

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Vectren)
Energy Delivery of Ohio, Inc., for Approval) Case No. 18-0049-GA-ALT
of an Alternative Rate Plan)

In the Matter of the Application of Vectren)
Energy Delivery of Ohio, Inc., for Approval of) Case No. 18-0298-GA-AIR
an Increase in Gas Rate)

In the Matter of the Application of Vectren)
Energy Delivery of Ohio, Inc., for Approval of) Case No. 18-0299-GA-ALT
an Alternative Rate Plan)

**SUPPLEMENTAL DIRECT TESTIMONY OF
MICHAEL J. VILBERT
ON BEHALF OF
VECTREN ENERGY DELIVERY OF OHIO, INC.**

_____	Management policies, practices, and organization
_____	Operating income
_____	Rate base
_____	Allocations
<u> X </u>	Rate of return (Cost of Common Equity Capital)
_____	Rates and tariffs
_____	Other

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1 **I. INTRODUCTION AND SUMMARY**

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

3 A1. My name is Michael J. Vilbert. My business address is *The Brattle Group*, 201 Mission
4 Street, Suite 2800, San Francisco, CA 94105, USA

5 **Q2. Did you submit direct testimony in this proceeding?**

6 A2. Yes. Attachment A to my direct testimony provides detail on my qualifications.

7 **Q3. What is the purpose of your supplemental direct testimony in this proceeding?**

8 A3. I have been asked by Vectren Energy Delivery of Ohio, Inc. (VEDO or the Company)
9 to respond to the report by the Staff of the Public Utilities Commission of Ohio (Staff)
10 regarding Staff's estimate of the cost of capital for the Company. Specifically, I provide
11 evidence that Staff has under estimated the appropriate return on equity (ROE)
12 estimates for the Company.

13 **Q4. Are you sponsoring any exhibits?**

14 A4. Yes, I am sponsoring Attachment A and Attachment B, which include the schedules
15 listed below. Attachment A shows my analysis for the supplemental direct testimony.
16 Attachment B shows revisions to the schedules of my direct testimony. I explain these
17 revisions in the sections below.

<u>Attachment</u>	<u>Schedule</u>	<u>Description</u>
A	A1.1	Staff DCF Results: Comparison of Original to Data Corrected Results
A	A1.2	Staff DCF Inputs: Comparison of Original to Data Corrected Inputs
A	A1.3	Staff DCF Results: Comparison of Original to Data and Methodology Corrected Results
A	A1.4	Staff DCF Inputs: Comparison of Data and Methodology Corrected Inputs

A	A1.5	Staff DCF Results: Data and Methodology Corrected with Staff and Brattle Proxy Group
A	A1.6	Staff DCF Inputs: Data and Methodology Corrected with Staff and Brattle Proxy Group
A	A2.1	Staff CAPM Results: Comparison of Original to MRP Corrected Results
A	A2.2	Staff CAPM Results: MRP Corrected with Brattle Proxy Group
A	A2.3	Staff Baseline Results: Comparison of Original to Corrected with Staff Proxy Group
A	A2.4	Staff Baseline Results: Corrected with Brattle Proxy Group

<u>Attachment</u>	<u>Schedule</u>	<u>Description</u>
B	R5	Cost of Common Shareholders' Equity
B	R5.1	Table of Contents
B	R5.2	Classification of Companies by Assets
B	R5.3	Market Value of the Expanded Sample
B	R5.4	Capital Structure Summary of the Expanded Sample
B	R5.5	Estimated Growth Rates of the Expanded Sample
B	R5.6	DCF Cost of Equity of the Expanded Sample
B	R5.7	Overall After-Tax DCF Cost of Capital of the Expanded Sample
B	R5.8	DCF Cost of Equity at VEDO's Capital Structure
B	R5.9	Risk-Free Rates
B	R5.10	Risk Positioning Cost of Equity of the Expanded Sample
B	R5.11	Overall After-Tax Risk Positioning Cost of Capital of the Expanded Sample
B	R5.12	Risk Positioning Cost of Equity at VEDO's Capital Structure
B	R5.13	Hamada Adjustment to Obtain Unlevered Asset Beta

- B R5.14 Expanded Sample Average Asset Beta Relevered at VEDO's Capital Structure
- B R5.15 Risk-Positioning Cost of Equity using Hamada-Adjusted Betas

1 **Q5. Were these exhibits prepared by you or under your direction?**

2 A5. Yes.

3 **Q6. What are the ROE and capital structure recommendations in this proceeding?**

4 A6. Figure 1 below shows the cost of capital recommendations that Staff and I have
5 submitted in this proceeding.

Figure 1
Witnesses' Recommended Cost of Capital

Witness	ROE (%)	Capital Structure (Equity %)
Vilbert	10.75%	51.06%
Staff	8.80% - 9.81%	51.06%

6 **Q7. What capital structure do you use for VEDO in your supplemental direct and**
7 **direct testimony?**

8 A7. In my supplemental direct testimony, I use a capital structure of 51.06 percent equity
9 for VEDO. In my direct testimony, I used a capital structure of 50.60 equity for VEDO.

10 **Q8. Why do your supplemental direct and direct testimony use a different capital**
11 **structure for VEDO?**

12 A8. Figure 1 shows that VEDO used a capital structure with 51.06 percent equity to
13 calculate its weighted average cost of capital. The Staff Report relies on this same
14 equity percentage. In the reporting of the percentage of equity in VEDO's capital
15 structure for use in my direct testimony however, there was a transcription error. The
16 revised schedules included here reflect the 51.06 percent equity in the capital structure
17 VEDO used for its application.

1 **Q9. What is the effect of the revised capital structure on your cost of capital analysis?**

2 A9. The ROE estimates change slightly, but my opinion on the appropriate ROE for the
3 VEDO has not changed. I have included revised direct testimony schedules in
4 Attachment B to show the effect of the revised capital structure on my ROE estimates.
5 The revised direct testimony schedules in Attachment B have the same schedule
6 number and name as they did in my direct testimony. Attachment B includes revisions
7 to direct testimony schedules D5 through D5.15. Direct testimony schedules D5.16 and
8 D5.17 are excluded from Attachment B as they have not changed. Note that the revised
9 direct testimony schedules in Attachment B are labeled with the prefix “R” to better
10 identify the revised from the original direct testimony schedules.

11 **Q10. Do the revised Schedules in Attachment B reflect any other changes in addition to**
12 **VEDO’s revised capital structure?**

13 A10. Yes. The revised Schedules in Attachment B also show the ECAPM ($\alpha = 0.5$) ROE
14 estimates and correct inconsistent naming convention and footnotes. The revised
15 schedules also correct a data error in my direct testimony schedules. This error affected
16 the ONE Gas 5-year average capital structure used in my CAPM based estimates. The
17 5-year average capital structure for ONE gas was corrected from 47.9 percent equity
18 and 22.1 percent debt to 69.7 percent equity and 30.3 percent debt. The correction
19 increases my CAPM based estimates, but does not change my opinion on the
20 appropriate ROE for VEDO.

21 **Q11. Would you please summarize your response to the Staff’s cost of capital report in**
22 **this proceeding?**

23 A11. Yes. The main points of my supplemental testimony are the following:

- 24 • I continue to recommend an ROE of 10¾ percent.¹
- 25 • Staff’s proxy group used companies from a different regulated industry than
- 26 VEDO. Staff selected a five company sample consisting of electric utility

¹ I report my recommended ROE to the nearest ¼ percentage point because I do not believe that the cost of capital can be estimated more precisely than that even though the model results can be calculated to several decimal places.

1 companies. However, VEDO is a natural gas local distribution company (gas LDC),
2 and therefore is not comparable to Staff's sample. Additionally, the proxy group
3 contradicts Staff's own selection criteria used for the 2007 VEDO rate case, Case
4 Nos. 07-1080-GA-AIR and 07-1081-GA-ALT. Finally, the limited sample size of
5 five companies can adversely affect the statistical properties of the estimates.

- 6 • The Staff discounted cash flow (DCF) models contained data input and
7 methodological errors, which understated the DCF cost of equity estimate. I correct
8 Staff's DCF errors, which increases the DCF cost of equity estimate range from
9 8.60 - 9.23 percent to 9.76 - 9.89 percent for Staff's sample. I explain the corrections
10 I implemented below in *Section II*.

- 11 • Staff incorrectly calculated the market risk premium (MRP) used in the capital asset
12 pricing Model (CAPM). I correct Staff's MRP, which increases Staff's average
13 CAPM cost of equity estimate from 9.11 to 9.84. I explain the corrections I
14 implemented below in *Section II*.

- 15 • In my direct testimony, I used an MRP of 6.94 percent—the long-term average
16 from 1926 - 2016² and justified using an MRP up to 7.94 percent given economic
17 conditions³ Current economic conditions in the U.S. and the world remain
18 uncertain and therefore continue to justify the use of a conditional MRP. I provide
19 more detail in *Section II* below.

20 **Q12. Is the difference in your ROE recommendation compared to Staff in this**
21 **proceeding due primarily to the fact that Staff's analyses employ more recent**
22 **data?**

23 A12. No. There are differences in our methodology and inputs that result in different cost of
24 equity estimates. These differences include the method used to calculate dividend yield,
25 the adjustment for financial risk, and modifications to the CAPM model to adjust for

² Duff and Phelps's Ibbotson *SBBI 2017 Yearbook* reports the realized arithmetic average MRP from 1926 to 2016 to be 6.94 percent.

³ Direct Testimony, pp. 25, 44.

consistent empirical observations.

Q13. After reviewing the Staff Report in this proceeding, have you changed your ROE recommendation for the Company?

A13. No. I recommend that the Company be allowed an ROE of 10¾ percent on its proposed 51.06 percent equity ratio. This is slightly above the mid-point of the 10 percent to 11 percent range of reasonable estimates that I calculated for the sample of companies comparable to VEDO's financial and business risk.⁴ Further, I continue to believe that VEDO is of greater risk than the average company in the sample due to the Company's large capital spending plan, dependency on the Wright Patterson Air Force Base, and regional economic conditions.⁵ Also, I note that the cost-of-capital estimates from the standard models continue to be downward biased given the current economic uncertainties domestically and abroad. Interest rates are increasing, and the cost of capital will also increase although not at a one-for-one ratio, meaning that if interest rates increase by 100 basis points (bps), the cost of equity will also increase, but likely by less than 100 bps.

Q14. How is your supplemental testimony organized?

A14. *Section II* critiques Staff's sample selection (proxy group) and explains the data and methodology issues I found in Staff's models. I then separately correct and quantify how Staff's (1) data input errors and (2) incorrect and/or questionable methodologies affected the ROE results using Staff's own proxy group. I then apply the corrected Staff methodologies to the proxy group from my direct testimony. I believe that the proxy group from my direct testimony is a better proxy for VEDO than Staff's proxy group. *Section III* updates capital market conditions and explains how these updates affect the cost of capital. Finally, *Section IV* summarizes my conclusions.

⁴ Direct Testimony, p. 6.

⁵ Direct Testimony, pp. 39-40. See also the testimony of Company witness, Colleen Ryan, for additional discussion of VEDO's unique risks.

II. COST OF CAPITAL ESTIMATION METHODOLOGIES

A. Sample Selection

Q15. How does Staff select their proxy group?

A15. Staff selected electric utilities with “significant gas distribution operations,” financial stability, investment grade bond rating, and market capitalization less than \$15 billion. This resulted in a Staff proxy group of five electric utilities.

Q16. Why does Staff select electric utilities for their proxy group?

A16. Staff justifies using electric utilities by noting that “VEDO is classified as an electric utility by *Value Line*.” This statement is incorrect. *Value Line* only provides information on public companies. VEDO is a subsidiary company of Vectren Corporation and therefore is not listed in *Value Line*. However, VEDO’s parent, Vectren Corporation (VVC), is listed and classified by *Value Line* as an electric utility. In addition to VEDO in Ohio, Vectren Corporation is the holding company of two utilities in Indiana, Vectren North and Vectren South, as well as several nonutility subsidiaries. Vectren North provides natural gas delivery services while Vectren South provides both natural gas and electricity delivery services in Indiana. The *Value Line* classification for Vectren Corporation does not apply to VEDO. In this proceeding, the allowed return for VEDO is being estimated, not the allowed return for Vectren Corporation.

Q17. Do you agree with how Staff selected the proxy group?

A17. No. Electric utilities—even ones with significant gas distribution operations—are not the best comparable companies to VEDO. As described by Staff, VEDO “is a natural gas company and a public utility engaged in the business of transporting and distributing natural gas.”⁶ Staff’s decision to use electric utilities as comparable peers to VEDO contradicts Staff’s own characterization of VEDO. Given that VEDO provides delivery services for natural gas and only natural gas, its comparable peers are natural gas distribution utilities. Additionally, limiting the proxy group to only five companies can

⁶ Staff Report, p. 7.

1 adversely affect the statistical properties of cost of equity estimates.

2 **Q18. VEDO used VVC’s capital structure to calculate VEDO’s weighted average cost**
3 **of capital. Should using VVC’s capital structure affect the proxy group selection**
4 **for VEDO?**

5 A18. No. The proxy group should reflect VEDO’s business operations and risk. VVC’s
6 capital structure should not govern the industry selection criteria for VEDO’s proxy
7 group.

8 **Q19. Is Staff selection criteria consistently applied?**

9 A19. No. Staff’s inclusion of OGE Energy Corp (OGE) in its proxy group violates Staff’s
10 own selection criteria. Staff explains that its proxy group only includes companies with
11 “significant gas distribution operations, which Staff determined to be at least 20 percent
12 of total energy revenues directly attributable to gas distribution operations.”⁷ However,
13 OGE does not generate revenue from natural gas distribution. OGE “sold its retail
14 natural gas business in 1928 and is no longer engaged in the natural gas distribution
15 business.”⁸ Instead, OGE is active in natural gas midstream operations, which includes
16 “gathering, processing, transporting and storing natural gas.”⁹

17 Additionally, Staff’s decision to use the industry classification of the parent company
18 rather than the applicant contradicts Staff’s selection criteria in VEDO’s 2007 rate
19 case.¹⁰ In the 2007 rate case, Staff selected companies that are “publicly traded on the
20 New York Stock Exchange, and are categorized as natural gas distribution companies”
21 as comparable peers to VEDO.

⁷ Staff Report, p. 20.

⁸ OGE Energy Corp, 2017 Form 10-K, p. 2.

⁹ *Ibid.*

¹⁰ Case Nos. 07-1080-GA-AIR and 07-1081-GA-ALT.

B. DCF Model

Q20. Please summarize the results of the Staff DCF Model and any issues you may have found.

A20. Staff used both the single- and multi-stage DCF models, as do I. Staff refers to the single- and multi-stage DCF models as the constant and non-constant DCF growth models, respectively.¹¹ The Staff constant and non-constant DCF models result in a sample average ROE of 8.60 and 9.23 percent, respectively.¹² In the subsequent reporting of the corrected Staff constant and non-constant DCF results, I will refer to the results as the “Staff DCF ROE range.” The Staff DCF range is understated because of data input errors and unusual methodologies. Correcting *only* the data input errors increases the Staff DCF ROE range to 9.16 - 9.39 percent, as shown in Figure 2. Additionally, using accepted standard methodologies in the Staff DCF models further increases the Staff DCF ROE range to 9.76 - 9.89 percent, as shown in Figure 6.

Figure 2
Staff DCF Results
Comparison of Original to Data Corrected Results

Company	Constant DCF		Downward Bias [3] = [1] - [2]	Non-Constant DCF		Downward Bias [6] = [4] - [5]
	Staff Original [1]	Staff Corrected [2]		Staff Original [4]	Staff Corrected [5]	
Ameren Corp	9.34%	9.62%	-0.28%	9.55%	9.65%	-0.10%
CMS Energy Corp	9.92%	9.55%	0.37%	9.64%	9.51%	0.13%
Alliant Energy Corp	8.71%	8.71%	0.00%	9.34%	9.34%	0.00%
MGE Energy Inc	7.42%	9.45%	-2.03%	8.30%	8.81%	-0.51%
OGE Energy Corp	7.58%	8.49%	-0.91%	9.33%	9.64%	-0.31%
Average	8.60%	9.16%	-0.57%	9.23%	9.39%	-0.16%
Sources and Notes:						
[1], [4]: Staff Model.						
[2], [5] Workpaper 1 to Schedule A1.1.						

Q21. Please explain the data input errors and your corrections.

¹¹ The Staff workpapers show both the constant and non-constant DCF ROE results. However, the Staff Report only focuses the non-constant DCF result. I discuss both the Staff constant and non-constant DCF models for completeness.

¹² Staff’s sample average constant DCF ROE estimate is 8.60 percent, while Staff’s sample average non-constant DCF ROE estimate is 9.23 percent.

1 A21. The Staff DCF models used incorrect earnings per share (EPS) growth rate projections,
2 which understated the ROE estimates. Staff averaged EPS growth rate projections from
3 Reuters, Yahoo, and *Value Line* for each company in the proxy group. I discovered the
4 following data input errors from these sources:

5 a. *Reuters*: Staff used the Reuters Consensus EPS growth rate estimate, which
6 includes outdated estimates. The 4.0 percent MGEE Consensus EPS growth
7 rate used by Staff is from an outdated March 2, 2011 analyst estimate. To
8 correct this error, I exclude the MGEE Reuters Consensus EPS growth rate
9 estimate from the DCF growth estimate average. Additionally, I corrected the
10 EPS growth rate projection for CMS, which incorrectly included a stale
11 estimate, resulting in the use of 7.05 percent instead of the correct 7.07 percent.

12 b. *Yahoo*: Yahoo Finance's EPS growth rate projections are provided by Thomson
13 Reuters.¹³ Staff's Yahoo Finance EPS rates had the same errors as the Reuters
14 EPS rates. Therefore, I apply the same corrections to the MGEE and CMS EPS
15 growth rate estimates as described directly above.

16 c. *Value Line*: Staff used incorrect *Value Line* EPS projections for AEE, CMS,
17 MGEE, and OGE. Figure 3, rows [g] through [j] show the data input errors and
18 my corrections.

¹³ See "Exchanges and data providers on Yahoo Finance," *Yahoo*, accessed 9/30/2018 at <https://help.yahoo.com/kb/finance-for-web/SLN2310.html?impressions=true>.

Figure 3
Staff DCF Inputs
Comparison of Original to Data Corrected Inputs

		Staff Original					Staff Data Corrected				
		AEE [1]	CMS [2]	LNT [3]	MGEE [4]	OGEE [5]	AEE [6]	CMS [7]	LNT [8]	MGEE [9]	OGEE [10]
Dividend Yields											
Average Stock Price	[a]	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06
Annualized Dividend	[b]	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27
Dividend Yield	[c] = [b] / [a]	3.10%	2.93%	3.09%	2.08%	3.73%	3.10%	2.93%	3.09%	2.08%	3.73%
Growth Rates											
Reuters EPS Growth	[d]	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Yahoo EPS Growth	[e]	6.30%	7.05%	5.85%	4.00%	4.30%	n/a	n/a	n/a	n/a	n/a
Average	[f] = ([d] + [e]) / 2	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Value Line											
2019 EPS Projection	[g]	\$7.85	\$2.50	\$2.25	\$2.50	\$2.15	\$3.25	\$2.50	\$2.25	\$2.50	\$2.15
2021-23 EPS Projection	[h]	\$9.25	\$3.00	\$2.60	\$3.30	\$2.50	\$4.00	\$3.00	\$2.60	\$3.30	\$2.50
Calculated CAGR	[i] = LN([h] / [g]) / 4	4.10%	4.56%	3.61%	6.94%	3.77%	5.19%	4.56%	3.61%	6.94%	3.77%
"Boxed" Earnings Growth	[j]	7.50%	8.50%	6.50%	6.00%	2.50%	7.50%	7.00%	6.50%	7.50%	6.00%
Average	[k] = ([i] + [j]) / 2	5.80%	6.53%	5.06%	6.47%	3.14%	6.35%	5.78%	5.06%	7.22%	4.89%
DCF Growth Estimate	[l] = ([f] + [k]) / 2	6.05%	6.79%	5.45%	5.24%	3.72%	6.32%	6.43%	5.45%	7.22%	4.59%
Sources and Notes:											
a): Average stock price over the year leading up to 6/25/2018.											
b): Sum of past four dividends prior to 6/25/2018.											
d), [e] [1]-[5]: Staff Model.											
d) [6]-[10]: Thomson Reuters Datastream, excludes stale estimates, as of 6/25/2018. In particular, MGEE's EPS growth estimate of 4% is dated 3/2/2011.											
g), [h], [j] [1]-[5]: Staff Model.											
g), [h], [j] [6]-[10]: Value Line Investment Analyzer as of 6/21/2018, correcting for data entry errors.											

Q22. What is the main difference among the DCF methodologies used by Staff and yourself?

A22. The Staff DCF models used unusual methodologies, some of which are different not only from my own methodology, but also from standard, generally accepted methodologies. Staff used an unusual methodology to calculate annual stock price and dividends, which understates the cost of equity. Additionally, Staff uses a different methodology than I do to calculate the earnings per share (EPS) compound annual growth rate (CAGR), which further understates the cost of equity. Staff also used a very unusual 400-year methodology to calculate the non-constant DCF growth rate cost of equity.

- a. *Stock Price*: Staff used the average of the daily stock price over a one year period, 6/26/2017 to 6/25/2018, in its DCF model. It is inappropriate to use a year's worth of historical data as the DCF model is forward looking and should reflect *current* expectations of future, rather than past performance. A company's recent stock price is a better indicator of expected future

1 performance than the historical year-long average stock price. To revise the
2 Staff DCF, I use the average 15-trading day stock price leading up to 6/25/2018,
3 as shown in Figure 4, row [a] below. I use a 15-trading day average stock price
4 to obtain a very current price estimate while minimizing the volatility that can
5 occur in a single day and bias estimates.

6 b. *Dividends*: Staff calculated the annual dividend by summing the last four
7 quarterly dividends. This method violates the forward looking purpose of the
8 DCF model as it does not reflect investor expectations of future dividends. To
9 revise the Staff DCF, I multiply the most recent quarterly dividend leading up
10 to 6/25/2018 by a factor of four to proxy the future annual dividend, as shown
11 in Figure 4, row [b] below.

12 c. *EPS CAGR*: Staff calculated the CAGR for the *Value Line* 2019 to 2021-2023
13 EPS projections over a four year period. This method implicitly assumes that
14 the *Value Line* 2021-2023 EPS projections are achieved in 2023. However, the
15 2021-2023 EPS projections may be reached as early as 2021, which would
16 decrease the time period used to calculate the CAGR from four to two years. I
17 conservatively assume that the 2021-2023 EPS projections are achieved in the
18 midpoint year, 2022. Therefore, I calculate the *Value Line* EPS CAGR over a
19 three year period. I show this corrected calculation in Figure 4, row [i].

20 d. *Non-Constant DCF*: In addition to the issues above, the Staff non-constant
21 growth rate DCF model projects dividend payments over a 400-year period.¹⁴
22 This is a highly unusual methodology and produces nonsensible dividend
23 values. For example, the Staff model shows that in 400 years, AEE's dividend
24 payment will be \$92.5 billion. The DCF model actually assumes a perpetual
25 stream of dividends, but investors do not forecast dividend payments over a
26 400-year period. Instead, they assume a price at which they can sell the stock at
27 some point in the future. This unusual methodology ultimately does not

¹⁴ For the first five years, the model increases dividends annually at the average of the Reuters, Yahoo, and *Value Line* EPS growth rate projections. Then for years 6-24, the model linearly adjusts the dividend growth rates to align with the long-term US Gross National Product (GNP) growth rate of 6.37 percent. Finally for years 25-400, the model increases dividends by 6.37 percent annually.

substantively affect the ROE estimates. However, I suggest using standard DCF methodology to avoid nonsensible dividend values and better align with reasonable investor beliefs. I revise the Staff DCF model after year 25 to use a standard perpetuity growth methodology to calculate the present value of the expected future dividend payments.¹⁵ I use Staff's own long-term growth rate of 6.37 percent in my revised methodology.

To summarize succinctly the downward bias in inputs as a result of both the data entry errors and the methodological issues utilized in the Staff's DCF calculations, I compare the dividend yield and company specific growth rates, as shown in Figure 5. For each company in the Staff sample, the DCF model inputs are downwardly biased due to the issues outlined above. These calculations use data through June 25, 2018 as Staff did in its report.

Figure 4
Staff DCF Inputs
Comparison of Original to Data and Methodology Corrected Inputs

		Staff Original					Staff Corrected				
		AEE	CMS	LNT	MGEE	OGE	AEE	CMS	LNT	MGEE	OGE
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Dividend Yields											
Average Stock Price	[a]	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06	\$57.30	\$44.20	\$40.02	\$58.55	\$34.24
Annualized Dividend	[b]	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27	\$1.83	\$1.43	\$1.34	\$1.29	\$1.33
Dividend Yield	[c] = [b] / [a]	3.10%	2.93%	3.09%	2.08%	3.73%	3.19%	3.24%	3.35%	2.20%	3.88%
Growth Rates											
Reuters EPS Growth	[d]	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Yahoo EPS Growth	[e]	6.30%	7.05%	5.85%	4.00%	4.30%	n/a	n/a	n/a	n/a	n/a
Average	[f] = ([d] + [e]) / 2	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Value Line											
2019 EPS Projection	[g]	\$7.85	\$2.50	\$2.25	\$2.50	\$2.15	\$3.25	\$2.50	\$2.25	\$2.50	\$2.15
2021-23 EPS Projection	[h]	\$9.25	\$3.00	\$2.60	\$3.30	\$2.50	\$4.00	\$3.00	\$2.60	\$3.30	\$2.50
Calculated CAGR	[i]	4.10%	4.56%	3.61%	6.94%	3.77%	6.92%	6.08%	4.82%	9.25%	5.03%
"Boxed" Earnings Growth	[j]	7.50%	8.50%	6.50%	6.00%	2.50%	7.50%	7.00%	6.50%	7.50%	6.00%
Average	[k] = ([i] + [j]) / 2	5.80%	6.53%	5.06%	6.47%	3.14%	7.21%	6.54%	5.66%	8.38%	5.51%
DCF Growth Estimate	[l] = ([f] + [k]) / 2	6.05%	6.79%	5.45%	5.24%	3.72%	6.76%	6.81%	5.75%	8.38%	4.91%
Sources and Notes: [a] [1]-[5]: Average stock price over the year leading up to 6/25/2018. [a] [6]-[10]: Average stock price over the last 15 days leading up to 6/25/2018. [b] [1]-[5]: Sum of past four dividends prior to 6/25/2018. [b] [6]-[10]: Most recent dividend prior to 6/25/2018 multiplied by four. [d], [e] [1]-[5]: Staff Model. [d] [6]-[10]: Thomson Reuters Datastream, excluding stale estimates, as of 6/25/2018. In particular, MGEE's EPS growth estimate of 4% is dated 3/2/2011. [g], [h], [j] [1]-[5]: Staff Model. [g], [h], [j] [6]-[10]: Value Line Investment Analyzer as of 6/21/2018. [i] [1]-[5] = LN([h] / [g]) / 4 [i] [6]-[10] = LN([h] / [g]) / 3											

¹⁵ I explain the perpetuity growth methodology in my direct testimony, pp. 56-57.

Figure 5
Staff DCF Inputs
Comparison of Data and Methodology Corrected Inputs

Company	Dividend Yield		Downward Bias	Company Growth Rate		Downward Bias
	Staff Input	Corrected Input		Staff Input	Corrected Input	
Ameren Corp	3.10%	3.19%	-0.10%	6.05%	6.76%	-0.70%
CMS Energy Corp	2.93%	3.24%	-0.30%	6.79%	6.81%	-0.02%
Alliant Energy Corp	3.09%	3.35%	-0.26%	5.45%	5.75%	-0.30%
MGE Energy Inc	2.08%	2.20%	-0.12%	5.24%	8.38%	-3.14%
OGE Energy Corp	3.73%	3.88%	-0.16%	3.72%	4.91%	-1.19%
Average	2.99%	3.17%	-0.19%	5.45%	6.52%	-1.07%

1 **Q23. What are the results of correcting for both data and methodological issues with**
2 **the Staff DCF model?**

3 A23. I summarize the results of correcting the Staff's modeling approach for data input and
4 methodological errors in Figure 6. By correcting for these errors, the sample average
5 Staff DCF ROE range increases from the lower range of 8.60 - 9.23 percent to the
6 higher range of 9.76 - 9.89 percent. More specifically, the Staff constant DCF ROE
7 estimate increased from 8.60 percent to 9.89 percent, and the Staff non-constant DCF
8 ROE estimate increased from 9.23 percent to 9.76 percent after correcting for data and
9 methodological issues in both Staff DCF models.

Figure 6
Staff DCF Results
Comparison of Original to Data and Methodology Corrected Results

Company	Constant DCF		Downward Bias	Non-Constant DCF		Downward Bias
	Staff Original	Staff Corrected		Staff Original	Staff Corrected	
	[1]	[2]	[3] = [1] - [2]	[4]	[5]	[6] = [4] - [5]
Ameren Corp	9.34%	10.16%	-0.83%	9.55%	9.91%	-0.36%
CMS Energy Corp	9.92%	10.26%	-0.34%	9.64%	9.98%	-0.34%
Alliant Energy Corp	8.71%	9.30%	-0.59%	9.34%	9.70%	-0.36%
MGE Energy Inc	7.42%	10.77%	-3.34%	8.30%	9.30%	-1.00%
OGE Energy Corp	7.58%	8.98%	-1.40%	9.33%	9.91%	-0.57%
Average	8.60%	9.89%	-1.30%	9.23%	9.76%	-0.53%

Sources and Notes:
[1], [4]: Staff Model.
[2], [5]: Workpaper 1 to Schedule A1.3.

1 **Q24. What is the ROE estimate if you use the revised Staff DCF models with the proxy**
2 **group in your direct testimony?**

3 A24. Applying the revised Staff DCF models to my Gas LDC proxy group results in an ROE
4 range of 9.69 - 10.19 percent using data available as of June 25, 2018, as shown in
5 Figure 7, row [b].

Figure 7
Staff DCF Results
Data and Methodology Corrected Results
Staff and Brattle Proxy Groups

Sample		Constant DCF		Non-Constant DCF	
		Range	Average	Range	Average
Staff	[a]	8.98% - 10.77%	9.89%	9.30% - 9.98%	9.76%
Brattle	[b]	7.02% - 16.43%	10.19%	8.39% - 12.62%	9.69%
Sources and Notes: Estimates as of 6/25/2018.					
[a] - [b]: Workpaper 1 to Schedule A1.3.					

6 **C. CAPM**

7 **Q25. Is Staff's estimate of 6.1 percent as the market risk premium (MRP) input to the**
8 **CAPM analysis reasonable at this time?**

9 A25. No. Staff erroneously calculated the MRP using the Ibbotson arithmetic *total return* of
10 12.1 percent on large company stocks less the 6.0 percent on long-term government
11 bonds. Staff should have used the Ibbotson *income return* of 4.99 percent instead of
12 total return on long-term government bonds to calculate the MRP. Ibbotson explicitly
13 instructs that to calculate the MRP, "the income return on the appropriate-horizon
14 Treasury security, rather than the total return, is used in the calculation" as only the
15 income return represents the riskless portion of the return.¹⁶ Correcting this error
16 increases the MRP from 6.1 percent to 7.1 percent and increases the CAPM cost of
17 equity estimate from 9.11 percent to 9.84 percent, as shown in Figure 8. For reasons
18 stated in *Section III* of my direct testimony and *Section III* of my supplemental

¹⁶ Duff and Phelps's Ibbotson *SBB I 2018 Yearbook*, p. 10-22.

1 testimony, I believe the MRP remains elevated above 7.1 percent in the current
2 economic environment.

Figure 8
Staff CAPM Results
Comparison of Original to MRP Corrected Results

Company	Staff Original				Staff MRP Corrected				Downward Bias
	Value Line	Market Risk	Risk Free	CAPM	Value Line	Market Risk	Risk Free	CAPM	
	Beta	Premium	Rate	Estimate	Beta	Premium	Rate	Estimate	
	[1]	[2]	[3]	[4] = [3] + ([1] × [2])	[5] = [1]	[6]	[7] = [3]	[8] = [7] + ([5] × [6])	[9] = [4] - [8]
Ameren Corp	0.65	6.10%	4.66%	8.63%	0.65	7.10%	4.66%	9.28%	-0.65%
CMS Energy Corp	0.65	6.10%	4.66%	8.63%	0.65	7.10%	4.66%	9.28%	-0.65%
Alliant Energy Corp	0.70	6.10%	4.66%	8.93%	0.70	7.10%	4.66%	9.63%	-0.70%
MGE Energy Inc	0.70	6.10%	4.66%	8.93%	0.70	7.10%	4.66%	9.63%	-0.70%
DGE Energy Corp	0.95	6.10%	4.66%	10.46%	0.95	7.10%	4.66%	11.41%	-0.95%
Average	0.73	6.10%	4.66%	9.11%	0.73	7.10%	4.66%	9.84%	-0.73%
Sources and Notes:									
[1] - [3]: Staff Model.									
[6]: Vilbert Supplemental Testimony, Section II.C.									

3 **Q26. What is the CAPM ROE if you use the MRP corrected Staff CAPM model with**
4 **the proxy group in your direct testimony?**
5 A26. The CAPM ROE result is 9.95 percent using the proxy group in my direct testimony
6 and data through June 25, 2018, as shown in Figure 9.

Figure 9
Staff CAPM Results
MRP Corrected with Brattle Proxy Group

Company	Brattle Proxy Group			
	<i>Value Line</i>	Market Risk	Risk Free	CAPM
	Beta [1]	Premium [2]	Rate [3]	Estimate [4] = [3] + ([1] × [2])
Atmos Energy	0.70	7.10%	4.66%	9.63%
Chesapeake Utilities	0.70	7.10%	4.66%	9.63%
ONE Gas Inc.	0.70	7.10%	4.66%	9.63%
South Jersey Inds.	0.85	7.10%	4.66%	10.70%
Southwest Gas	0.80	7.10%	4.66%	10.34%
Spire Inc.	0.70	7.10%	4.66%	9.63%
New Jersey Resources	0.80	7.10%	4.66%	10.34%
Northwest Natural Gas	0.70	7.10%	4.66%	9.63%
WGL Holdings Inc.	0.75	7.10%	4.66%	9.99%
Average	0.74	7.10%	4.66%	9.95%
Sources and Notes:				
[1]: Value Line Investment Analyzer as of 6/21/2018.				
[2]: Vilbert Supplemental Testimony, Section II.C.				
[3]: Staff Model.				

D. Baseline ROE Range

Q27. How does Staff determine the baseline ROE range?

A27. Staff determines the baseline ROE range using the non-constant DCF and CAPM ROE estimates. I noted above that Staff workpapers calculate both the constant and non-constant DCF ROE estimate. As shown in Figure 7 above, the corrected Staff constant DCF ROE estimates are higher than the corrected Staff non-constant DCF ROE estimates. However, the Staff Report only relies on the non-constant DCF ROE estimate. Staff does not provide a reason for excluding the constant DCF ROE estimate.

Q28. What is the baseline ROE range when the corrected Staff DCF and CAPM models are applied to the Staff proxy group?

A28. Combining the data and methodology corrected Staff non-constant DCF result with the MRP corrected Staff CAPM result increases the baseline ROE from 8.80 - 9.81 percent to 9.43 - 10.45 percent, as shown in Figure 10.

Figure 10
Staff Baseline Results
Comparison of Original to Corrected Baseline Staff Proxy Group

		Staff Original [1]	Staff Corrected [2]
CAPM Estimate	[a]	9.11%	9.84%
Non-Constant DCF Estimate	[b]	9.23%	9.76%
Average	$[c] = ([a] + [b])/2$	9.17%	9.80%
100 bps Range	$[d] = [c] + /- 50bps$	8.67% - 9.67%	9.30% - 10.30%
Adjustment Factor	[e]	1.01407	1.01407
Baseline Range	$[f] = [d] \times [e]$	8.80% - 9.81%	9.43% - 10.45%
Sources and Notes:			
[a][1], [b][1], [e]: Staff Report, pp. 21-22.			
[a][2]: Schedule A2.1.			
[b][2]: Schedule A1.3.			

- 1 **Q29. What is the baseline ROE range when the corrected Staff DCF and CAPM models**
2 **are applied to the proxy group from your direct testimony?**
3 A29. The baseline ROE range is 9.45 - 10.46 percent using the proxy group in my direct
4 testimony and data through June 25, 2018, as shown in Figure 11.

Figure 11
Staff Baseline Results
Corrected with Brattle Proxy Group

		Brattle Proxy Group [1]
CAPM Estimate	[a]	9.95%
Non-Constant DCF Estimate	[b]	9.69%
Average	$[c] = ([a] + [b])/2$	9.82%
100 bps Range	$[d] = [c] + /- 50\text{bps}$	9.32% - 10.32%
Adjustment Factor	[e]	1.01407
Baseline Range	$[f] = [d] \times [e]$	9.45% - 10.46%
Sources and Notes:		
[a]: Schedule A2.2.		
[b]: Schedule A1.5.		
[e]: Staff Report, pp. 21-22.		

Q30. Do you have concerns about how the Staff baseline ROE range is determined?

A30. Yes. I am concerned that the Staff baseline ROE does not consider how capital structure affects the rate of return required by shareholders. I discussed the relationship between capital structure and rate of return in my direct testimony (Section II.B) in detail. In my direct testimony, I explained that for a given level of business risk, a higher debt-to-capital ratio increases financial risk. Shareholders require a higher rate of return in order to be compensated for the additional financial risk.

VEDO has a higher debt-to-capital ratio than the companies in the proxy group that I used in my direct testimony. VEDO has a debt-to-capital ratio of 48.94 percent. In comparison, the average debt-to-capital ratio of the proxy group in my direct testimony is 32.6 percent.¹⁷ VEDO's financial risk is higher than the proxy group's given VEDO's higher debt-to-capital ratio. However, the Staff baseline ROE does not consider the difference in capital structure between VEDO and the relevant proxy group. This causes the Staff baseline ROE to understate the appropriate ROE that

¹⁷ See Attachment B Schedule No. D5.4 submitted with my supplemental direct testimony. The sample average DCF debt-to-capital ratio is 32.6 percent. The 5-year average debt-to-capital ratio I use in my CAPM analyses is 33.0 percent.

1 should be allowed for VEDO. Thus, the baseline ROE results shown in Figure 10 and
2 Figure 11 are too low for VEDO. I believe the methodologies in my direct testimony
3 provide a more accurate ROE rate. Therefore, I continue to recommend an ROE of 10¾
4 percent for VEDO.

5 **III. UPDATE TO CAPITAL MARKET CONDITIONS**

6 **A. Update of Economic Conditions Since February 2018**

7 **Q31. Please provide an update on economic conditions since your direct testimony**

8 A31. Current economic conditions show increased volatility due to the combination of
9 heightened geopolitical uncertainty along with higher interest rates, inflation, and GDP
10 growth. Recent developments that have heightened geopolitical uncertainty and risk
11 include ongoing trade wars between the US and China, challenging negotiations
12 regarding Brexit, and the new US-Mexico-Canada Agreement (USMCA) that replaced
13 the North American Free Trade Agreement (NAFTA).

14 Additionally, the Federal Reserve increased the range of the federal funds rate from 1¾
15 - 2 percent up to 2 - 2¼ percent on September 26, 2018. Higher interest rates further
16 increase economic uncertainty through stock price volatility as higher bond yields
17 attract investors away from stocks. Higher interest rates have recently caused major
18 stock market adjustments. On October 10, the S&P 500 fell for the fifth day in a row,
19 representing the longest losing-streak since November of 2016.¹⁸ Also on October 10,
20 the Dow Jones Industrial Average (Dow) declined by more than 800 basis points, or
21 3.1 percent, the worst decline since February 2018. Even more recently, on October 24,
22 the S&P 500 and Dow both fell to negative returns on the year.¹⁹

23 Also, both current and projected inflation and real GDP growth rates have increased
24 since February 2018. In February 2018, the year-over-year inflation, as measured by

¹⁸ See “Stocks close sharply lower as Dow sinks over 800 points in worst day since February,” Sue Chang, *MarketWatch*, October 10, 2018.

¹⁹ See “U.S. Stocks Fall Sharply as Markets Extend Rocky Stretch,” Amrith Ramkumar, *The Wall Street Journal*, October 24, 2018.

1 the Consumer Price Index (CPI), was 2.2 percent.²⁰ Since then, the CPI consistently
2 increased until it reached a six-year high of 2.9 percent in July 2018. Real GDP growth
3 has increased from an annual rate of 2.2 percent in the first quarter of 2018 to 4.2
4 percent in the second quarter of 2018.²¹ Additionally, projected inflation and real GDP
5 growth rates have also increased. The 2019 CPI forecast has increased from 2.2
6 percent²² in February 2018 to 2.3 percent²³ in October 2018. Likewise, the 2019 real
7 GDP forecast has increased from 2.4 percent²⁴ to 2.6 percent²⁵ over the same period.

8 **Q32. Are current economic conditions reflected in the Staff baseline results?**

9 A32. No. The updated Staff baseline results, as shown in Figure 10 and Figure 11, only use
10 data through June 25, 2018 and therefore do not reflect current economic conditions
11 through the end of October. I discuss economic conditions through October because
12 there has been a significant increase in volatility, which affects investors required rate
13 of return and the cost of capital.

14 **Q33. What is the current evidence regarding market volatility?**

15 A33. A measure of the market's expectations for volatility is the VIX, which measures the
16 30-day implied volatility of the S&P 500 index. This index is sometimes called the
17 "investor fear gauge" because it provides a market indication of how investors in stock
18 index options perceive the likelihood of large swings in the stock market within the
19 next month. While the VIX has been trading below its long term historical average in
20 recent months, it spiked significantly on October 10 and October 24, which correspond
21 with decline in the S&P 500 and Dow. See Figure 12 below.

²⁰ CPI - All Urban Consumers, Bureau of Labor Statistics, accessed 10/25/2018 at https://data.bls.gov/timeseries/CUUR0000SA0?output_view=pct_12mths.

²¹ Real GDP, Bureau of Economic Analysis, September 27, 2018, accessed 10/25/2018 at <https://www.bea.gov/news/2018/gross-domestic-product-2nd-quarter-2018-third-estimate-corporate-profits-2nd-quarter-2018>.

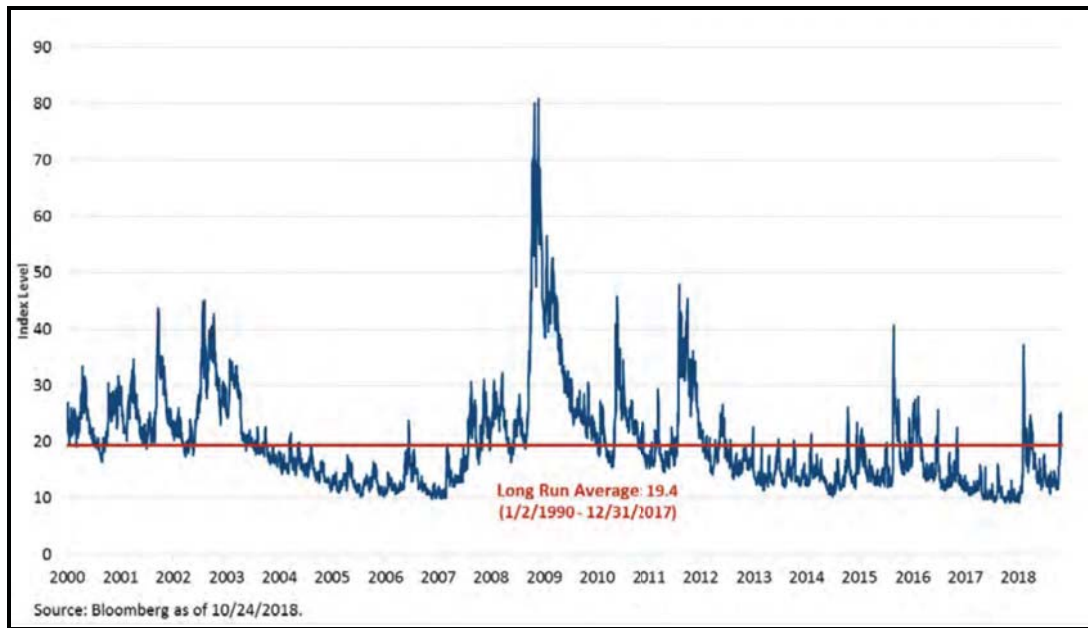
²² Forecast by Blue Chip Economic Indicators, Edition – February 2018.

²³ Forecast by *Blue Chip Economic Indicators*, Edition – October 2018.

²⁴ Forecast by Blue Chip Economic Indicators, Edition – February 2018.

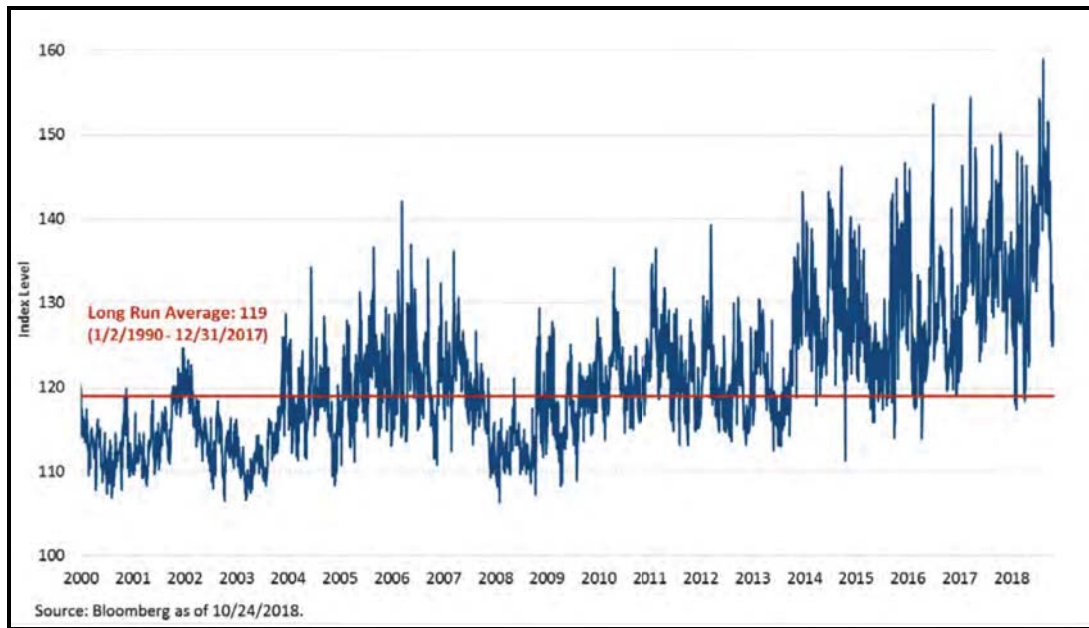
²⁵ Forecast by *Blue Chip Economic Indicators*, Edition – October 2018.

Figure 12
VIX Index (January 2000 – October 2018)



- 1 **Q34. Are there other indications that investors are exhibiting elevated signs of risk**
2 **aversion?**
- 3 A34. Yes, the SKEW index measures the market's willingness to pay for protection against
4 negative "black swan" stock market events (i.e., sudden substantial downturns). A
5 SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW value
6 increases, the probability of outlier declines also increases. Figure 13 displays the
7 SKEW Index since 2000, as well as its long run average. The average SKEW since
8 August is over 140, indicating investors are exhibiting signs of elevated risk aversion
9 and willing to pay for protection against significant downside risks.

Figure 13
SKEW Index (January 2000 – October 2018)



B. Effect of Current Economic Conditions

Q35. How do current economic conditions affect the cost of capital?

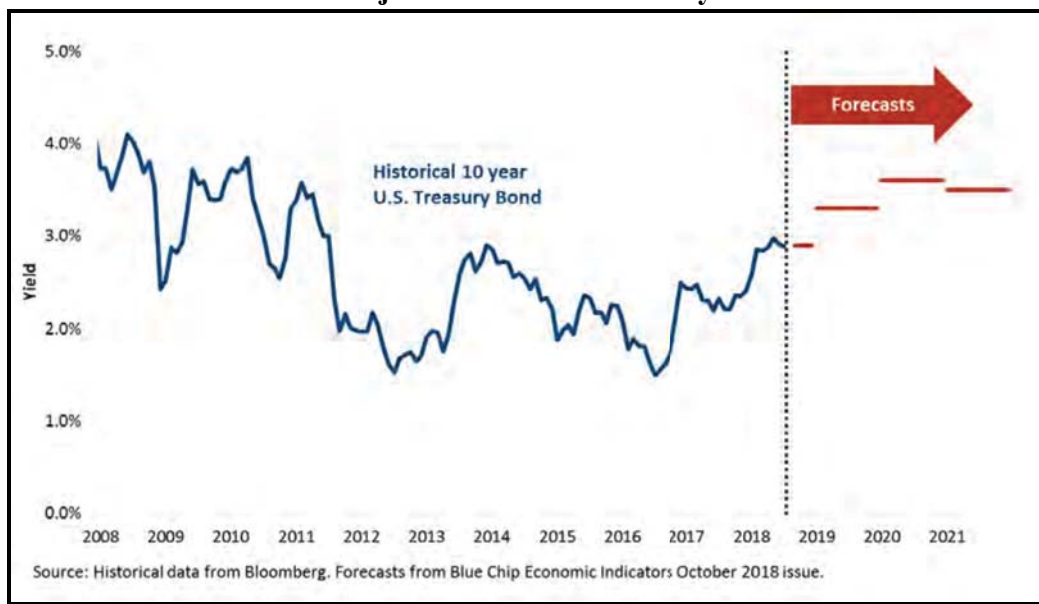
A35. Current and projected economic conditions increase the cost of capital. Conceptually, the combination of increased volatility, higher interest rates, inflation, and economic growth leads investors to expect a higher return on capital. Current and projected economic conditions increase the DCF and CAPM model ROE estimates through multiple mechanisms, most notably through higher expected dividend yields, dividend growth rate, elevated risk free rate and MRP.

Q36. How do current economic conditions affect the DCF ROE estimates?

A36. Higher interest rates and GDP increase the DCF ROE estimates, all else equal. This is because in a higher interest rate environment, dividend yields would be expected to increase in order to remain competitive with higher bond yields. Indeed, long-term government bond yields have increased substantially over the past year and are forecasted to continue on their upward trajectory in coming years. For example, the yield on 10-year US. Treasury bond is currently 3.0 percent, the highest it has been

1 since mid-2011.²⁶ Additionally, the 10-year Treasury is forecasted to continue
2 increasing, reaching 3.6 percent by 2020, as shown in Figure 14 below.²⁷

Figure 14
Historical and Projected 10-Year Treasury Bond Yields



Q37. How do current economic conditions affect the CAPM ROE estimates?

A37. The higher interest rate environment increases the CAPM ROE estimates, all else equal. Higher interest rates increase the yield on long-term government bonds used to represent the risk-free rate in the CAPM model. Additionally, the MRP continues to remain elevated above historical levels,²⁸ as demonstrated by the elevated spread between the yield on BBB-rated utility bonds and US Treasury Bonds.

The spread between the yield on BBB-rated Utility bonds and U.S. Treasury Bonds, both of 20 year maturities, has remained elevated relative to its pre-crisis average. At the time of filing my direct evidence, most recent data available showed a spread of 151 bps. As is shown in Figure 15, the current spread is 169 bps, which is 46 bps above the pre-crisis average. The consequence of an elevated yield spread is that if the ROE

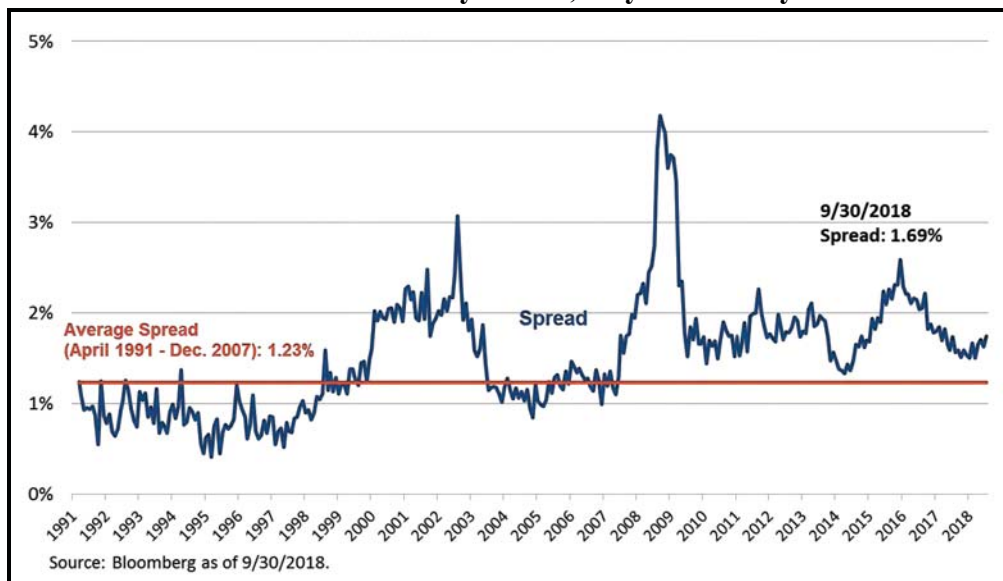
²⁶ Bloomberg as of 9/31/2018.

²⁷ Forecast by Blue Chip Economic Indicators, Edition – October 2018.

²⁸ Direct Testimony, pp. 19-22.

1 is estimated using the current risk-free rate and a historical average MRP, the estimate
2 will be downward biased. Therefore, I believe current economic conditions continue to
3 warrant the use of a conditional MRP estimate of 7.94 percent as discussed in my direct
4 testimony.²⁹

Figure 15
Spread Between BBB-rated Utility Bonds
and U.S. Treasury Bonds, 20 yr. Maturity



5 IV. CONCLUSION

6 Q38. Please summarize your supplemental analyses.

7 A38. After reviewing the Staff Report, DCF, and CAPM models, I believe Staff's ROE
8 recommendation range of 8.80 - 9.81 percent is understated because of data input errors
9 and unusual methodologies. When I apply the corrected Staff DCF and CAPM to
10 Staff's proxy group using data through June 25, 2018, the baseline ROE increases from
11 8.80 - 9.81 percent to 9.43 - 10.45 percent, as shown in Figure 10 above. Even though
12 the current estimates from the Staff's proxy group are not substantially different from
13 those from the Gas LDC proxy group I recommend, I do not believe that the Staff proxy
14 group is appropriate for estimating the ROE for VEDO. Thus, I apply the corrected
15 Staff DCF and CAPM to the proxy group from my direct testimony using data through

²⁹ Direct Testimony, pp. 25, 44.

1 June 25, 2018, which results in a baseline ROE range of 9.45 - 10.46 percent, as shown
2 in Figure 11. However, as discussed in *Section II.D*, the baseline ROE is understated
3 for VEDO because Staff's baseline methodology does not consider the effect of capital
4 structure and financial risk on the rate of return. Additionally, the baseline ROE does
5 not reflect the recent and significant increase in capital market volatility. Given current
6 economic conditions, using more recent data generally indicates an increase in the
7 estimated ROEs, further supporting my recommendation. These factors justify an
8 allowed ROE above the top of the Staff's estimated range.

9 I continue to recommend an allowed ROE of 10¾ for the reasons discussed in my direct
10 testimony and given current economic conditions.

11 **Q39. Does this conclude your supplemental testimony?**

12 A39. Yes, it does.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document was served by electronic mail to the following persons on this 7th day of November, 2018:

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Delivery of Ohio, Inc.

MJV Supplemental Attachment A Table of Contents

Schedule	Description
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1.2	Staff DCF Inputs: Comparison of Original to Data Corrected Inputs
1.3	Staff DCF Results: Comparison of Original to Data and Methodology Corrected Results
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Schedule A1.1
Staff DCF Results: Comparison of Original to Data Corrected Results

Company	Constant DCF		Downward Bias [3] = [1] - [2]	Non-Constant DCF		Downward Bias [6] = [4] - [5]
	Staff Original [1]	Staff Corrected [2]		Staff Original [4]	Staff Corrected [5]	
Ameren Corp	9.34%	9.62%	-0.28%	9.55%	9.65%	-0.10%
CMS Energy Corp	9.92%	9.55%	0.37%	9.64%	9.51%	0.13%
Alliant Energy Corp	8.71%	8.71%	0.00%	9.34%	9.34%	0.00%
MGE Energy Inc	7.42%	9.45%	-2.03%	8.30%	8.81%	-0.51%
OGE Energy Corp	7.58%	8.49%	-0.91%	9.33%	9.64%	-0.31%
Average	8.60%	9.16%	-0.57%	9.23%	9.39%	-0.16%

Sources and Notes:

[1], [4]: Staff Model.

[2], [5] Workpaper 1 to Schedule A1.1.

Schedule A1.2
Staff DCF Inputs: Comparison of Original to Data Corrected Inputs

		Staff Original					Staff Data Corrected				
		AEE	CMS	LNT	MGEE	OGE	AEE	CMS	LNT	MGEE	OGE
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Dividend Yields											
Average Stock Price	[a]	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06
Annualized Dividend	[b]	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27
Dividend Yield	[c] = [b] / [a]	3.10%	2.93%	3.09%	2.08%	3.73%	3.10%	2.93%	3.09%	2.08%	3.73%
Growth Rates											
Reuters EPS Growth	[d]	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Yahoo EPS Growth	[e]	6.30%	7.05%	5.85%	4.00%	4.30%	n/a	n/a	n/a	n/a	n/a
Average	[f] = ([d] + [e]) / 2	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Value Line											
2019 EPS Projection	[g]	\$7.85	\$2.50	\$2.25	\$2.50	\$2.15	\$3.25	\$2.50	\$2.25	\$2.50	\$2.15
2021-23 EPS Projection	[h]	\$9.25	\$3.00	\$2.60	\$3.30	\$2.50	\$4.00	\$3.00	\$2.60	\$3.30	\$2.50
Calculated CAGR	[i] = LN([h] / [g]) / 4	4.10%	4.56%	3.61%	6.94%	3.77%	5.19%	4.56%	3.61%	6.94%	3.77%
"Boxed" Earnings Growth	[j]	7.50%	8.50%	6.50%	6.00%	2.50%	7.50%	7.00%	6.50%	7.50%	6.00%
Average	[k] = ([i] + [j]) / 2	5.80%	6.53%	5.06%	6.47%	3.14%	6.35%	5.78%	5.06%	7.22%	4.89%
DCF Growth Estimate	[l] = ([f] + [k]) / 2	6.05%	6.79%	5.45%	5.24%	3.72%	6.32%	6.43%	5.45%	7.22%	4.59%

Sources and Notes:

[a]: Average stock price over the year leading up to 6/25/2018.

[b]: Sum of past four dividends prior to 6/25/2018.

[d], [e] [1]-[5]: Staff Model.

[d] [6]-[10]: Thomson Reuters Datastream, excludes stale estimates, as of 6/25/2018. In particular, MGEE's EPS growth estimate of 4% is dated 3/2/2011.

[g], [h], [j] [1]-[5]: Staff Model.

[g], [h], [j] [6]-[10]: Value Line Investment Analyzer as of 6/21/2018, correcting for data entry errors.

Schedule A1.3

Staff DCF Results: Comparison of Original to Data and Methodology Corrected Results

Company	Constant DCF		Downward Bias [3] = [1] - [2]	Non-Constant DCF		Downward Bias [6] = [4] - [5]
	Staff Original [1]	Staff Corrected [2]		Staff Original [4]	Staff Corrected [5]	
Ameren Corp	9.34%	10.16%	-0.83%	9.55%	9.91%	-0.36%
CMS Energy Corp	9.92%	10.26%	-0.34%	9.64%	9.98%	-0.34%
Alliant Energy Corp	8.71%	9.30%	-0.59%	9.34%	9.70%	-0.36%
MGE Energy Inc	7.42%	10.77%	-3.34%	8.30%	9.30%	-1.00%
OGE Energy Corp	7.58%	8.98%	-1.40%	9.33%	9.91%	-0.57%
Average	8.60%	9.89%	-1.30%	9.23%	9.76%	-0.53%

Sources and Notes:

[1], [4]: Staff Model.

[2], [5]: Workpaper 1 to Schedule A1.3.

Schedule A1.4
Staff DCF Inputs: Comparison of Original to Data and Methodology Corrected Inputs

		Staff Original					Staff Corrected				
		AEE [1]	CMS [2]	LNT [3]	MGEE [4]	OGE [5]	AEE [6]	CMS [7]	LNT [8]	MGEE [9]	OGE [10]
Dividend Yields											
Average Stock Price	[a]	\$57.95	\$46.18	\$41.44	\$61.31	\$34.06	\$57.30	\$44.20	\$40.02	\$58.55	\$34.24
Annualized Dividend	[b]	\$1.80	\$1.36	\$1.28	\$1.28	\$1.27	\$1.83	\$1.43	\$1.34	\$1.29	\$1.33
Dividend Yield	[c] = [b] / [a]	3.10%	2.93%	3.09%	2.08%	3.73%	3.19%	3.24%	3.35%	2.20%	3.88%
Growth Rates											
Reuters EPS Growth	[d]	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
Yahoo EPS Growth	[e]	6.30%	7.05%	5.85%	4.00%	4.30%	n/a	n/a	n/a	n/a	n/a
Average	[f] = ([d] + [e]) / 2	6.30%	7.05%	5.85%	4.00%	4.30%	6.30%	7.07%	5.85%	n/a	4.30%
<i>Value Line</i>											
2019 EPS Projection	[g]	\$7.85	\$2.50	\$2.25	\$2.50	\$2.15	\$3.25	\$2.50	\$2.25	\$2.50	\$2.15
2021-23 EPS Projection	[h]	\$9.25	\$3.00	\$2.60	\$3.30	\$2.50	\$4.00	\$3.00	\$2.60	\$3.30	\$2.50
Calculated CAGR	[i]	4.10%	4.56%	3.61%	6.94%	3.77%	6.92%	6.08%	4.82%	9.25%	5.03%
"Boxed" Earnings Growth	[j]	7.50%	8.50%	6.50%	6.00%	2.50%	7.50%	7.00%	6.50%	7.50%	6.00%
Average	[k] = ([i] + [j]) / 2	5.80%	6.53%	5.06%	6.47%	3.14%	7.21%	6.54%	5.66%	8.38%	5.51%
DCF Growth Estimate	[l] = ([f] + [k]) / 2	6.05%	6.79%	5.45%	5.24%	3.72%	6.76%	6.81%	5.75%	8.38%	4.91%

Sources and Notes:

[a] [1]-[5]: Average stock price over the year leading up to 6/25/2018.

[a] [6]-[10]: Average stock price over the last 15 days leading up to 6/25/2018.

[b] [1]-[5]: Sum of past four dividends prior to 6/25/2018.

[b] [6]-[10]: Most recent dividend prior to 6/25/2018 multiplied by four.

[d], [e] [1]-[5]: Staff Model.

[d] [6]-[10]: Thomson Reuters Datastream, excluding stale estimates, as of 6/25/2018. In particular, MGEE's EPS growth estimate of 4% is dated 3/2/2011.

[g], [h], [j] [1]-[5]: Staff Model.

[g], [h], [j] [6]-[10]: Value Line Investment Analyzer as of 6/21/2018.

[i] [1]-[5] = $\text{LN}([h] / [g]) / 4$

[i] [6]-[10] = $\text{LN}([h] / [g]) / 3$

Schedule A1.5
Staff DCF Results: Data and Methodology Corrected with Staff and Brattle
Proxy Group

		Constant DCF		Non-Constant DCF	
Sample		Range	Average	Range	Average
Staff	[a]	8.98% - 10.77%	9.89%	9.30% - 9.98%	9.76%
Brattle	[b]	7.02% - 16.43%	10.19%	8.39% - 12.62%	9.69%

Sources and Notes: Estimates as of 6/25/2018.

[a] - [b]: Workpaper 1 to Schedule A1.3.

Schedule A1.6
Staff DCF Inputs: Data and Methodology Corrected with Staff and Brattle Proxy Group

		Staff Proxy Group					Brattle Proxy Group								
		AEE [1]	CMS [2]	LNT [3]	MGEE [4]	OGE [5]	ATO [6]	CPK [7]	OGS [8]	SJI [9]	SWX [10]	SR [11]	NJR [12]	NWN [13]	WGL [14]
Average Stock Price	[a]	\$57.30	\$44.20	\$40.02	\$58.55	\$34.24	\$86.44	\$76.48	\$71.72	\$31.09	\$74.82	\$67.65	\$41.95	\$59.46	\$87.98
Annualized Dividend	[b]	\$1.83	\$1.43	\$1.34	\$1.29	\$1.33	\$1.94	\$1.48	\$1.84	\$1.12	\$2.08	\$2.25	\$1.09	\$1.89	\$2.06
Dividend Yield	[c] = [b] / [a]	3.19%	3.24%	3.35%	2.20%	3.88%	2.24%	1.94%	2.57%	3.60%	2.78%	3.33%	2.60%	3.18%	2.34%
IBES Growth Rate	[d]	6.30%	7.07%	5.85%	n/a	4.30%	6.65%	6.00%	5.50%	n/a	4.00%	3.47%	6.43%	4.50%	n/a
Value Line															
2019 EPS Projection	[e]	\$3.25	\$2.50	\$2.25	\$2.50	\$2.15	\$4.30	\$3.35	\$3.35	\$1.70	\$4.35	\$4.00	\$2.75	\$2.45	\$4.25
2021-23 EPS Projection	[f]	\$4.00	\$3.00	\$2.60	\$3.30	\$2.50	\$5.15	\$4.50	\$4.00	\$2.30	\$5.50	\$5.00	\$2.95	\$3.50	\$4.60
CAGR	[g] = LN([f]/[e]) / 3	6.92%	6.08%	4.82%	9.25%	5.03%	6.01%	9.84%	5.91%	10.08%	7.82%	7.44%	2.34%	11.89%	2.64%
"Boxed" Earnings Growth	[h]	7.50%	7.00%	6.50%	7.50%	6.00%	7.50%	8.50%	7.00%	9.50%	9.00%	7.50%	9.50%	30.50%	6.50%
Average	[i] = ([g] + [h]) / 2	7.21%	6.54%	5.66%	8.38%	5.51%	6.76%	9.17%	6.46%	9.79%	8.41%	7.47%	5.92%	21.19%	4.57%
DCF Growth Estimate	[j] = ([d] + [i]) / 2	6.76%	6.81%	5.75%	8.38%	4.91%	6.70%	7.58%	5.98%	9.79%	6.20%	5.47%	6.18%	12.85%	4.57%
Terminal Growth Estimate	[k]	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%	6.37%

Sources and Notes:

[a]: Average Stock price for the last 15 days leading up to 6/25/2018. [1] - [5] from Staff. [6] - [14] from Bloomberg.

[b]: Most recently paid dividend annualized (multiplied by 4). [1] - [5] from Staff. [6] - [14] from Bloomberg.

[d]: Thomson Reuters Datastream, excluding stale estimates, as of 6/25/2018.

[e], [f], [h]: Value Line Investment Analyzer as of 6/21/2018.

[k]: Staff Model, Tab "GNP".

Schedule A2.1
Staff CAPM Results: Comparison of Original to MRP Corrected Results

Company	Staff Original				Staff MRP Corrected				Downward Bias [9] = [4] - [8]
	<i>Value Line</i>	Market Risk	Risk Free	CAPM	<i>Value Line</i>	Market Risk	Risk Free	CAPM	
	Beta [1]	Premium [2]	Rate [3]	Estimate [4] = [3] + ([1] × [2])	Beta [5] = [1]	Premium [6]	Rate [7] = [3]	Estimate [8] = [7] + ([5] × [6])	
Ameren Corp	0.65	6.10%	4.66%	8.63%	0.65	7.10%	4.66%	9.28%	-0.65%
CMS Energy Corp	0.65	6.10%	4.66%	8.63%	0.65	7.10%	4.66%	9.28%	-0.65%
Alliant Energy Corp	0.70	6.10%	4.66%	8.93%	0.70	7.10%	4.66%	9.63%	-0.70%
MGE Energy Inc	0.70	6.10%	4.66%	8.93%	0.70	7.10%	4.66%	9.63%	-0.70%
OGE Energy Corp	0.95	6.10%	4.66%	10.46%	0.95	7.10%	4.66%	11.41%	-0.95%
Average	0.73	6.10%	4.66%	9.11%	0.73	7.10%	4.66%	9.84%	-0.73%

Sources and Notes:

[1] - [3]: Staff Model.

[6]: Vilbert Supplemental Testimony, Section II.C.

Schedule A2.2
Staff CAPM Results: MRP Corrected with Brattle Proxy Group

Company	Brattle Proxy Group			
	<i>Value Line</i>	Market Risk	Risk Free	CAPM
	Beta [1]	Premium [2]	Rate [3]	Estimate [4] = [3] + ([1] × [2])
Atmos Energy	0.70	7.10%	4.66%	9.63%
Chesapeake Utilities	0.70	7.10%	4.66%	9.63%
ONE Gas Inc.	0.70	7.10%	4.66%	9.63%
South Jersey Inds.	0.85	7.10%	4.66%	10.70%
Southwest Gas	0.80	7.10%	4.66%	10.34%
Spire Inc.	0.70	7.10%	4.66%	9.63%
New Jersey Resources	0.80	7.10%	4.66%	10.34%
Northwest Natural Gas	0.70	7.10%	4.66%	9.63%
WGL Holdings Inc.	0.75	7.10%	4.66%	9.99%
Average	0.74	7.10%	4.66%	9.95%

Sources and Notes:

[1]: Value Line Investment Analyzer as of 6/21/2018.

[2]: Vilbert Supplemental Testimony, Section II.C.

[3]: Staff Model.

Schedule A2.3
Staff Baseline Results: Comparison of Original to Corrected with
Staff Proxy Group

		Staff Original	Staff Corrected
		[1]	[2]
CAPM Estimate	[a]	9.11%	9.84%
Non-Constant DCF Estimate	[b]	9.23%	9.76%
Average	[c] = ([a] + [b])/2	9.17%	9.80%
100 bps Range	[d] = [c] + /- 50bps	8.67% - 9.67%	9.30% - 10.30%
Adjustment Factor	[e]	1.01407	1.01407
Baseline Range	[f] = [d] × [e]	8.80% - 9.81%	9.43% - 10.45%

Sources and Notes:

[a][1], [b][1], [e]: Staff Report, pp. 21-22.

[a][2]: Schedule A2.1.

[b][2]: Schedule A1.3.

Schedule A2.4

Staff Baseline Results: Corrected with Brattle Proxy Group

		Brattle Proxy Group [1]
CAPM Estimate	[a]	9.95%
Non-Constant DCF Estimate	[b]	9.69%
Average	$[c] = ([a] + [b])/2$	9.82%
100 bps Range	$[d] = [c] + /- 50\text{bps}$	9.32% - 10.32%
Adjustment Factor	[e]	1.01407
Baseline Range	$[f] = [d] \times [e]$	9.45% - 10.46%

Sources and Notes:

[a]: Schedule A2.2.

[b]: Schedule A1.5.

[e]: Staff Report, pp. 21-22.

Schedule No. R5

10.75% Cost of Common Shareholders' Equity

Schedule No. R5.1

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Schedule No. R5.2

Classification of Companies by Assets

Company	Company Category
Atmos Energy	R
Chesapeake Utilities	M
ONE Gas Inc.	R
South Jersey Inds.	M
Southwest Gas	R
Spire Inc.	R
New Jersey Resources	M
Northwest Natural Gas	R
WGL Holdings Inc.	R

Sources and Notes:

Percent regulated determined based on respective company
2016 10-K information.

R = Regulated (greater than 80 percent of total assets are regulated).

M = Mostly Regulated (50 to 80 percent of total assets are regulated).

D = Diversified (less than 50 percent of total assets are regulated).

Schedule No. R5.3
Market Value of the Expanded Sample
Panel A: Atmos Energy
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$3,899	\$3,899	\$3,699	\$3,272	\$3,064	\$2,661	\$2,424	[a]
Shares Outstanding (in millions) - Common	106	106	105	102	101	91	91	[b]
Price per Share - Common	\$82	\$88	\$74	\$63	\$55	\$45	\$36	[c]
Market Value of Common Equity	\$8,649	\$9,303	\$7,778	\$6,398	\$5,523	\$4,061	\$3,223	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$8,649	\$9,303	\$7,778	\$6,398	\$5,523	\$4,061	\$3,223	[f] = [d]
Market to Book Value of Common Equity	2.22	2.39	2.10	1.96	1.80	1.53	1.33	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$540	\$540	\$979	\$863	\$1,119	\$1,300	\$1,165	[j]
Current Liabilities	\$1,013	\$1,013	\$1,950	\$1,515	\$1,421	\$2,014	\$1,645	[k]
Current Portion of Long-Term Debt	\$0	\$0	\$250	\$0	\$0	\$500	\$0	[l]
Net Working Capital	(\$474)	(\$474)	(\$720)	(\$652)	(\$302)	(\$214)	(\$480)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$448	\$448	\$941	\$763	\$551	\$690	\$831	[n]
Adjusted Short-Term Debt	\$448	\$448	\$720	\$652	\$302	\$214	\$480	[o] = See Sources and Notes.
Long-Term Debt	\$3,067	\$3,067	\$2,314	\$2,455	\$2,455	\$1,956	\$1,956	[p]
Book Value of Long-Term Debt	\$3,515	\$3,515	\$3,285	\$3,107	\$2,757	\$2,670	\$2,437	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$2,845	\$2,845	\$2,669	\$2,770	\$2,676	\$2,426	\$2,561	
Carrying Amount	\$2,460	\$2,460	\$2,460	\$2,460	\$2,460	\$1,960	\$2,213	
Adjustment to Book Value of Long-Term Debt	\$385	\$385	\$209	\$310	\$216	\$466	\$348	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$3,900	\$3,900	\$3,494	\$3,417	\$2,973	\$3,136	\$2,785	[s] = [q] + [r].
Market Value of Debt	\$3,900	\$3,900	\$3,494	\$3,417	\$2,973	\$3,136	\$2,785	[t] = [s].
MARKET VALUE OF FIRM								
	\$12,549	\$13,203	\$11,272	\$9,815	\$8,496	\$7,197	\$6,008	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	68.92%	70.46%	69.00%	65.19%	65.00%	56.43%	53.65%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	31.08%	29.54%	31.00%	34.81%	35.00%	43.57%	46.35%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel B: Chesapeake Utilities
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$464	\$464	\$446	\$358	\$300	\$279	\$257	[a]
Shares Outstanding (in millions) - Common	16	16	16	15	15	14	14	[b]
Price per Share - Common	\$73	\$79	\$68	\$56	\$49	\$39	\$30	[c]
Market Value of Common Equity	\$1,192	\$1,293	\$1,104	\$851	\$710	\$570	\$435	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$1,192	\$1,293	\$1,104	\$851	\$710	\$570	\$435	[f] = [d]
Market to Book Value of Common Equity	2.57	2.79	2.48	2.38	2.36	2.04	1.70	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$149	\$149	\$141	\$112	\$122	\$126	\$101	[j]
Current Liabilities	\$339	\$339	\$334	\$280	\$194	\$222	\$162	[k]
Current Portion of Long-Term Debt	\$12	\$12	\$12	\$9	\$9	\$11	\$8	[l]
Net Working Capital	(\$178)	(\$178)	(\$181)	(\$159)	(\$63)	(\$84)	(\$53)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$203	\$203	\$210	\$173	\$88	\$106	\$61	[n]
Adjusted Short-Term Debt	\$178	\$178	\$181	\$159	\$63	\$84	\$53	[o] = See Sources and Notes.
Long-Term Debt	\$201	\$201	\$137	\$149	\$158	\$118	\$102	[p]
Book Value of Long-Term Debt	\$392	\$392	\$330	\$317	\$230	\$213	\$163	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$162	\$162	\$165	\$181	\$137	\$133	\$142	
Carrying Amount	\$146	\$146	\$154	\$162	\$122	\$110	\$119	
Adjustment to Book Value of Long-Term Debt	\$16	\$16	\$11	\$19	\$15	\$23	\$24	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$407	\$407	\$341	\$336	\$245	\$236	\$187	[s] = [q] + [r].
Market Value of Debt	\$407	\$407	\$341	\$336	\$245	\$236	\$187	[t] = [s].
MARKET VALUE OF FIRM								
	\$1,599	\$1,700	\$1,446	\$1,188	\$955	\$806	\$622	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	74.53%	76.06%	76.39%	71.70%	74.34%	70.69%	69.91%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	25.47%	23.94%	23.61%	28.30%	25.66%	29.31%	30.09%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel C: ONE Gas Inc.
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$1,932	\$1,932	\$1,888	\$1,842	\$1,794	n/a	n/a	[a]
Shares Outstanding (in millions) - Common	52	52	52	52	52	n/a	n/a	[b]
Price per Share - Common	\$70	\$75	\$64	\$49	\$42	n/a	n/a	[c]
Market Value of Common Equity	\$3,644	\$3,901	\$3,324	\$2,577	\$2,188	n/a	n/a	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$3,644	\$3,901	\$3,324	\$2,577	\$2,188	n/a	n/a	[f] = [d]
Market to Book Value of Common Equity	1.89	2.02	1.76	1.40	1.22	n/a	n/a	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	n/a	n/a	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	n/a	n/a	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$446	\$446	\$569	\$483	\$668	n/a	n/a	[j]
Current Liabilities	\$392	\$392	\$444	\$304	\$392	n/a	n/a	[k]
Current Portion of Long-Term Debt	\$0	\$0	\$0	\$0	\$0	n/a	n/a	[l]
Net Working Capital	\$53	\$53	\$125	\$179	\$275	n/a	n/a	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$174	\$174	\$145	\$13	\$42	n/a	n/a	[n]
Adjusted Short-Term Debt	\$0	\$0	\$0	\$0	\$0	n/a	n/a	[o] = See Sources and Notes.
Long-Term Debt	\$1,193	\$1,193	\$1,192	\$1,192	\$1,201	n/a	n/a	[p]
Book Value of Long-Term Debt	\$1,193	\$1,193	\$1,192	\$1,192	\$1,201	n/a	n/a	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$1,200	\$1,200	\$1,200	\$1,300	\$1,200	n/a	n/a	
Carrying Amount	\$1,200	\$1,200	\$1,200	\$1,200	\$1,000	n/a	n/a	
Adjustment to Book Value of Long-Term Debt	\$0	\$0	\$0	\$100	\$200	n/a	n/a	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$1,193	\$1,193	\$1,192	\$1,292	\$1,401	n/a	n/a	[s] = [q] + [r].
Market Value of Debt	\$1,193	\$1,193	\$1,192	\$1,292	\$1,401	n/a	n/a	[t] = [s].
MARKET VALUE OF FIRM								
	\$4,837	\$5,094	\$4,517	\$3,868	\$3,590	n/a	n/a	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	75.34%	76.58%	73.60%	66.61%	60.96%	n/a	n/a	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	n/a	n/a	[w] = [i] / [u].
Debt - Market Value Ratio	24.66%	23.42%	26.40%	33.39%	39.04%	n/a	n/a	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel D: South Jersey Inds.
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$1,221	\$1,221	\$1,289	\$1,038	\$932	\$827	\$736	[a]
Shares Outstanding (in millions) - Common	80	80	79	71	68	65	63	[b]
Price per Share - Common	\$30	\$32	\$34	\$23	\$29	\$28	\$25	[c]
Market Value of Common Equity	\$2,350	\$2,516	\$2,719	\$1,648	\$1,999	\$1,805	\$1,600	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$2,350	\$2,516	\$2,719	\$1,648	\$1,999	\$1,805	\$1,600	[f] = [d]
Market to Book Value of Common Equity	1.92	2.06	2.11	1.59	2.14	2.18	2.17	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$323	\$323	\$473	\$431	\$567	\$483	\$395	[j]
Current Liabilities	\$684	\$684	\$953	\$832	\$850	\$765	\$652	[k]
Current Portion of Long-Term Debt	\$11	\$11	\$232	\$29	\$150	\$21	\$25	[l]
Net Working Capital	(\$350)	(\$350)	(\$247)	(\$372)	(\$134)	(\$261)	(\$232)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$280	\$280	\$296	\$432	\$246	\$354	\$339	[n]
Adjusted Short-Term Debt	\$280	\$280	\$247	\$372	\$134	\$261	\$232	[o] = See Sources and Notes.
Long-Term Debt	\$1,180	\$1,180	\$808	\$997	\$879	\$701	\$601	[p]
Book Value of Long-Term Debt	\$1,471	\$1,471	\$1,287	\$1,399	\$1,163	\$983	\$858	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$1,081	\$1,081	\$1,079	\$1,059	\$713	\$682	\$533	
Carrying Amount	\$1,047	\$1,047	\$1,036	\$1,009	\$701	\$626	\$426	
Adjustment to Book Value of Long-Term Debt	\$33	\$33	\$43	\$49	\$12	\$56	\$107	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$1,505	\$1,505	\$1,331	\$1,448	\$1,174	\$1,039	\$965	[s] = [q] + [r].
Market Value of Debt	\$1,505	\$1,505	\$1,331	\$1,448	\$1,174	\$1,039	\$965	[t] = [s].
MARKET VALUE OF FIRM								
	\$3,855	\$4,021	\$4,049	\$3,096	\$3,173	\$2,844	\$2,565	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	60.97%	62.58%	67.14%	53.23%	62.99%	63.47%	62.37%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	39.03%	37.42%	32.86%	46.77%	37.01%	36.53%	37.63%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel E: Southwest Gas
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$1,716	\$1,716	\$1,663	\$1,594	\$1,489	\$1,415	\$1,310	[a]
Shares Outstanding (in millions) - Common	48	48	47	47	47	46	46	[b]
Price per Share - Common	\$75	\$81	\$76	\$53	\$60	\$54	\$42	[c]
Market Value of Common Equity	\$3,581	\$3,860	\$3,606	\$2,528	\$2,771	\$2,506	\$1,952	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$3,581	\$3,860	\$3,606	\$2,528	\$2,771	\$2,506	\$1,952	[f] = [d]
Market to Book Value of Common Equity	2.09	2.25	2.17	1.59	1.86	1.77	1.49	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$539	\$539	\$533	\$558	\$607	\$495	\$458	[j]
Current Liabilities	\$656	\$656	\$628	\$535	\$470	\$434	\$535	[k]
Current Portion of Long-Term Debt	\$28	\$28	\$50	\$19	\$19	\$11	\$50	[l]
Net Working Capital	(\$89)	(\$89)	(\$45)	\$43	\$156	\$72	(\$27)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$111	\$111	\$0	\$18	\$5	\$0	\$0	[n]
Adjusted Short-Term Debt	\$89	\$89	\$0	\$0	\$0	\$0	\$0	[o] = See Sources and Notes.
Long-Term Debt	\$1,732	\$1,732	\$1,550	\$1,551	\$1,631	\$1,381	\$1,268	[p]
Book Value of Long-Term Debt	\$1,849	\$1,849	\$1,600	\$1,571	\$1,651	\$1,392	\$1,319	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$1,680	\$1,680	\$1,646	\$1,796	\$1,463	\$1,482	\$1,319	
Carrying Amount	\$1,550	\$1,550	\$1,551	\$1,657	\$1,392	\$1,319	\$1,253	
Adjustment to Book Value of Long-Term Debt	\$130	\$130	\$94	\$139	\$71	\$164	\$66	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$1,979	\$1,979	\$1,695	\$1,710	\$1,722	\$1,556	\$1,384	[s] = [q] + [r].
Market Value of Debt	\$1,979	\$1,979	\$1,695	\$1,710	\$1,722	\$1,556	\$1,384	[t] = [s].
MARKET VALUE OF FIRM								
	\$5,560	\$5,839	\$5,300	\$4,238	\$4,492	\$4,062	\$3,336	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	64.40%	66.10%	68.03%	59.65%	61.68%	61.70%	58.50%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	35.60%	33.90%	31.97%	40.35%	38.32%	38.30%	41.50%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel F: Spire Inc.
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$2,079	\$2,079	\$1,797	\$1,600	\$1,534	\$1,066	\$621	[a]
Shares Outstanding (in millions) - Common	48	48	46	43	43	33	23	[b]
Price per Share - Common	\$69	\$76	\$64	\$58	\$52	\$45	\$39	[c]
Market Value of Common Equity	\$3,322	\$3,677	\$2,935	\$2,533	\$2,261	\$1,482	\$877	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$3,322	\$3,677	\$2,935	\$2,533	\$2,261	\$1,482	\$877	[f] = [d]
Market to Book Value of Common Equity	1.60	1.77	1.63	1.58	1.47	1.39	1.41	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$853	\$853	\$816	\$636	\$816	\$571	\$400	[j]
Current Liabilities	\$1,211	\$1,211	\$1,342	\$848	\$1,082	\$478	\$275	[k]
Current Portion of Long-Term Debt	\$106	\$106	\$250	\$0	\$115	\$80	\$25	[l]
Net Working Capital	(\$253)	(\$253)	(\$277)	(\$212)	(\$152)	\$173	\$150	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$584	\$584	\$506	\$377	\$398	\$94	\$83	[n]
Adjusted Short-Term Debt	\$253	\$253	\$277	\$212	\$152	\$0	\$0	[o] = See Sources and Notes.
Long-Term Debt	\$2,030	\$2,030	\$1,821	\$1,852	\$1,736	\$833	\$364	[p]
Book Value of Long-Term Debt	\$2,389	\$2,389	\$2,348	\$2,063	\$2,003	\$913	\$389	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$2,257	\$2,257	\$1,944	\$1,937	\$954	\$453	\$444	
Carrying Amount	\$2,084	\$2,084	\$1,852	\$1,851	\$913	\$364	\$364	
Adjustment to Book Value of Long-Term Debt	\$173	\$173	\$93	\$86	\$41	\$88	\$79	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$2,562	\$2,562	\$2,441	\$2,149	\$2,044	\$1,001	\$469	[s] = [q] + [r].
Market Value of Debt	\$2,562	\$2,562	\$2,441	\$2,149	\$2,044	\$1,001	\$469	[t] = [s].
MARKET VALUE OF FIRM								
	\$5,884	\$6,239	\$5,376	\$4,682	\$4,305	\$2,483	\$1,346	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	56.45%	58.93%	54.60%	54.09%	52.53%	59.68%	65.18%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	43.55%	41.07%	45.40%	45.91%	47.47%	40.32%	34.82%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel G: New Jersey Resources
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$1,237	\$1,237	\$1,185	\$1,144	\$1,104	\$882	\$863	[a]
Shares Outstanding (in millions) - Common	87	87	86	86	85	84	84	[b]
Price per Share - Common	\$39	\$40	\$36	\$31	\$30	\$22	\$20	[c]
Market Value of Common Equity	\$3,401	\$3,499	\$3,119	\$2,663	\$2,554	\$1,892	\$1,678	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$3,401	\$3,499	\$3,119	\$2,663	\$2,554	\$1,892	\$1,678	[f] = [d]
Market to Book Value of Common Equity	2.75	2.83	2.63	2.33	2.31	2.15	1.94	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$579	\$579	\$815	\$589	\$900	\$898	\$771	[j]
Current Liabilities	\$803	\$803	\$823	\$575	\$816	\$1,053	\$797	[k]
Current Portion of Long-Term Debt	\$165	\$165	\$97	\$11	\$35	\$70	\$9	[l]
Net Working Capital	(\$58)	(\$58)	\$89	\$25	\$120	(\$85)	(\$17)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$266	\$266	\$285	\$211	\$254	\$504	\$394	[n]
Adjusted Short-Term Debt	\$58	\$58	\$0	\$0	\$0	\$85	\$17	[o] = See Sources and Notes.
Long-Term Debt	\$997	\$997	\$1,027	\$848	\$703	\$518	\$530	[p]
Book Value of Long-Term Debt	\$1,221	\$1,221	\$1,124	\$859	\$738	\$672	\$555	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$732	\$732	\$584	\$587	\$557	\$530	\$416	
Carrying Amount	\$708	\$708	\$583	\$558	\$530	\$480	\$380	
Adjustment to Book Value of Long-Term Debt	\$24	\$24	\$1	\$29	\$27	\$50	\$37	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$1,244	\$1,244	\$1,125	\$888	\$765	\$722	\$592	[s] = [q] + [r].
Market Value of Debt	\$1,244	\$1,244	\$1,125	\$888	\$765	\$722	\$592	[t] = [s].
MARKET VALUE OF FIRM								
	\$4,645	\$4,743	\$4,244	\$3,551	\$3,319	\$2,615	\$2,270	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	73.21%	73.77%	73.49%	74.99%	76.95%	72.37%	73.91%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	26.79%	26.23%	26.51%	25.01%	23.05%	27.63%	26.09%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel H: Northwest Natural Gas
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$847	\$847	\$850	\$781	\$767	\$752	\$730	[a]
Shares Outstanding (in millions) - Common	29	29	29	27	27	27	27	[b]
Price per Share - Common	\$57	\$62	\$60	\$50	\$49	\$43	\$44	[c]
Market Value of Common Equity	\$1,639	\$1,776	\$1,726	\$1,369	\$1,340	\$1,155	\$1,191	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$1,639	\$1,776	\$1,726	\$1,369	\$1,340	\$1,155	\$1,191	[f] = [d]
Market to Book Value of Common Equity	1.94	2.10	2.03	1.75	1.75	1.54	1.63	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[h]
Market Value of Preferred Equity	\$0	\$0	\$0	\$0	\$0	\$0	\$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$200	\$200	\$288	\$331	\$363	\$330	\$284	[j]
Current Liabilities	\$203	\$203	\$275	\$478	\$469	\$433	\$368	[k]
Current Portion of Long-Term Debt	\$22	\$22	\$40	\$25	\$40	\$60	\$0	[l]
Net Working Capital	\$19	\$19	\$54	(\$122)	(\$67)	(\$42)	(\$85)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$0	\$0	\$53	\$270	\$235	\$188	\$190	[n]
Adjusted Short-Term Debt	\$0	\$0	\$0	\$122	\$67	\$42	\$85	[o] = See Sources and Notes.
Long-Term Debt	\$757	\$757	\$679	\$569	\$622	\$682	\$692	[p]
Book Value of Long-Term Debt	\$779	\$779	\$719	\$716	\$729	\$784	\$776	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$793	\$793	\$667	\$757	\$806	\$835	\$809	
Carrying Amount	\$719	\$719	\$602	\$662	\$742	\$692	\$682	
Adjustment to Book Value of Long-Term Debt	\$74	\$74	\$65	\$95	\$65	\$143	\$127	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$853	\$853	\$785	\$811	\$793	\$927	\$903	[s] = [q] + [r].
Market Value of Debt	\$853	\$853	\$785	\$811	\$793	\$927	\$903	[t] = [s].
MARKET VALUE OF FIRM								
	\$2,492	\$2,630	\$2,511	\$2,181	\$2,133	\$2,082	\$2,095	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	65.76%	67.54%	68.74%	62.79%	62.81%	55.48%	56.87%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	34.24%	32.46%	31.26%	37.21%	37.19%	44.52%	43.13%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.3
Market Value of the Expanded Sample
Panel I: WGL Holdings Inc.
(\$MM)

	DCF Capital Structure	Year End, 2017	Year End, 2016	Year End, 2015	Year End, 2014	Year End, 2013	Year End, 2012	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	\$1,503	\$1,503	\$1,439	\$1,289	\$1,243	\$1,273	\$1,303	[a]
Shares Outstanding (in millions) - Common	51	51	51	50	50	52	52	[b]
Price per Share - Common	\$85	\$86	\$78	\$63	\$54	\$39	\$39	[c]
Market Value of Common Equity	\$4,340	\$4,392	\$3,985	\$3,126	\$2,660	\$2,025	\$2,032	[d] = [b] x [c].
Market Value of GP Equity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[e]
Total Market Value of Equity	\$4,340	\$4,392	\$3,985	\$3,126	\$2,660	\$2,025	\$2,032	[f] = [d]
Market to Book Value of Common Equity	2.89	2.92	2.77	2.43	2.14	1.59	1.56	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	\$28	\$28	\$28	\$28	\$28	\$28	\$28	[h]
Market Value of Preferred Equity	\$28	\$28	\$28	\$28	\$28	\$28	\$28	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	\$986	\$986	\$1,095	\$918	\$1,028	\$1,040	\$1,011	[j]
Current Liabilities	\$1,489	\$1,489	\$1,422	\$1,181	\$1,033	\$1,090	\$970	[k]
Current Portion of Long-Term Debt	\$250	\$250	\$0	\$25	\$20	\$30	\$37	[l]
Net Working Capital	(\$253)	(\$253)	(\$327)	(\$238)	\$15	(\$20)	\$78	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	\$560	\$560	\$634	\$528	\$350	\$443	\$361	[n]
Adjusted Short-Term Debt	\$253	\$253	\$327	\$238	\$0	\$20	\$0	[o] = See Sources and Notes.
Long-Term Debt	\$1,431	\$1,431	\$1,435	\$946	\$976	\$599	\$554	[p]
Book Value of Long-Term Debt	\$1,934	\$1,934	\$1,762	\$1,209	\$996	\$649	\$591	[q] = [l] + [o] + [p].
Unadjusted Market Value of Long Term Debt	\$1,642	\$1,642	\$1,058	\$809	\$630	\$759	\$721	
Carrying Amount	\$1,444	\$1,444	\$944	\$679	\$524	\$589	\$587	
Adjustment to Book Value of Long-Term Debt	\$198	\$198	\$114	\$130	\$106	\$170	\$134	[r] = See Sources and Notes.
Market Value of Long-Term Debt	\$2,132	\$2,132	\$1,876	\$1,339	\$1,102	\$819	\$724	[s] = [q] + [r].
Market Value of Debt	\$2,132	\$2,132	\$1,876	\$1,339	\$1,102	\$819	\$724	[t] = [s].
MARKET VALUE OF FIRM								
	\$6,500	\$6,552	\$5,889	\$4,493	\$3,790	\$2,872	\$2,785	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	66.77%	67.04%	67.67%	69.58%	70.18%	70.50%	72.98%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	0.43%	0.43%	0.48%	0.63%	0.74%	0.98%	1.01%	[w] = [i] / [u].
Debt - Market Value Ratio	32.80%	32.53%	31.85%	29.79%	29.07%	28.51%	26.01%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of January 31, 2018

Capital structure from Year End, 2017 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2017 balance sheet information and a 15-trading day average closing price ending on 1/31/2018.

Prices are reported in Supporting Schedule #1 to Schedule No. R5.6.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2017 10-K.

Schedule No. R5.4

Capital Structure Summary of the Expanded Sample

Company	DCF Capital Structure			5-Year Average Capital Structure		
	Common Equity - Value	Preferred Equity - Value	Debt - Value	Common Equity - Value	Preferred Equity - Value	Debt - Value
	Ratio [1]	Ratio [2]	Ratio [3]	Ratio [4]	Ratio [5]	Ratio [6]
Atmos Energy	68.9%	0.0%	31.1%	63.5%	0.0%	36.5%
Chesapeake Utilities	74.5%	0.0%	25.5%	73.2%	0.0%	26.8%
ONE Gas Inc.	75.3%	0.0%	24.7%	69.7%	0.0%	30.3%
South Jersey Inds.	61.0%	0.0%	39.0%	61.9%	0.0%	38.1%
Southwest Gas	64.4%	0.0%	35.6%	62.7%	0.0%	37.3%
Spire Inc.	56.5%	0.0%	43.5%	56.6%	0.0%	43.4%
New Jersey Resources	73.2%	0.0%	26.8%	74.3%	0.0%	25.7%
Northwest Natural Gas	65.8%	0.0%	34.2%	62.4%	0.0%	37.6%
WGL Holdings Inc.	66.8%	0.4%	32.8%	69.6%	0.7%	29.7%
Full Sample Average	67.4%	0.0%	32.6%	66.0%	0.1%	33.9%
Sub Sample Average	67.6%	0.0%	32.4%	64.7%	0.0%	35.3%

Sources and Notes:

[1], [4]: Supporting Schedule #1 to Schedule No. R5.4.

[2], [5]: Supporting Schedule #2 to Schedule No. R5.4.

[3], [6]: Supporting Schedule #3 to Schedule No. R5.4.

Values in this table may not add up exactly to 100% because of rounding.

Schedule No. R5.5

Estimated Growth Rates of the Expanded Sample

Company	ThomsonOne IBES Estimate		Value Line			Combined Growth Rate
	Long-Term Growth Rate	Number of Estimates	EPS Year 2017 Estimate	EPS Year 2020-2022 Estimate	Annualized Growth Rate	
	[1]	[2]	[3]	[4]	[5]	
Atmos Energy	6.5%	1	\$3.80	\$4.50	4.3%	5.4%
Chesapeake Utilities	n/a	n/a	\$2.65	\$4.20	12.2%	12.2%
ONE Gas Inc.	6.0%	1	\$2.95	\$4.00	7.9%	7.0%
South Jersey Inds.	n/a	n/a	\$1.15	\$2.00	14.8%	14.8%
Southwest Gas	n/a	n/a	\$3.55	\$4.80	7.8%	7.8%
Spire Inc.	4.5%	2	\$3.80	\$4.65	5.2%	4.7%
New Jersey Resources	n/a	n/a	\$1.90	\$2.05	1.9%	1.9%
Northwest Natural Gas	n/a	n/a	\$2.25	\$3.15	8.8%	8.8%
WGL Holdings Inc.	n/a	n/a	\$3.50	\$3.45	-0.4%	-0.4%

Sources and Notes:

[1] - [2]: Updated from ThomsonOne as of Jan 31, 2018.

[3] - [4]: From Valueline Investment Analyzer as of Jan 8, 2018.

[5]: $([4]/[3])^{(1/4)} - 1$, where 4 is the number of years between 2021, the middle year of Value Line's 3-5 year forecast, and our study year 2017.

[6]: Weighted average growth rate.

Schedule No. R5.6

DCF Cost of Equity of the Expanded Sample

Panel A: Simple DCF Method (Quarterly)

Company	Stock Price [1]	Most Recent Dividend [2]	Quarterly Dividend Yield [3]	Combined Long-Term Growth [4]	Quarterly Growth Rate [5]	DCF Cost of Equity [6]
Atmos Energy	\$81.51	\$0.49	0.60%	5.4%	1.3%	7.9%
Chesapeake Utilities	\$72.90	\$0.33	0.46%	12.2%	2.9%	14.2%
ONE Gas Inc.	\$69.72	\$0.42	0.61%	7.0%	1.7%	9.6%
South Jersey Inds.	\$29.55	\$0.28	0.98%	14.8%	3.5%	19.3%
Southwest Gas	\$75.01	\$0.50	0.67%	7.8%	1.9%	10.7%
Spire Inc.	\$68.72	\$0.56	0.83%	4.7%	1.2%	8.2%
New Jersey Resources	\$39.29	\$0.27	0.70%	1.9%	0.5%	4.8%
Northwest Natural Gas	\$57.07	\$0.47	0.85%	8.8%	2.1%	12.4%
WGL Holdings Inc.	\$84.73	\$0.51	0.60%	-0.4%	-0.1%	2.1%

Sources and Notes:

[1]: Supporting Schedule #1 to Schedule No. R5.6.

[2]: Supporting Schedule #2 to Schedule No. R5.6.

[3]: $([2] / [1]) \times (1 + [5])$.

[4]: Schedule No. R5.5, [6].

[5]: $\{(1 + [4])^{(1/4)}\} - 1$.

[6]: $\{([3] + [5] + 1)^4\} - 1$.

Schedule No. R5.6

DCF Cost of Equity of the Expanded Sample

Panel B: Multi-Stage DCF (Using Blue Chip Economic Indicators, October 2017 U.S. GDP Growth Forecast as the Perpetual Rate)

Company	Stock Price [1]	Most Recent Dividend [2]	Combined Long- Term Growth Rate [3]	Growth Rate: Year 6 [4]	Growth Rate: Year 7 [5]	Growth Rate: Year 8 [6]	Growth Rate: Year 9 [7]	Growth Rate: Year 10 [8]	GDP Long- Term Growth Rate [9]	DCF Cost of Equity [10]
Atmos Energy	\$81.51	\$0.49	5.41%	5.21%	5.01%	4.80%	4.60%	4.40%	4.20%	6.9%
Chesapeake Utilities	\$72.90	\$0.33	12.20%	10.87%	9.53%	8.20%	6.87%	5.53%	4.20%	7.3%
ONE Gas Inc.	\$69.72	\$0.42	6.95%	6.50%	6.04%	5.58%	5.12%	4.66%	4.20%	7.2%
South Jersey Inds.	\$29.55	\$0.28	14.84%	13.06%	11.29%	9.52%	7.75%	5.97%	4.20%	11.6%
Southwest Gas	\$75.01	\$0.50	7.83%	7.23%	6.62%	6.02%	5.41%	4.81%	4.20%	7.7%
Spire Inc.	\$68.72	\$0.56	4.71%	4.63%	4.54%	4.46%	4.37%	4.29%	4.20%	7.8%
New Jersey Resources	\$39.29	\$0.27	1.92%	2.30%	2.68%	3.06%	3.44%	3.82%	4.20%	6.7%
Northwest Natural Gas	\$57.07	\$0.47	8.78%	8.01%	7.25%	6.49%	5.73%	4.96%	4.20%	8.8%
WGL Holdings Inc.	\$84.73	\$0.51	-0.36%	0.40%	1.16%	1.92%	2.68%	3.44%	4.20%	6.1%

Sources and Notes:

[1]: Supporting Schedule #1 to Schedule No. R5.6.

[2]: Supporting Schedule #2 to Schedule No. R5.6.

[3]: Schedule No. R5.5, [6].

[4]: $[3] - \{([3] - [9]) / 6\}$.

[5]: $[4] - \{([3] - [9]) / 6\}$.

[6]: $[5] - \{([3] - [9]) / 6\}$.

[7]: $[6] - \{([3] - [9]) / 6\}$.

[8]: $[7] - \{([3] - [9]) / 6\}$.

[9]: Blue Chip Economic Indicators, October 2017 U.S. This number is assumed to be the perpetual growth rate.

[10]: Supporting Schedule #3 to Schedule No. R5.6.

Schedule No. R5.7

Overall After-Tax DCF Cost of Capital of the Expanded Sample

Panel A: Simple DCF Method (Quarterly)

Company	4th Quarter, 2017 Bond Rating [1]	4th Quarter, 2017 Preferred Equity Rating [2]	DCF Cost of Equity [3]	DCF Common Equity to Market Value Ratio [4]	Cost of Preferred Equity [5]	DCF Preferred Equity to Market Value Ratio [6]	DCF Cost of Debt [7]	DCF Debt to Market Value Ratio [8]	VEDO Representative Income Tax Rate [9]	Overall After-Tax Cost of Capital [10]
Atmos Energy	A	-	7.9%	68.9%	-	0.0%	3.9%	31.1%	21.0%	6.4%
Chesapeake Utilities	n/a	-	14.2%	74.5%	-	0.0%	n/a	25.5%	21.0%	n/a
ONE Gas Inc.	A	-	9.6%	75.3%	-	0.0%	3.9%	24.7%	21.0%	8.0%
South Jersey Inds.	BBB	-	19.3%	61.0%	-	0.0%	4.2%	39.0%	21.0%	13.0%
Southwest Gas	BBB	-	10.7%	64.4%	-	0.0%	4.2%	35.6%	21.0%	8.1%
Spire Inc.	A	-	8.2%	56.5%	-	0.0%	3.9%	43.5%	21.0%	6.0%
New Jersey Resources	n/a	-	4.8%	73.2%	-	0.0%	n/a	26.8%	21.0%	n/a
Northwest Natural Gas	A	-	12.4%	65.8%	-	0.0%	3.9%	34.2%	21.0%	9.2%
WGL Holdings Inc.	A	A	2.1%	66.8%	3.9%	0.4%	3.9%	32.8%	21.0%	2.4%
Simple Full Sample Average			10.9%	67.4%	NA	0.0%	4.0%	32.6%	21.0%	8.4%
Simple Sub Sample Average			10.5%	67.6%	NA	0.0%	3.9%	32.4%	21.0%	7.5%

Sources and Notes:

[1]: S&P Credit Ratings from Research Insight.

[2]: Preferred ratings were assumed equal to debt ratings.

[3]: Schedule No. R5.6; Panel A, [6].

[4]: Schedule No. R5.4, [1].

[5]: Supporting Schedule #2 to Schedule No. R5.11, Panel C.

[6]: Schedule No. R5.4, [2].

[7]: Supporting Schedule #2 to Schedule No. R5.11, Panel B.

[8]: Schedule No. R5.4, [3].

[9]: VEDO Effective Corporate Tax Rate.

[10]: $([3] \times [4]) + ([5] \times [6]) + \{[7] \times [8] \times (1 - [9])\}$. A strikethrough indicates the utility was excluded from the full sample average calculation as a result of its cost of equity not exceeding its cost of debt by 100 basis points.

Schedule No. R5.7

Overall After-Tax DCF Cost of Capital of the Expanded Sample

Panel B: Multi-Stage DCF (Using Blue Chip Economic Indicators, October 2017 U.S. GDP Growth Forecast as the Perpetual Rate)

Company	4th Quarter, 2017 Bond Rating [1]	4th Quarter, 2017 Preferred Equity Rating	DCF Cost of Equity [3]	DCF Common Equity to Market Value Ratio [4]	Cost of Preferred Equity [5]	DCF Preferred Equity to Market Value Ratio [6]	DCF Cost of Debt [7]	DCF Debt to Market Value Ratio [8]	VEDO Representative Income Tax Rate [9]	Overall After-Tax Cost of Capital [10]
Atmos Energy	A	-	6.9%	68.9%	-	0.0%	3.9%	31.1%	21.0%	5.7%
Chesapeake Utilities	n/a	-	7.3%	74.5%	-	0.0%	n/a	25.5%	21.0%	n/a
ONE Gas Inc.	A	-	7.2%	75.3%	-	0.0%	3.9%	24.7%	21.0%	6.2%
South Jersey Inds.	BBB	-	11.6%	61.0%	-	0.0%	4.2%	39.0%	21.0%	8.3%
Southwest Gas	BBB	-	7.7%	64.4%	-	0.0%	4.2%	35.6%	21.0%	6.1%
Spire Inc.	A	-	7.8%	56.5%	-	0.0%	3.9%	43.5%	21.0%	5.7%
New Jersey Resources	n/a	-	6.7%	73.2%	-	0.0%	n/a	26.8%	21.0%	n/a
Northwest Natural Gas	A	-	8.8%	65.8%	-	0.0%	3.9%	34.2%	21.0%	6.9%
WGL Holdings Inc.	A	A	6.1%	66.8%	3.9%	0.4%	3.9%	32.8%	21.0%	5.1%
Multi Full Sample Average			7.8%	67.4%	3.9%	0.0%	4.0%	32.6%	21.0%	6.3%
Multi Sub Sample Average			7.6%	67.6%	NA	0.00%	3.9%	32.4%	21.0%	6.1%

Sources and Notes:

[1]: S&P Credit Ratings from Research Insight.

[2]: Preferred ratings were assumed equal to debt ratings.

[3]: Schedule No. R5.6; Panel B, [10].

[4]: Schedule No. R5.4, [1].

[5]: Supporting Schedule #2 to Schedule No. R5.11, Panel C.

[6]: Schedule No. R5.4, [2].

[7]: Supporting Schedule #2 to Schedule No. R5.11, Panel B.

[8]: Schedule No. R5.4, [3].

[9]: VEDO Effective Corporate Tax Rate.

[10]: $([3] \times [4]) + ([5] \times [6]) + \{[7] \times [8] \times (1 - [9])\}$. A strikethrough indicates the utility was excluded from the full sample average calculation as a result of its cost of equity not exceeding its cost of debt by 100 basis points.

Schedule No. R5.8

DCF Cost of Equity at VEDO's Capital Structure

	Overall After -Tax Cost of [1]	VEDO Representative Base Deemed % [2]	Representative Cost of A Rated Utility Debt [3]	VEDO Representative Income Tax Rate [4]	VEDO Representative Base Deemed % [5]	Estimated Return on Equity [6]
Full Sample						
Simple DCF Quarterly	8.4%	48.9%	3.9%	21.0%	51.1%	13.6%
Multi-Stage DCF - Using Long-Term GDP Growth Forecast as the Perpetual Rate	6.3%	48.9%	3.9%	21.0%	51.1%	9.4%
Sub Sample						
Simple DCF Quarterly	7.5%	48.9%	3.9%	21.0%	51.1%	11.8%
Multi-Stage DCF - Using Long-Term GDP Growth Forecast as the Perpetual Rate	6.1%	48.9%	3.9%	21.0%	51.1%	9.1%

Sources and Notes:

[1]: Schedule No. R5.7; Panels A-B, [10].

[2]: VEDO Assumed Capital Structure.

[3]: Based on an A rating. Yield from Bloomberg as of January 31, 2018.

[4]: VEDO Effective Corporate Tax Rate.

[5]: VEDO Assumed Capital Structure.

[6]: $\{[1] - ([2] \times [3] \times (1 - [4]))\} / [5]$.

Schedule No. R5.9

Risk-Free Rates

[1] Consensus 10-Year Forecast		3.40%
U.S. Government Bond Yields		
[2]	20-Year	4.81%
[3]	10-Year	4.27%
[4]	Maturity Premium	0.54%
[5] Consensus 10-Year Forecast Adjusted to 20-year Horizon		3.94%

Sources and Notes:

[1]: Bluechip Consensus Forecast in October 2017.

[2]-[3]: Supporting Schedule # 1 to Schedule No. R5.9. Averages of monthly bond yields from September 1992 through September 2017.

[4]: [2] - [3].

[5]: [1] + [4].

Schedule No. R5.10

Risk Positioning Cost of Equity of the Expanded Sample

Panel A: Scenario 1 - Long-Term Risk Free Rate of 4.14%, Long-Term Market Risk Premium of 6.94%

Company	Long-Term Risk-Free Rate [1]	Value Line Betas [2]	Long-Term Market Risk Premium [3]	ECAPM		
				CAPM Cost of Equity [4]	(0.5%) Cost of Equity [5]	ECAPM (1.5%) Cost of Equity [6]
Atmos Energy	4.14%	0.70	6.94%	9.0%	9.1%	9.4%
Chesapeake Utilities	4.14%	0.70	6.94%	9.0%	9.1%	9.4%
ONE Gas Inc.	4.14%	0.70	6.94%	9.0%	9.1%	9.4%
South Jersey Inds.	4.14%	0.85	6.94%	10.0%	10.1%	10.3%
Southwest Gas	4.14%	0.80	6.94%	9.7%	9.8%	10.0%
Spire Inc.	4.14%	0.70	6.94%	9.0%	9.1%	9.4%
New Jersey Resources	4.14%	0.80	6.94%	9.7%	9.8%	10.0%
Northwest Natural Gas	4.14%	0.70	6.94%	9.0%	9.1%	9.4%
WGL Holdings Inc.	4.14%	0.80	6.94%	9.7%	9.8%	10.0%
Full Sample Average	4.14%	0.75	6.94%	9.3%	9.5%	9.7%
Sub Sample Average	4.14%	0.72	6.94%	9.1%	9.3%	9.5%

Sources and Notes:

[1]: Vilbert Direct Testimony.

[2]: From Valueline Investment Analyzer as of Jan 8, 2018.

[3]: Vilbert Direct Testimony.

[4]: $[1] + ([2] \times [3])$.

[5]: $([1] + 0.5\%) + [2] \times ([3] - 0.5\%)$.

[6]: $([1] + 1.5\%) + [2] \times ([3] - 1.5\%)$.

Schedule No. R5.10

Risk Positioning Cost of Equity of the Expanded Sample

Panel B: Scenario 2 - Long-Term Risk Free Rate of 3.94%, Long-Term Market Risk Premium of 7.94%

Company	Long-Term Risk-Free Rate [1]	Value Line Betas [2]	Long-Term Market Risk Premium [3]	ECAPM		
				CAPM Cost of Equity [4]	(0.5%) Cost of Equity [5]	ECAPM (1.5%) Cost of Equity [6]
Atmos Energy	3.94%	0.70	7.94%	9.5%	9.6%	9.9%
Chesapeake Utilities	3.94%	0.70	7.94%	9.5%	9.6%	9.9%
ONE Gas Inc.	3.94%	0.70	7.94%	9.5%	9.6%	9.9%
South Jersey Inds.	3.94%	0.85	7.94%	10.7%	10.8%	10.9%
Southwest Gas	3.94%	0.80	7.94%	10.3%	10.4%	10.6%
Spire Inc.	3.94%	0.70	7.94%	9.5%	9.6%	9.9%
New Jersey Resources	3.94%	0.80	7.94%	10.3%	10.4%	10.6%
Northwest Natural Gas	3.94%	0.70	7.94%	9.5%	9.6%	9.9%
WGL Holdings Inc.	3.94%	0.80	7.94%	10.3%	10.4%	10.6%
Full Sample Average	3.94%	0.75	7.94%	9.9%	10.0%	10.3%
Sub Sample Average	3.94%	0.72	7.94%	9.6%	9.8%	10.1%

Sources and Notes:

[1]: Vilbert Direct Testimony.

[2]: From Valueline Investment Analyzer as of Jan 8, 2018.

[3]: Vilbert Direct Testimony.

[4]: [1] + ([2] x [3]).

[5]: ([1] + 0.5%) + [2] x ([3] - 0.5%).

[6]: ([1] + 1.5%) + [2] x ([3] - 1.5%).

Schedule No. R5.11

Overall After-Tax Risk Positioning Cost of Capital of the Expanded Sample

Panel A: CAPM Cost of Equity Scenario 1 - Long-Term Risk Free Rate of 4.14%, Long-Term Market Risk Premium of 6.94%

Company	CAPM Cost of Equity [1]	ECAPM (0.5%) Cost of Equity [2]	ECAPM (1.5%) Cost of Equity [3]	5-Year Average Common Equity to Market Value Ratio [4]	Weighted - Average Cost of Preferred Equity [5]	5-Year Average Preferred Equity to Market Value Ratio [6]	Weighted-Average Cost of Debt [7]	5-Year Average Debt to Market Value Ratio [8]	VEDO Representative Income Tax Rate [9]	Overall After-Tax Cost of Capital (CAPM) [10]	Overall After-Tax Cost of Capital (ECAPM 0.5%) [11]	Overall After-Tax Cost of Capital (ECAPM 1.5%) [12]
Atmos Energy	9.0%	9.1%	9.4%	63.5%	-	0.0%	3.9%	36.5%	21.0%	6.9%	6.9%	7.1%
Chesapeake Utilities	9.0%	9.1%	9.4%	73.2%	-	0.0%	-	26.8%	21.0%	n/a	n/a	n/a
ONE Gas Inc.	9.0%	9.1%	9.4%	69.7%	-	0.0%	3.9%	30.3%	21.0%	7.2%	7.3%	7.5%
South Jersey Inds.	10.0%	10.1%	10.3%	61.9%	-	0.0%	4.2%	38.1%	21.0%	7.5%	7.5%	7.6%
Southwest Gas	9.7%	9.8%	10.0%	62.7%	-	0.0%	4.1%	37.3%	21.0%	7.3%	7.3%	7.5%
Spire Inc.	9.0%	9.1%	9.4%	56.6%	-	0.0%	3.9%	43.4%	21.0%	6.4%	6.5%	6.7%
New Jersey Resources	9.7%	9.8%	10.0%	74.3%	-	0.0%	-	25.7%	21.0%	n/a	n/a	n/a
Northwest Natural Gas	9.0%	9.1%	9.4%	62.4%	-	0.0%	3.9%	37.6%	21.0%	6.8%	6.9%	7.1%
WGL Holdings Inc.	9.7%	9.8%	10.0%	69.6%	3.9%	0.7%	3.9%	29.7%	21.0%	7.7%	7.8%	7.9%
Full Sample Average	9.3%	9.5%	9.7%	66.0%	3.9%	0.1%	4.0%	33.9%	21.0%	7.1%	7.2%	7.3%
Sub Sample Average	9.1%	9.3%	9.5%	64.7%	-	0.0%	3.9%	35.3%	21.0%	6.9%	7.0%	7.2%

Sources and Notes:

[1]: Schedule No. R5.10; Panel A, [4].

[2]: Schedule No. R5.10; Panel A, [5].

[3]: Schedule No. R5.10; Panel A, [6].

[4]: Schedule No. R5.4, [4].

[5]: Supporting Schedule #2 to Schedule No. R5.11, Panel C.

[6]: Schedule No. R5.4, [5].

[7]: Supporting Schedule #2 to Schedule No. R5.11, Panel B.

[8]: Schedule No. R5.4, [6].

[9]: VEDO Effective Corporate Tax Rate.

[10]: $(([1] \times [4]) + ([5] \times [6]) + ([7] \times [8] \times (1 - [9])))$.

[11]: $(([2] \times [4]) + ([5] \times [6]) + ([7] \times [8] \times (1 - [9])))$.

[12]: $(([3] \times [4]) + ([5] \times [6]) + ([7] \times [8] \times (1 - [9])))$.

[10] - [12]: Companies without a debt rating from S&P Research Insight are excluded as they do not have a cost of debt estimate.

Schedule No. R5.11

Overall After-Tax Risk Positioning Cost of Capital of the Expanded Sample

Panel B: CAPM Cost of Equity Scenario 2 - Long-Term Risk Free Rate of 3.94%, Long-Term Market Risk Premium of 7.94%

Company	CAPM Cost of Equity [1]	ECAPM (0.5%) Cost of Equity [2]	ECAPM (1.5%) Cost of Equity [3]	5-Year Average Common Equity to Market Value Ratio [4]	Weighted - Average Cost of Preferred Equity [5]	5-Year Average Preferred Equity to Market Value Ratio [6]	Weighted-Average Cost of Debt [7]	5-Year Average Debt to Market Value Ratio [8]	VEDO Representative Income Tax Rate [9]	Overall After-Tax Cost of Capital (CAPM) [10]	Overall After-Tax Cost of Capital (ECAPM 0.5%) [11]	Overall After-Tax Cost of Capital (ECAPM 1.5%) [12]
Atmos Energy	9.5%	9.6%	9.9%	63.5%	-	0.0%	3.9%	36.5%	21.0%	7.2%	7.3%	7.5%
Chesapeake Utilities	9.5%	9.6%	9.9%	73.2%	-	0.0%	-	26.8%	21.0%	n/a	n/a	n/a
ONE Gas Inc.	9.5%	9.6%	9.9%	69.7%	-	0.0%	3.9%	30.3%	21.0%	7.5%	7.7%	7.9%
South Jersey Inds.	10.7%	10.8%	10.9%	61.9%	-	0.0%	4.2%	38.1%	21.0%	7.9%	7.9%	8.0%
Southwest Gas	10.3%	10.4%	10.6%	62.7%	-	0.0%	4.1%	37.3%	21.0%	7.6%	7.7%	7.8%
Spire Inc.	9.5%	9.6%	9.9%	56.6%	-	0.0%	3.9%	43.4%	21.0%	6.7%	6.8%	7.0%
New Jersey Resources	10.3%	10.4%	10.6%	74.3%	-	0.0%	-	25.7%	21.0%	n/a	n/a	n/a
Northwest Natural Gas	9.5%	9.6%	9.9%	62.4%	-	0.0%	3.9%	37.6%	21.0%	7.1%	7.2%	7.4%
WGL Holdings Inc.	10.3%	10.4%	10.6%	69.6%	3.9%	0.7%	3.9%	29.7%	21.0%	8.1%	8.2%	8.3%
Full Sample Average	9.9%	10.0%	10.3%	66.0%	3.9%	0.1%	4.0%	33.9%	21.0%	7.4%	7.5%	7.7%
Sub Sample Average	9.6%	9.8%	10.1%	64.7%	-	0.0%	3.9%	35.3%	21.0%	7.2%	7.3%	7.5%

Sources and Notes:

[1]: Schedule No. R5.10; Panel B, [4].

[2]: Schedule No. R5.10; Panel B, [5].

[3]: Schedule No. R5.10; Panel B, [6].

[4]: Schedule No. R5.4, [4].

[5]: Supporting Schedule #2 to Schedule No. R5.11, Panel C.

[6]: Schedule No. R5.4, [5].

[7]: Supporting Schedule #2 to Schedule No. R5.11, Panel B.

[8]: Schedule No. R5.4, [6].

[9]: VEDO Effective Corporate Tax Rate.

[10]: $((1) \times [4]) + ((5) \times [6]) + \{[7] \times [8] \times (1 - [9])\}$.

[11]: $((2) \times [4]) + ((5) \times [6]) + \{[7] \times [8] \times (1 - [9])\}$.

[12]: $((3) \times [4]) + ((5) \times [6]) + \{[7] \times [8] \times (1 - [9])\}$.

[10] - [12]: Companies without a debt rating from S&P Research Insight are excluded as they do not have a cost of debt estimate.

Schedule No. R5.12

Risk Positioning Cost of Equity at VEDO's Capital Structure

	Overall After- Tax Cost of Capital (Scenario 1) [1]	Overall After- Tax Cost of Capital (Scenario 2) [2]	VEDO Representative Base Deemed % Debt [3]	Representative Cost of A-Rated Utility Debt [4]	VEDO Representative Income Tax Rate [5]	VEDO Representative Base Deemed % Equity [6]	Estimated Return on Equity (Scenario 1) [7]	Estimated Return on Equity (Scenario 2) [8]
Full Sample:								
CAPM	7.1%	7.4%	48.9%	3.9%	21.0%	51.1%	11.0%	11.6%
ECAPM (0.5%)	7.2%	7.5%	48.9%	3.9%	21.0%	51.1%	11.1%	11.8%
ECAPM (1.50%)	7.3%	7.7%	48.9%	3.9%	21.0%	51.1%	11.4%	12.1%
Sub Sample:								
CAPM	6.9%	7.2%	48.9%	3.9%	21.0%	51.1%	10.6%	11.2%
ECAPM (0.5%)	7.0%	7.3%	48.9%	3.9%	21.0%	51.1%	10.7%	11.4%
ECAPM (1.50%)	7.2%	7.5%	48.9%	3.9%	21.0%	51.1%	11.1%	11.7%

Sources and Notes:

- [1]: Schedule No. R5.11; Panel A, [10] - [12].
[2]: Schedule No. R5.11; Panel B, [10] - [12].
[3]: VEDO Assumed Capital Structure.
[4]: Based on a A rating. Yield from Bloomberg as of January 31, 2018.
[5]: VEDO Effective Corporate Tax Rate.
[6]: VEDO Assumed Capital Structure.
[7]: $\{[1] - ([3] \times [4] \times (1 - [5]))\} / [6]$.
[8]: $\{[2] - ([3] \times [4] \times (1 - [5]))\} / [6]$.
- Scenario 1: Long-Term Risk Free Rate of 4.14%, Long-Term Market Risk Premium of 6.94%.
Scenario 2: Long-Term Risk Free Rate of 3.94%, Long-Term Market Risk Premium of 7.94%.

Schedule No. R5.13

Hamada Adjustment to Obtain Unlevered Asset Beta

Company	Value Line Betas [1]	Debt Beta [2]	5-Year Average Common Equity to Market Value Ratio [3]	5-Year Average Preferred Equity to Market Value Ratio [4]	5-Year Average Debt to Market Value Ratio [5]	VEDO Representative Income Tax Rate [6]	Asset Beta: Without Taxes [7]	Asset Beta: With Taxes [8]
Atmos Energy	0.70	0.06	63.5%	0.0%	36.5%	21.0%	0.47	0.50
Chesapeake Utilities	0.70	n/a	73.2%	0.0%	26.8%	21.0%	n/a	n/a
ONE Gas Inc.	0.70	0.05	69.7%	0.0%	30.3%	21.0%	0.50	0.53
South Jersey Inds.	0.85	0.10	61.9%	0.0%	38.1%	21.0%	0.56	0.60
Southwest Gas	0.80	0.08	62.7%	0.0%	37.3%	21.0%	0.53	0.57
Spire Inc.	0.70	0.05	56.6%	0.0%	43.4%	21.0%	0.42	0.45
New Jersey Resources	0.80	n/a	74.3%	0.0%	25.7%	21.0%	n/a	n/a
Northwest Natural Gas	0.70	0.05	62.4%	0.0%	37.6%	21.0%	0.46	0.49
WGL Holdings Inc.	0.80	0.05	69.6%	0.7%	29.7%	21.0%	0.57	0.61
Full Sample Average	0.75	0.06	66.0%	0.00	33.9%	21.0%	0.50	0.54
Sub Sample Average	0.72	0.06	64.7%	0.00	35.3%	21.0%	0.47	0.51

Sources and Notes:

[1]: Supporting Schedule # 1 to Schedule No. R5.10, [1].

[2]: Supporting Schedule #1 to Schedule No. R5.13, [7].

[3]: Schedule No. R5.4, [4].

[4]: Schedule No. R5.4, [5].

[5]: Schedule No. R5.4, [6].

[6]: VEDO Effective Corporate Tax Rate.

[7]: $[1] \times [3] + [2] \times ([4] + [5])$.

[8]: $\{[1] \times [3] + [2] \times ([4] + [5] \times (1 - [6]))\} / \{[3] + [4] + [5] \times (1 - [6])\}$.

Schedule No. R5.14

Expanded Sample Average Asset Beta Relevered at VEDO's Capital Structure

	Asset Beta [1]	Assumed Debt Beta [2]	VEDO Representative Base Deemed % Debt [3]	VEDO Representative Income Tax Rate [4]	VEDO Representative Base Deemed % Equity [5]	Estimated Equity Beta [6]
Full Sample:						
Asset Beta Without Taxes	0.50	0.05	48.9%	21.0%	51.1%	0.93
Asset Beta With Taxes	0.54	0.05	48.9%	21.0%	51.1%	0.91
Sub Sample:						
Asset Beta Without Taxes	0.47	0.05	48.9%	21.0%	51.1%	0.88
Asset Beta With Taxes	0.51	0.05	48.9%	21.0%	51.1%	0.86

Sources and Notes:

[1]: Schedule No. R5.13, [7] - [8].

[2]: Debt Beta estimate for A-rated entities. Corporate Finance, Berk and Demarzo, Second Edition, p. 389.

[3]: VEDO Assumed Capital Structure.

[4]: VEDO Effective Corporate Tax Rate.

[5]: VEDO Assumed Capital Structure.

[6]: $[1] + [3]/[5] * ([1] - [2])$ without taxes, $[1] + [3] * (1 - [4])/[5] * ([1] - [2])$ with taxes.

Schedule No. R5.15

Risk-Positioning Cost of Equity using Hamada-Adjusted Betas

Panel A: Scenario 1 - Long-Term Risk Free Rate of 4.14%, Long-Term Market Risk Premium of 6.94%

Company	Long-Term Risk-Free Rate [1]	Hamada Adjusted Equity Betas [2]	Long-Term Market Risk [3]	CAPM Cost of Equity [4]	ECAPM (0.5%) Cost of Equity [5]	ECAPM (1.5%) Cost of Equity [6]
Full Sample:						
Asset Beta Without Taxes	4.14%	0.93	6.94%	10.6%	10.7%	10.7%
Asset Beta With Taxes	4.14%	0.91	6.94%	10.4%	10.5%	10.6%
Sub Sample:						
Asset Beta Without Taxes	4.14%	0.88	6.94%	10.3%	10.3%	10.4%
Asset Beta With Taxes	4.14%	0.86	6.94%	10.1%	10.2%	10.3%

Sources and Notes:

[1]: Vilbert Direct Testimony.

[2]: Schedule No. R5.14, [6].

[3]: Vilbert Direct Testimony.

[4]: $[1] + ([2] \times [3])$.

[5]: $([1] + 0.5\%) + [2] \times ([3] - 0.5\%)$.

[6]: $([1] + 1.5\%) + [2] \times ([3] - 1.5\%)$.

Schedule No. R5.15

Risk-Positioning Cost of Equity using Hamada-Adjusted Betas

Panel B: Scenario 2 - Long-Term Risk Free Rate of 3.94%, Long-Term Market Risk Premium of 7.94%

Company	Long-Term Risk-Free Rate [1]	Hamada Adjusted Equity Betas [2]	Long-Term Market Risk [3]	CAPM Cost of Equity [4]	ECAPM (0.5%) Cost of Equity [5]	ECAPM (1.5%) Cost of Equity [6]
Full Sample:						
Asset Beta Without Taxes	3.94%	0.93	7.94%	11.4%	11.4%	11.5%
Asset Beta With Taxes	3.94%	0.91	7.94%	11.1%	11.2%	11.3%
Sub Sample:						
Asset Beta Without Taxes	3.94%	0.88	7.94%	10.9%	11.0%	11.1%
Asset Beta With Taxes	3.94%	0.86	7.94%	10.8%	10.8%	11.0%

Sources and Notes:

[1]: Vilbert Direct Testimony.

[2]: Schedule No. R5.14, [6].

[3]: Vilbert Direct Testimony.

[4]: $[1] + ([2] \times [3])$.

[5]: $([1] + 0.5\%) + [2] \times ([3] - 0.5\%)$.

[6]: $([1] + 1.5\%) + [2] \times ([3] - 1.5\%)$.

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in

Case No(s). 18-0049-GA-ALT, 18-0298-GA-AIR, 18-0299-GA-ALT

Summary: Exhibit 5.1 - Supplemental Direct Testimony of Michael J. Vilbert electronically filed by Ms. Rebekah J. Glover on behalf of Vectren Energy Delivery of Ohio, Inc.