leveraged can increase its cost of capital. In contrast a company can generally decrease its cost of capital by taking on reasonable levels of debt, owing in part to the deductibility of interest from corporate taxes.

<sup>19</sup> This is a simplified treatment of what is generally a complex and on-going area of academic investigation. The roles of taxes, market imperfections and constraints, etc. are areas of on-going research and differing assumptions can yield subtly different formulations for how to formulate the weighted average cost of capital that is constant over all (or most) capital structures.

<sup>20</sup> Market value capital structures are used in estimating the overall cost of capital for the proxy companies.

Recognizing that under general conditions, the value of a firm can be decomposed into its value with and without a tax shield, I obtain:<sup>21</sup>

$$V = V_U + PV(ITS) \quad (8)$$

where  $V = E + D$  is the total value of the firm as in Equation (7),

$V_U$  is the “unlevered” value of the firm—its value if financed entirely by equity

$PV(ITS)$  represents the present value of the interest tax shields associated with debt

For a company with a fixed book-value capital structure and no additional costs to leverage, it can be shown that the formula above implies:

$$r_E = r_U + \frac{D}{E}(1 - \tau_c)(r_U - r_D) \quad (9)$$

where  $r_U$  is the “unlevered cost of capital”—the required return on assets if the firm’s assets were financed with 100% equity and zero debt—and the other parameters are defined as in Equation (7).

Replacing each of these returns by their CAPM representation and simplifying them gives the following relationship between the “levered” equity beta  $\beta_L$  for a firm (i.e., the one observed in market data as a consequence of the firm’s actual market value capital structure) and the “unlevered” beta  $\beta_U$  that would be measured for the same firm if it had no debt in its capital structure:

$$\beta_L = \beta_U + \frac{D}{E}(1 - \tau_c)(\beta_U - \beta_D) \quad (10)$$

where  $\beta_D$  is the beta on the firm’s debt. The unlevered beta is assumed to be constant with respect to capital structure, reflecting as it does the systematic risk of the firm’s assets. Since the beta on

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<sup>21</sup> This follows development in Fernandez (2003). Other standard papers in this area include Hamada (1972), Miles and Ezzell (1985), Harris and Pringle (1985), Fernandez (2006). (See Fernandez, P., “Levered and Unlevered Beta,” IESE Business School Working Paper WP-488, University of Navarra, Jan 2003 (rev. May 2006); Hamada, R.S., “The Effect of the Firm’s Capital Structure on the Systematic Risk of Common Stock,” *Journal of Finance*, 27, May 1972, pp. 435-452; Miles, J.A. and J.R. Ezzell, “Reformulating Tax Shield Valuation: A Note,” *Journal of Finance*, XL5, Dec 1985, pp. 1485-1492; Harris, R.S. and J.J. Pringle, “Risk-Adjusted Discount Rates Extensions from the Average-Risk Case,” *Journal of Financial Research*, Fall 1985, pp. 237-244; Fernandez, P., “The Value of Tax Shields Depends Only on the Net Increases of Debt,” IESE Business School Working Paper WP-613, University of Navarra, 2006.) Additional discussion can be found in Brealey, Myers, and Allen (2014).

an investment grade firm's debt is much lower than the beta of its assets (i.e.,  $\beta_D < \beta_U$ ), this equation embodies the fact that increasing financial leverage (and thereby increasing the debt to equity ratio) increases the systematic risk of *levered* equity ( $\beta_L$ ).

An alternative formulation derived by Harris and Pringle (1985) provides the following equation that holds when the market value capital structures (rather than book value) are assumed to be held constant:

$$\beta_L = \beta_U + \frac{D}{E}(\beta_U - \beta_D) \quad (11)$$

Unlike Equation (10), Equation (11) does not include an adjustment for the corporate tax deduction. However, both equations account for the fact that increased financial leverage increases the systematic risk of equity that will be measured by its market beta. And both equations allow an analyst to adjust for differences in financial risk by translating back and forth between  $\beta_L$  and  $\beta_U$ . In principal, Equation (10) is more appropriate for use with regulated utilities, which are typically deemed to maintain a fixed book value capital structure. However, I employ both formulations when adjusting my CAPM estimates for financial risk, and consider the results as sensitivities in my analysis.

It is clear that the beta of debt needs to be determined as an input to either Equation (10), or Equation (11). Rather than estimating debt betas, I rely on the standard financial textbook of Professors Berk & DeMarzo, who report a debt beta of 0.05 for A-rated debt and a beta of 0.10 for BBB rated debt.<sup>22</sup>

Once a decision on debt betas is made, the levered equity beta of each proxy company can be computed (in this case by Value Line) from market data and then translated to an unlevered beta at the company's market value capital structure. The unlevered betas for the proxy companies are comparable on an "apples to apples" basis, since they reflect the systematic risk inherent in the assets of the proxy companies, independent of their financing. The unlevered betas are averaged to produce an estimate of the industry's unlevered beta. To estimate the cost of equity for the regulated target company, this estimate of unlevered beta can be "re-levered" to the regulated company's capital structure, and CAPM reapplied with this levered beta, which reflects both the business and financial risk of the target company.

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<sup>22</sup> Berk, J. & DeMarzo, P., *Corporate Finance, 2<sup>nd</sup> Edition*. 2011 Prentice Hall, p. 389.

Hamada adjustment procedures—so-named for Professor Robert S. Hamada who contributed to their development<sup>23</sup>—are ubiquitous among finance practitioners when using the CAPM to estimate discount rates.

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<sup>23</sup> Hamada, R.S., “The Effect of the Firm’s Capital Structure on the Systematic Risk of Common Stock”, *The Journal of Finance*, 27(2), 1971, pp. 435-452.

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Exhibit A-14 Schedule D5.18  
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## Revised Schedule D5.18: Electric Sample Characteristics

| Company                 | Revenue          |                      | Regulated Assets | Market Cap. (Q3 2023) | Value Line Beta | Long-Term Growth Estimate | Credit Ratings |           | Generation |            | Per Share CapEx |            |            |
|-------------------------|------------------|----------------------|------------------|-----------------------|-----------------|---------------------------|----------------|-----------|------------|------------|-----------------|------------|------------|
|                         | Annual (Q3 2023) | From Industrial Load |                  |                       |                 |                           | S&P            | Moody's   | Nuclear    | Coal       | 2023            | 2024       | 2026-2028  |
|                         | (\$MM)           | (%)                  |                  |                       |                 |                           |                |           | (%)        | (%)        | (\$MM)          | (\$MM)     | (\$MM)     |
|                         | [1]              | [2]                  |                  |                       |                 |                           | [7]            | [8]       | [9]        | [10]       | [11]            | [12]       | [13]       |
| ALLETE                  | \$1,750          | 43%                  | MR               | \$3,200               | 0.95            | 8.1%                      | BBB            | Baa1      | 0          | 28%        | \$5.95          | \$5.95     | \$7.25     |
| Alliant Energy          | \$4,100          | 29%                  | R                | \$12,600              | 0.90            | 6.7%                      | A-             | Baa2      | 0          | 32%        | \$5.80          | \$5.80     | \$5.40     |
| Amer. Elec. Power       | \$19,500         | 18%                  | R                | \$41,300              | 0.80            | 3.7%                      | A-             | Baa2      | n/a        | n/a        | \$15.35         | \$14.15    | \$14.00    |
| Ameren Corp.            | \$8,000          | 8%                   | R                | \$20,400              | 0.90            | 5.4%                      | BBB+           | Baa1      | 11%        | 73%        | \$12.90         | \$12.55    | \$13.00    |
| Avista Corp.            | \$1,700          | 10%                  | R                | \$2,400               | 0.90            | 5.9%                      | BBB            | Baa2      | 0          | 31%        | \$6.00          | \$6.35     | \$6.75     |
| Black Hills             | \$2,600          | 23%                  | R                | \$3,300               | 1.00            | n/a                       | BBB+           | Baa2      | 0          | 35%        | \$9.30          | \$9.50     | \$9.25     |
| CMS Energy Corp.        | \$8,500          | 15%                  | R                | \$16,700              | 0.85            | 7.7%                      | BBB+           | Baa2      | 0          | 29%        | \$8.00          | \$9.50     | \$9.75     |
| CenterPoint Energy      | \$9,200          | n/a                  | R                | \$17,600              | 1.15            | n/a                       | BBB+           | Baa2      | n/a        | n/a        | \$6.65          | \$7.05     | \$9.00     |
| Duke Energy             | \$29,650         | 13%                  | R                | \$67,700              | 0.85            | n/a                       | BBB+           | Baa2      | 30%        | 18%        | \$16.75         | \$17.60    | \$16.75    |
| Edison Int'l            | \$17,350         | 3%                   | R                | \$24,000              | 1.00            | 4.9%                      | BBB            | Baa2      | 9%         | 0%         | \$15.25         | \$15.75    | \$17.00    |
| Entergy Corp.           | \$12,225         | 27%                  | R                | \$21,500              | 0.95            | n/a                       | BBB+           | Baa2      | 22%        | 9%         | \$23.00         | \$19.00    | \$19.75    |
| Eversource Inc.         | \$5,780          | 15%                  | R                | \$11,700              | 0.95            | 2.5%                      | BBB+           | Baa2      | 17%        | 54%        | \$9.20          | \$9.25     | \$9.50     |
| Exelon Corp.            | \$19,700         | 17%                  | MR               | \$38,300              | n/a             | 10.1%                     | BBB+           | Baa2      | n/a        | n/a        | \$6.80          | \$6.80     | \$7.00     |
| IDACORP Inc.            | \$1,675          | 22%                  | R                | \$4,900               | 0.85            | n/a                       | BBB            | Baa2      | 0%         | 20%        | \$14.00         | \$16.00    | \$11.00    |
| MGE Energy              | \$740            | 3%                   | R                | \$2,700               | 0.75            | n/a                       |                |           | 0%         | 35%        | \$4.65          | \$4.00     | \$5.25     |
| NextEra Energy          | \$27,600         | 45%                  | MR               | \$116,000             | 0.95            | 8.2%                      | A-             | Baa1      | 21%        | 0%         | \$9.50          | \$9.50     | \$9.75     |
| NorthWestern Corp.      | \$1,500          | 5%                   | R                | \$3,000               | 0.95            | n/a                       | BBB            | Baa2      | 0%         | 28%        | \$8.50          | \$7.75     | \$7.00     |
| OGE Energy              | \$3,400          | 11%                  | R                | \$7,000               | 1.05            | n/a                       | BBB+           | (P)Baa1   | 0%         | 21%        | \$4.75          | \$4.75     | \$4.75     |
| Otter Tail Corp.        | \$1,350          | 30%                  | R                | \$3,100               | 0.90            | n/a                       | BBB            | Baa2      | 0%         | 38%        | \$5.90          | \$6.00     | \$6.25     |
| Pinnacle West Capital   | \$4,625          | 41%                  | R                | \$8,300               | 0.95            | 5.9%                      | BBB+           | Baa1      | 24%        | 20%        | \$14.50         | \$15.00    | \$15.00    |
| Public Serv. Enterprise | \$11,900         | 9%                   | MR               | \$30,000              | 0.90            | 5.2%                      | BBB+           | Baa2      | n/a        | n/a        | \$7.20          | \$7.20     | \$7.25     |
| Sempra Energy           | \$17,350         | n/a                  | R                | \$43,100              | 1.00            | n/a                       | BBB+           | Baa2      | n/a        | n/a        | \$8.55          | \$8.55     | \$9.00     |
| Southern Co.            | \$27,500         | 19%                  | R                | \$72,800              | 0.90            | 7.1%                      | BBB+           | Baa2      | 16%        | 20%        | \$7.85          | \$7.85     | \$7.50     |
| WEC Energy Group        | \$9,375          | 21%                  | R                | \$25,900              | 0.85            | 5.5%                      | A-             | Baa1      | 0%         | 36%        | \$9.30          | \$9.30     | \$9.25     |
| Xcel Energy Inc.        | \$15,100         | 48%                  | R                | \$31,800              | 0.85            | 6.3%                      | A-             | Baa1      | 13%        | 23%        | \$9.00          | \$9.25     | \$9.50     |
| <b>DTE Electric</b>     | <b>\$6,397</b>   | <b>18%</b>           | <b>R</b>         | <b>n/a</b>            | <b>n/a</b>      | <b>n/a</b>                | <b>A-</b>      | <b>A2</b> | <b>19%</b> | <b>45%</b> | <b>n/a</b>      | <b>n/a</b> | <b>n/a</b> |
| Electric Sample         | \$10,487         | 21%                  | R                | \$25,172              | 0.92            | 6%                        | BBB+           | Baa2      | 8%         | 28%        | \$9.79          | \$9.78     | \$9.84     |
| Median                  | \$8,500          | 18%                  | R                | \$17,600              | 0.90            | 6%                        | BBB+           | Baa2      | 0%         | 28%        | \$8.55          | \$9.25     | \$9.25     |

Case No. U-21534  
Exhibit A-14 Schedule D5.18  
page 2 of 2

**Revised Schedule D5.18: Electric Sample Characteristics**

**Electric Sample Sources:**

[1]-[2]: Value Line as of 12/21/2023  
[3]: Key R - Regulated (80% or more of assets regulated).  
MR - Mostly Regulated (less than 80% of assets regulated).  
[4]-[5]: Value Line as of 12/21/2023  
[6]: Eikon as of 1/9/2024  
[7]: S&P as of 1/30/2024  
[8]: Moody's as of 12/21/2023  
[9]-[16]: Value Line as of 12/21/2023  
[17]: [11]\*[14]  
[18]: [12]\*[15]  
[19]: [13]\*[16]  
[20]: ([18]+[19])/2  
[21]: [17]+[18]+[20]  
[22]: Value Line as of 12/21/2023

**DTE Electric Sources:**

[1]: DTE 2022 10-K, p.32  
[2]: DTE 2022 10-K, p.33 - Calculated by dividing Industrial Total by Total DTE Electric Sales  
[3]: Key R - Regulated (80% or more of assets regulated).  
MR - Mostly Regulated (less than 80% of assets regulated).  
[7]: S&P as of 1/30/2024  
[8]: Moody's as of 12/21/2023  
[9]-[10]: DTE Business Update Presentation, Slide 18  
[17]: DTE Business Update Presentation, Slide 14  
[18]-[20]: DTE Business Update Presentation, Slide 4; \$20B total CapEx from 2024-2028; \$20B / 5 years = \$4,000MM per year  
[22]: DTE 2022 10-K, p.89

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of )  
**DTE ELECTRIC COMPANY** for )  
authority to increase its rates, amend its )  
rate schedules and rules governing the )  
distribution and supply of electric energy, )  
and for miscellaneous accounting authority )

Case No. U-21534

**PROOF OF SERVICE**

STATE OF MICHIGAN )  
 ) ss.  
COUNTY OF WAYNE )

ESTELLA R. BRANSON states that on June 25, 2024, she served a copy of DTE Electric Company's Revised Direct Testimony of Dr. Bente Villadsen and Revised Exhibit A-14, Schedule D5.18 in the above captioned matter, via electronic mail upon the persons listed on the attached service list.

Estella R.  
Branson

Digitally signed by Estella R. Branson  
Date: 2024.06.25 12:51:02 -04'00'

ESTELLA R. BRANSON

**ADMINISTRATIVE LAW JUDGE**

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