DEPARTMENT OF REVENUE

Date: May 13, 2019
From: Jon Klockziem, Director – Property Tax Division
Subject: Final Capitalization Rate Study

The Property Tax Division of the Minnesota Department of Revenue is responsible for the assessment of utility, pipeline, and railroad operating property. We complete a Capitalization Rate Study each year. We use the capitalization rates published in the study to help determine the unitary value of State Assessed Property.

We posted the 2019 Draft Capitalization Rate Study on April 3, 2019 and welcomed comments until April 19, 2019. We appreciated the thoughtful comments we received.

Who can I contact with questions?

If you have questions about this final study, contact Holly Soderbeck in our State Assessed Property Section at 651-556-6119 or sa.property@state.mn.us.

Jon Klockziem, Director
Property Tax Division

2019 Capitalization Rate Study

Assessment Year 2019

Property Tax Division
Minnesota Department of Revenue
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Introduction

The Minnesota Department of Revenue assesses utility, pipeline, and railroad operating property, under state law. The department completes this study to help determine unitary valuations for these market segments in Minnesota, known as State Assessed Property.

We initially provided this study as a draft version, with a comment period for the public. A summary of the comments we received and our responses are provided in the last section, Public Comments on Draft Study (page 37).

After reviewing the comments, we adjusted the capital structure for the Class I Railroad market segment (page 44 and E-2). We also adjusted the cost of debt for the gas distribution market segment due to a clerical error (page B4).

This study derives a yield capitalization rate (yield rate), a direct capitalization rate (direct rate), an implied growth rate, a short-term growth rate, a long-term growth rate, and an implied inflation rate for each market segment. The market segments are electric, gas distribution, gas transmission pipeline, fluid transportation pipeline, class I railroads, and other railroads.

The department's Property Tax Division assesses State Assessed Property, in part, with the income capitalization approach to valuation. This approach measures the present value of the anticipated future benefits of property ownership. There are two methods of income capitalization: direct and yield capitalization.[1]

- **Yield capitalization** calculates the net present value of the anticipated future income by discounting cash flows using the yield rate.
- **Direct capitalization** converts an estimate of a single year's net operating income expectancy into an indication of value for the subject property using the direct rate. This conversion is based on the market-observed relationship between an income level and market value.

Under the income approach, yield rates are used in yield capitalization models and direct rates are used in direct capitalization models.

The band of investment method is used for both the yield and direct rates. This method considers equity and debt financing and is a combination of the weighted rates for each, as shown in the table below.

	Capital Structure	×	Market Rate	=	Weighted Rate
Debt	50%	×	6%	=	3%
Equity	50%	×	10%	=	5%
Combined Rate				=	**8%**

[1] Appraisal Institute (2013). The Appraisal of Real Estate, 14th Edition, Page 46

The table below summarizes the rates derived from this study.

Market Segments	Yield Rate	Direct Rate	Implied Growth Rate [2]	Short-Term Growth Rate [3]	Long-Term Growth Rate [4]	Implied Inflation Rate [5]
Electric	7.20%	4.73%	2.47%	6.25%	1.90%	2.00%
Gas Distribution	7.37%	4.38%	2.99%	9.50%	1.90%	2.00%
Gas Transmission Pipeline	12.14%	5.20%	6.94%	12.33%	1.90%	2.00%
Fluid Transportation Pipeline	12.45%	7.71%	4.74%	12.78%	1.90%	2.00%
Class I Railroads	10.73%	5.50%	5.23%	11.50%	1.90%	2.00%
Other Railroads	10.77%	5.33%	5.44%	6.00%	1.90%	2.00%

The table below compares the yield rates for each market segment over the past three assessment years.

Market Segments Yield Rates	2019 AY	2018 AY	2017 AY
Electric	7.20%	6.92%	7.13%
Gas Distribution	7.37%	7.01%	6.81%
Gas Transmission Pipeline	12.14%	8.77%	8.96%
Fluid Transportation Pipeline	12.45%	9.50%	10.08%
Class I Railroads	10.73%	9.30%	9.16%
Other Railroads	10.77%	9.73%	9.78%

[2] This is the difference between the yield rate and the direct rate for each market segment.

[3] See the short-term growth rate section in this narrative.

[4] This is the estimated long-term nominal growth rate of the United States Economy, explained in further detail in the Growth section of this narrative.

[5] See the Inflation Section in this narrative.

Yield Capitalization Rate (Yield Rate)

The yield capitalization model is based on the premise that the value of a property is equivalent to the present value of all future benefits.[6] Yield capitalization calculates the present value of the anticipated future income by discounting cash flows using the yield rate (Y_0).

The present value of future benefits as of the assessment date is what the current owner would give up by selling the property and what the new owner would receive by purchasing the property.

Discounted Cash Flows is the most sophisticated form of yield capitalization and is used when explicit forecasts of anticipated net cash flows (NCF) are available and when the rate of change in the cash flows is not constant.

Net cash flows are equal to net operating income plus non-cash expenses minus capital expenditures minus change in working capital. Net operating income is an after-tax accounting income prior to any deductions for interest or dividends.

Key – Variables in Equations

Y_0	Yield Rate for Current Assessment Period
NCF	Net Cash Flows
NCF_1	Net Cash Flows for Next Period
n	nth Period
g	Expected long-term growth rate in net cash flows
NOI	Net Operating Income

$$\text{Value} = NCF_1 / (1+Y_0)^1 + NCF_2 / (1+Y_0)^2 + NCF_3 / (1+Y_0)^3 + \ldots + NCF_n / (1+Y_0)^n$$

Because explicit forecasts of anticipated cash flows are generally not made into perpetuity, after the period of explicit forecasts, the assumption is made that the growth rate in anticipated cash flows will be stable. A long-term growth rate is applied to the cash flows into perpetuity, after the period of anticipated cash flows. This step is called the reversion.

The formula below shows three periods of explicit forecasts of anticipated cash flows followed by the reversion.

$$\text{Value} = NCF_1 / (1+Y_0)^1 + NCF_2 / (1+Y_0)^2 + NCF_3 / (1+Y_0)^3 + ((NCF_3 * (1+g)/ (Y_0\text{-}g)) / (1+Y_0)^3)$$

Stable Growth Yield Capitalization is used when explicit forecasts of anticipated net cash flows are not available or when the anticipated growth in net cash flows is stable. This model is a simplified, but mathematically identical, model to the Discounted Cash Flows model when the anticipated growth rate (g) is constant.

$$\text{Value} = NCF_1 / (Y_0 - g)^1$$

A version of this model that assumes that the constant growth rate is 0%, which means that the income with remain the same over time, is called a Zero Percent Stable Growth Yield Capitalization Model.

$$\text{Value} = NCF_1 / (Y_0 - 0\%)^1$$

[6] Western States Association of Tax Administrators, (2009). Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, Page III-13

If the further assumption is made that net cash flows will be equal to the net operating income (NOI) – which means that depreciation will be equal to capital expenditures over time – the formula becomes:

$$\text{Value} = NOI_1 / (Y_0 - 0\%)^1$$

This model assumes 0% growth into perpetuity.

Guideline Companies

When selecting guideline companies, the department reviews the Standard Industrial Classification Code and market segments listed by Value Line Investment Survey. We use the Value Line survey because it is a well-respected, widely used publication.

Value Line classifies companies into 100 unique industries and groupings based on their operations, products, customers, and competitors. Value Line constantly evaluates every company tracked in the survey to make sure they are located in the proper sector.[7]

The department reviewed companies in the following Value Line industries as possible guideline companies in our market segments:

Value Line's Industry	Department's Market Segment
Electric Utility (Central, East, and West)	Electric
Natural Gas Utility	Gas Distribution
Pipeline MLPs, Natural Gas Diversified, Oil/Gas Distribution	Fluid Transportation Pipeline or Gas Transmission Pipeline
Railroad	Class I Railroad or Other Railroad

The department reviewed possible guideline companies for comparability in their market segments to the companies doing business in Minnesota. We generally exclude companies that underwent a merger or acquisition in the previous calendar year, or companies that have announced an upcoming merger or acquisition during the current year.

Guideline Company Updates

The department updates the list of guideline companies for this study each year, depending on mergers and acquisitions, market activities, and other factors. This year's changes are summarized below. For details on the companies reviewed for each segment, see Guideline Company Selection (page H-1).

Electric Market Segment

The department removed CenterPoint Energy Inc. and Vectren Corp. as guideline companies. These companies completed a merger on February 1, 2019.

Gas Distribution Market Segment

7 Severo Nieves, (9 March 2016). Value Line Institutional Services, Institutional Sales & Marketing, Analyst, email

The department:

- Removed RGC Resources Inc. as a guideline company because there are not enough analysts' forecasts available.
- Added ONE Gas Inc. as a guideline company.

Gas Transmission Pipeline Market Segment

The department changed from using partnerships to corporations as guideline companies for the Gas Transmission Pipeline market segment, given the recent transitions in this market segment. [8] We:

- Removed Enterprise Products Partners L.P. and TC PipeLines L.P. as guideline companies because the department is going to use corporations as guideline companies.
- Removed Boardwalk Pipeline Partners L.P. and Williams Partners L.P. because the companies are no longer publicly traded.
- Added ONEOK Inc., TransCanada Corp., and The Williams Companies for a total of four guideline companies for this market segment.[9]

Note: Though Williams Companies Inc. and Williams Partners L.P. merged in August 2018, the department still used Williams Companies Inc. as a guideline company for the Gas Transmission Pipeline market segment and considered the merger when selecting the rates for this market segment.

Fluid Transportation Pipeline Market Segment

The department:

- Removed Enbridge Energy Partners LP because it is no longer publicly traded.
- Removed NuStar Energy LP because it was recently involved in a reorganization or merger with a related company that completed on July 20, 2018.
- Added Phillips 66 Partners LP as a guideline company.

Class I Railroad and Other Railroad Market Segments

The department did not make any changes to the guideline companies in the Class I Railroads and Other Railroads market segments.

Market Rate of Equity

The department used the Capital Asset Pricing Model (CAPM) and Dividend Growth Model (DGM) to determine the market rate of equity for each market segment. We also considered the Build-Up Model.

[8] For the 2018 assessment year, the department used five guideline companies for the Gas Transmission Pipeline market segment. Four of those companies are limited partnerships. However, two of them have reorganized into their parent corporation and are no longer publicly traded, which left only two partnerships we could have used for this market segment.

[9] The department has received comments in the past related to not including a wider range of guideline companies in the Gas Transmission Pipeline market segment. However, the department does not believe we should select a wider range to provide more guideline companies in this or other market segments. The purer the guideline company selection, the better indication for that market segment.

The market rate of equity for each market segment was selected after considering seven different CAPMs, seven different Empirical Capital Asset Pricing Models (ECAPMs), and three different DGMs. The models allowed the department to establish a range of acceptability.

In the past, regulated companies have asked the department to consider the allowed return on equity set by regulators. We note that – while regulators establish a maximum allowed rate of return for a specific company – the department estimates the cost of equity for each market segment.

Capital Asset Pricing Model (CAPM)

The CAPM is based on the theory that all investors will independently optimize their portfolios. The expected return on an asset is related to its risk. The department uses this model to determine the market rate of equity. For the risk-free rate in the CAPM, we use the U.S. Treasury 30-year coupon bond yield. We also use a market-specific beta that is calculated with data from the Value Line Investment Survey.

The CAPM is based on the following assumptions, according to Shannon Pratt and Roger Grabowski [10]:

1. Investors are risk averse.
2. Rational investors seek to hold efficient portfolios (portfolios that are fully diversified).
3. All investors have identical investment time horizons (expected holding periods).
4. All investors have identical expectations about such variables as expected rates of return and how discount rates are generated.
5. There are no transaction costs.
6. There are no investment-related taxes. However, there may be corporate income taxes.
7. The rate received from lending money is the same as the cost of borrowing money.
8. The market has perfect divisibility and liquidity (investors can readily buy or sell any desired fractional interest).

Risk-Free Rate

The risk-free rate reflects the actual market conditions as of the property assessment date of January 2, 2019. The department used a risk-free rate of 2.97% for this study.[11] This rate includes inflation expectations.[12]

"Low interest rates are not a short-term aberration, but part of a long-term trend," Ben Bernanke noted during his term as Federal Reserve chair. The Fed, he added, is keeping the interest rates low, only in a

[10] Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Page 113
[11] The daily observations rate for 30-year U.S. Treasury coupon bonds was 2.97% as of January 2, 2019.

[12] Preparing for AICPA's Valuation Principles Examination Review (2016). Page 4-6.

very narrow sense: “The [Federal Reserve’s] ability to affect real rates of return, especially longer-term real rates, is transitory and limited.”[13]

While serving as vice chair of the Federal Reserve, Stanley Fischer said, “The actual federal funds rate has to be so low for the Fed to meet its objectives suggests that the equilibrium interest rate –that is, the federal funds rate that will prevail in the longer run, once cyclical and other transitory factors have played out—has fallen.” In addition, Fischer added, “…changes in factors over which the Federal Reserve has little influence—such as technological innovation and demographics—are important factors contributing to both short- and long-term interest rates being so low at present.” [14]

Corporate finance and equity valuation expert Dr. Aswath Damodaran also addressed this topic: “There is only one rate that the Federal Reserve sets, and it is the Fed Funds rate. It is the rate at which banks trade funds, that they hold at the Federal Reserve, with each other. … [I]interest rates in the U.S. (and Europe) have been low because inflation has been non-existent and real growth has been anemic.”[15]

Damodaran, the author of several finance textbooks, also notes: “In the long term, the real riskless rate will converge on the real growth rate of the economy and the nominal riskless rate will approach the nominal growth rate of the economy.… A simple rule of thumb on the stable growth rate is that it should not exceed the riskless rate used in the valuation”[16].

Some company representatives have suggested that the risk-free rate used in the capital asset pricing model is arbitrarily low due to actions of the Federal Reserve, and that the department should normalize to a higher risk-free rate. According to the Federal Reserve website, “the Federal Reserve controls three tools of monetary policy – open market operations, the discount rate, and reserve requirements.”[17] Using the three tools, the Federal Reserve influences the demand for, and supply of, balances that depository institutions hold at Federal Reserve Banks and in this way alters the federal funds rate.[18]

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[13] Bernanke, Ben. (30 March 2015). “Why are interest rates so low?” Retrieved from http://www.brookings.edu/blogs/ben-bernanke/posts/2015/03/30-why-interest-rates-so-low.

[14] Fischer, Stanley (17 October 2016). *Why Are Interest Rates So Low? Causes and Implications*. Live Speech at Economics Club of New York, New York. Retrieved from https://www.wsj.com/livecoverage/federal-reserve-september-2017

[15] Damodaran, A. (4 September 2015). “The Fed, interest rates, and stock prices: fighting the fear factor.” Retrieved from http://aswathdamodaran.blogspot.com/2015/09/the-fed-interest-rates-and-stock-prices.html.

[16] Damodaran, A. Chapter 2, Intrinsic Valuation, Page 32, Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/DSV2/Ch2.pdf

[17] Board of Governors of the Federal Reserve System. March 20, 2019. Federal Open Market Committee. Retrieved March 21, 2019 from https://www.federalreserve.gov/monetarypolicy/fomc.htm

[18] Board of Governors of the Federal Reserve System. January 30, 2019. Federal Open Market Committee. Retrieved January 31, 2019 from https://www.federalreserve.gov/monetarypolicy/fomc.htm

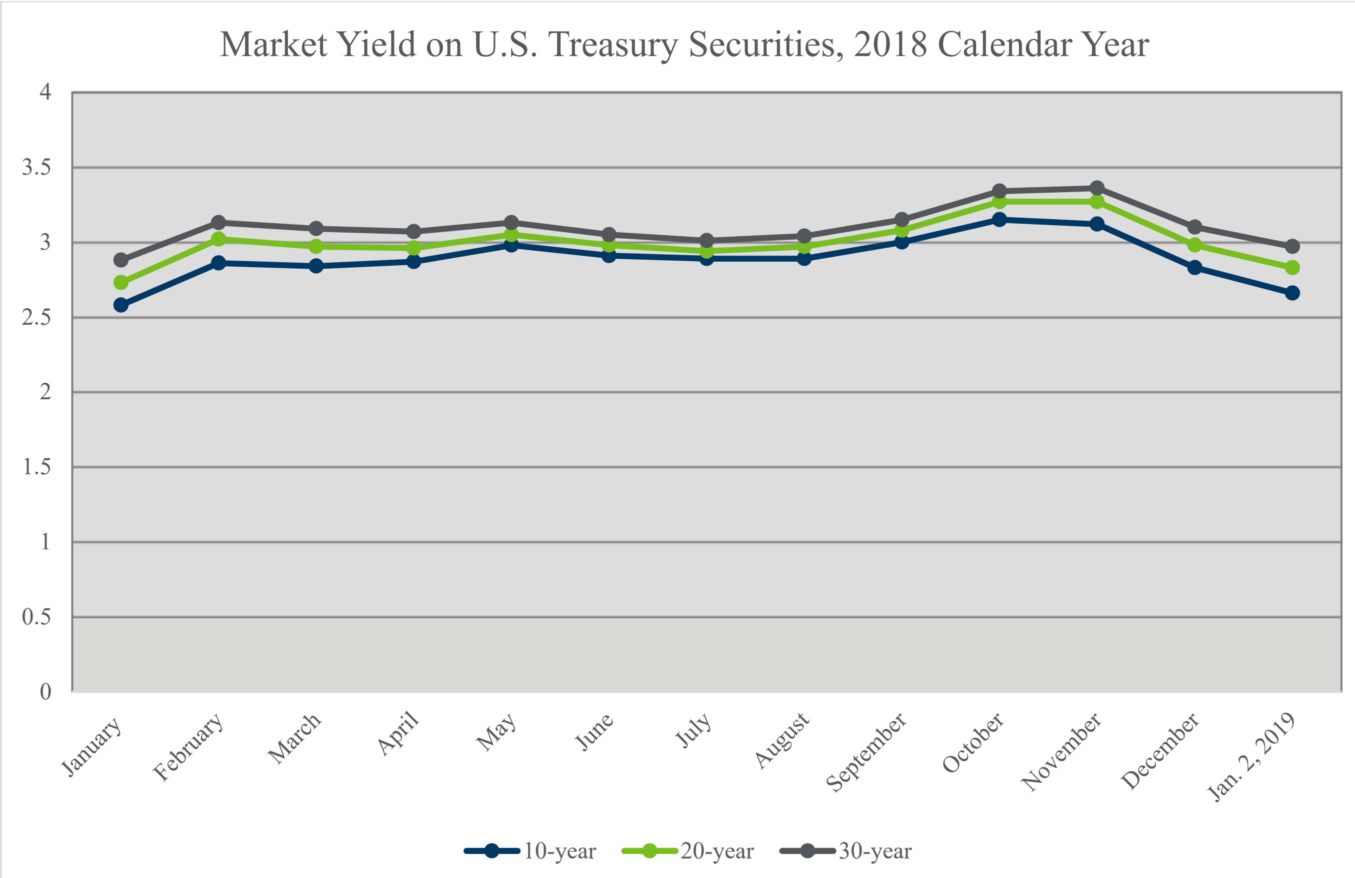
According to Thornton's (2014), "the Fed's ability to control interest rates is exaggerated for the simple reason that historically the effect of policy actions on the total supply of credit has been too small to have a significant effect on the level of the structure of interest rates" (p. 211).[19] According to French (2013), "the evidence says that Fed actions with respect to its target rate TF have little effect on long-term interest rates, and there is substantial uncertainty about the extent of Fed control of short-term rates" (pp. 19-20).[20] The department will continue to use the actual yield on U.S Treasury Securities rather than a "normalized' rate[21].

Some company representatives have suggested using the risk-free rate listed by Damodaran in his data set to match the use of the implied risk premium calculated by Damodaran. The 2018 risk-free rate listed in the data set is 2.68%, which is the U.S. Treasury Bond Yield on 10-year securities, not a forward-looking estimate. The department uses the yield on 30-year U.S. Treasury Bonds as of January 2, 2019, to match the length of time used in the Yield to Maturities calculation for the cost of debt.

[19] Thorton, D. (2014). Monetary policy: Why money matters (and interest rates don't). *Journal of Macroeconomics.* Volume 40. Pages 202-213. Retrieved January 31, 2019 from http://dx.doi.org/10.1016/j.jmacro.2013.12.005

[20] Fama, Eugene F., Does the Fed Control Interest Rates? (June 29, 2013). The Review of Asset Pricing Studies, Forthcoming; Chicago Booth Research Paper No. 12-23; Fama-Miller Working Paper. Retrieved January 31, 2019 from: https://ssrn.com/abstract=2124039

[21] Except for the normalized rate required to be used in conjunction with the Duff & Phelps equity risk premium.



Beta

The beta selected for each market segment indicates the segment's systematic risk relative to the market. The department used the Hamada formula to analyze the effects of un-levering and re-levering guideline companies' betas for the selected capital structure for each market segment, with one exception.[22]

First, we unlevered the beta for each guideline company using the company-specific components:

Unlevered beta = Levered beta / [1 + (1 – Tax Rate) x (Debt / Equity)].

Next, we re-levered the beta for each guideline company using the average tax rate and the selected capital structure for the market segment:

[22] Guideline companies in the Fluid Transportation Pipeline market segment are limited partnerships and the income tax liability is "passed-through" to the shareholders. Therefore, the Hamada formula, which includes a component for income taxes is not applicable.

Re-levered beta = Unlevered Beta x [1 + (1 – Tax Rate) x (Debt / Equity)].[23]

See each market segment's Beta Analysis page in the appendices for more information on how the department arrived at the indicated beta.

Equity Risk Premium

The equity risk premium, as defined by Pratt and Grabowski, is the extra return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks.[24] Bradford Cornell has a similar definition for the equity risk premium, noting it is the difference between the return on common stock and the return on government securities.[25] The equity risk premium should reflect what investors think the risk premium will be going forward.

As provided by Damodaran, "Broadly speaking, there are two ways of estimating equity risk premiums, with the first being a historical premium estimated by looking at the difference between past returns on stocks and the risk free investment and the second being a forward looking estimate, where you back out from stock prices what investors are building in as an expected return on stocks in the future."[26]

The department reviewed seven different calculations of the equity risk premium:

Ex Post (6.91%), long-horizon expected equity risk premium from Duff & Phelps Cost of Capital Navigator[27]. Large company stock total returns minus long-term government bond income returns.[28] As provided in Duff & Phelps Valuation Handbook (2017), the long-term "historical" equity risk premium is calculated as, "the average annual return of the S&P 500 total return index minus the average annual return of the SBBI long-term (20-year) government bond income return series over the 1926-2016 time period" (p. 5-14). [29]

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[23] Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Pages 188-189
[24] Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Pages 115-116

[25] Cornell, Bradford, (1999). *The Equity Risk Premium,* Page 18

[26] Damodaran, Aswath, Dr. (April 2016). *The Cost of Capital: The Swiss Army Knife of Finance*, Page 11. Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/papers/costofcapital.pdf

[27] Duff & Phelps. (2019). *Cost of Capital Navigator*. Historical long-term (1926-present) equity risk premium. Retrieved February 6, 2019 from https://costofcapital.duffandphelps.com/landing

[28] Duff & Phelps. (2017). *Valuation Handbook: Guide to Cost of Capital*. Hoboken: John Wiley & Sons. Chapter 3, Page 1

[29] Duff & Phelps. (2017). *Valuation Handbook: Guide to Cost of Capital*. Hoboken: John Wiley & Sons. Chapter 5, p. 14.

Supply Side (6.14%), long-horizon expected equity risk premium forecasted by the use of supply side models from Duff & Phelps Cost of Capital Navigator.[30] Finance and capital expert Roger Ibbotson described the Supply Side Model in his Stocks, Bonds, Bills, and Inflation Yearbook: "Long-term expected equity return scan be forecasted by the use of supply side models. "The supply of stock market returns is generated by the productivity of the corporations in the real economy. Investors should not expect a much higher or lower return than that produced by the companies in the real economy. Thus, over the long run, equity returns should be close to the long-run supply estimates." [31]

Three Stage Ex Ante (5.65%), forward looking model using a three-stage dividend growth model of the Standard & Poor's 500. The department calculates this equity risk premium. [32] According to Ibbotson, "One of the advantages of a three-stage discounted cash flow model is that it fits with the life cycle theories in regards to company growth." [33]

The department received suggestions for completing a single-stage ex ante calculation. The three-stage model uses the short-term growth estimate of the S&P 500 in the first stage, then applies a linear decline in the growth rate until during the second stage, until reaching the long-term expected growth rate of the U.S. economy in the third stage. Applying the short-term growth rate (13.09%) to a single-stage model would imply that the S&P 500 will continue to grow at 13.09% into perpetuity. Financial theory suggests that the sustainable growth rate used in a single-stage model cannot exceed the long-term growth rate of the economy as a whole. Therefore, the department did not complete a single-stage ex ante calculation.

Damodaran (5.96%), implied equity risk premium as calculated by Damodaran, Professor of Finance at the Stern School of Business at New York University.[34] This equity risk premium is estimated using the current level of index, the expected dividends on stock and the expected growth rate in earnings. The expected growth rate from 1960 to 1985 was estimated using

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30 Duff & Phelps. (2019). *Cost of Capital Navigator*. Supply side (1926-present) equity risk premium. Retrieved February 6, 2019 from https://costofcapital.duffandphelps.com/landing

31 *Ibbotson SBBI 2013 valuation yearbook: market results for stocks, bonds, bills, and inflation, 1926-2012*. (2013). Chicago: Morningstar. P. 64.

32 See Appendix F for this calculation.

33 Ibbotson, *SBBI 2013 valuation yearbook.* Page 51

34 Damodaran, Aswath (2019). Implied Equity Risk Premium on January 1, 2019. Retrieved on January 22, 2019 from http://pages.stern.nyu.edu/~adamodar/

historical growth rates. From 1985 onwards, we use the Zacks Investment Research consensus estimate of growth for the stocks in the S&P 500.[35]

Some company representatives have debated that the correct equity risk premium to use as calculated by Damodaran is the historical risk premium comparing Stocks to Treasury Bonds from 1928 to the current year. Because this is a similar calculation to the Duff & Phelps equity risk premium and the ex post equity risk premium, we believe using Damodaran's forward-looking approach allows for a different calculation than already provided by the other equity risk premium estimates.

Duff & Phelps (5.50%), recommended equity risk premium (conditional). The Duff & Phelps recommended equity risk premium was developed in relation to their 3.50% "normalized" risk-free rate. [36] As provided in Duff & Phelps Valuation Handbook (2017), "Duff & Phelps employs a multi-faceted analysis to estimate the conditional ERP [equity risk premium] that takes into account a broad range of economic information and multiple ERP estimation methodologies to arrive at its recommendation" (p. 3-38)." [37]

Graham and Harvey (4.42%), forward-looking equity risk premium based on surveys of U.S. Chief Financial Officers and their opinion of the equity risk premium in every quarter from June 2000 to December 2017. The risk premium is the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield. "The hurdle rates are significantly higher than the cost of capital implied by the market risk premium estimates" (p. 1). "Given capital constraints, firms often impose a higher hurdle rate on their investment. For example, to allocate capital to an investment that promises a projected return exactly at a firm's WACC [weighted average cost of capital] is equivalent to accepting a zero net present value project" (p. 9).[38]

Fernandez, Pershin, and Acin (5.40%), forward-looking equity risk premium based on surveys of finance and economics professors, analysts and managers of companies and their opinion of the required market risk premium in different countries. [39]

The department has received comments related to the equity risk premiums provided in the studies from Graham and Harvey and Fernandez, Pershin, and Acin. Those comments noted the low response rate the surveys received and the timeliness of the studies. We used the equity risk premiums from these studies

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[35] Damodaran, A. Variables used in Data Set. http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/variable.htm

[36] Duff & Phelps. (2019). *Cost of Capital Navigator*. Recommended equity risk premium and normalized risk-free rate. Retrieved February 6, 2019 from https://costofcapital.duffandphelps.com/landing

[37] Duff & Phelps. (2017). *Valuation Handbook: Guide to Cost of Capital*. Hoboken: John Wiley & Sons. Chapter 3, p. 38.

[38] Graham, J. R., and Harvey, C. R. (28 March 2018). *The Equity Risk Premium in 2018*. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

[39] Fernandez, P., Pershin, V., and Acín, I. F. (4 April 2018). *Market Risk Premium and Risk-Free Rate Used for 59 Countries in 2018: A Survey*. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

to establish a range of acceptability and gave each equity risk premium consideration based on the quality and quantity of information available.

The equity risk premium (RP_e) is multiplied by the market segment-specific beta (β). The product is then added to the risk-free rate (R_f) to estimate the market rate of equity for the market segment.

Key – Variables in Equations	
RP_e	Equity risk premium
R_f	Risk-free rate
β	Beta

$$\text{Market Rate of Equity for Market Segment} = (RP_e \times \beta) + R_f$$

Damodaran commented on the use of a historical risk premium versus an implied risk premium early in 2018:

> *While it is tempting to continue to dissect last year's numbers, it is healthier to turn our attention to the future. It is why I have increasingly moved away from using historical risk premiums, like the 4.77% premium that I computed by looking at the 1928-2017 return table, and towards implied equity risk premiums, where I back out what investors are demanding as a premium for investing in stocks by looking at how much they pay for stocks and what they expect to generate as cash flows. (Think of it as an IRR for stocks, analogous to the yield to maturity on a bond). At the start of 2018, putting this approach into play, I estimated an equity risk premium of 5.08% for the S&P 500.* [40]

Empirical Capital Asset Pricing Model

The Empirical Capital Asset Pricing Model (ECAPM) is a modification of the above CAPM Model. The ECAPM applies 25% weight to the equity risk premium component and 75% weight to the beta times the equity risk premium component. This reduces the sensitivity of the cost of equity estimate.

According to Steven Kihm, Andrew Satchwell, and Peter Cappers, the model "mutes the sensitivity of the cost of equity estimate to changes in the beta coefficient, consistent with the adjustment suggested by the empirical research."[41]

The equity risk premium (RP_e) is multiplied by the market segment-specific beta (β) and 75%. The product is then added to the equity risk premium (RP_e) multiplied by 25%. The two products and the risk free rate are added tighter to estimate the market rate of equity for the market segment.

$$\text{Market Rate of Equity for Market Segment} = (RP_e \times \beta \times 75\%) + (RP_e \times 25\%) + R_f$$

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[40] Damodaran, A. January 2018 Data Update 2: The Buoyancy of US Equities. January 9, 2018. https://aswathdamodaran.blogspot.com/2018/01/january-2017-data-update-2-buoyancy-of.html

[41] Kihm, Steven; Satchwell, Andrew; and Cappers, Peter. *The Financial Impacts of Declining Investment Opportunities on Electric Utility Shareholders,* Electricity Markets & Policy Group, Technical Brief, Page 20

We completed seven ECAPM models for each market segment, using the equity risk premiums described in the Capital Asset Pricing Model section above.

Build-Up Model

The Build-Up Model is another model used to estimate the market rate of equity. Some view this as a version of the Capital Asset Pricing Model without specifically incorporating systematic risk.[42] The CAPM assumes that the risk premium portion of a security's expected return is a function of that security's systematic risk.[43]

An investor can diversify their portfolio to remove unsystematic risk (market segment-specific risk). Systematic risk (market risk) is the risk related to an investment return that cannot be eliminated through diversification.[44]

In the Build-Up Model, the market rate of equity for the market segment is equal to the risk free rate plus the equity risk premium plus the risk specific to the market segment for unsystematic risk.

$$\text{Market rate of equity for Market Segment} = R_f + RP_e + RP_u$$

Key – Variables in Equations	
RP_e	Equity risk premium
R_f	Risk-free rate
RP_U	Market segment specific risk premium (unsystematic)

The Build-Up Model can be used when the inputs are not available to complete CAPM. The department was able to complete the CAPM for each market segment and did not need to resort to the Build-Up Model.

Dividend Growth Model (DGM)

The department also uses the DGM to determine the market rate of equity. It is based on the theory that the prices paid for a share of stock reflect the investors' discounted present value of future expected earnings.[45] The DGM is a widely used method and is also called the Discounted Cash Flows Model or Gordon Growth Model.

The formula for this model is the same as the simplified Discounted Cash Flows Income Model explained above, referred to as Stable Growth Yield Capitalization, using a stable growth rate. Estimating the sustainable growth rate is explored below in this section and the Growth section.

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42 Pratt, Shannon and Grabowski, Roger, *Cost of Capital Applications and Examples,* 4th Ed., Page 102 (2010)

43 Ibid, p. 105

44 Keown, Arthur; Martin, John; and Petty, J., *Foundations of Finance: The Logic and Practice of Financial Management*, 8th Ed., (2014). Page 195

45 Western States Association of Tax Administrators (2009). *Appraisal Handbook – Unit Valuation of Centrally Assessed Properties*, Page III-20

Theoretically, the growth estimate in the DGM is the estimated growth in dividends, which are cash flows to equity shareholders after reinvestment. Dividend growth estimates may track earnings growth estimates. However, companies may change dividend payment policies drastically, resulting in large differences between earnings growth estimates and dividend growth estimates.

A consensus based on substantial academic literature indicates analysts' expectations of earnings take account of all the information provided by more formulaic forecasting rules and incorporate other information as well. "Based on these findings, the most common solution is to assume that the dividend payout rate remains effectively constant and to use analyst forecasts of earnings growth as a proxy for the growth rate of dividends."[46]

Another issue that leads the department to question the usefulness and reliability of the dividend growth rate in this model is the trend for U.S. companies to include stock buybacks in their dividend payment policies. This is discussed in detail in the Stock Buybacks section.

Key – Variables in Equations	
DY	Dividend Yield
DG	Dividend Growth
EG	Earnings Growth

The formula uses Dividend Yield (DY), which is next year's expected dividends per share divided by the current market price per share of stock, plus an estimate of growth. Both dividend and earnings growth models were reviewed.

Dividend Growth (DG), analysts' estimates of dividend growth is used in the model:

Market Rate of Equity for Market Segment = DY + DG

Earnings Growth (EG), analysts' estimates of earnings growth is used in the model:

Market Rate of Equity for Market Segment = DY + EG

Another formulaic expression of the Dividend Growth Model is:

$$K_E = D_1 / P_0 + G_1$$

In this expression, the Cost of Equity is estimated by taking the Dividend Yield (Expected Dividends in the next period divided by the Recent Stock Price) plus expected growth. This model is the same model as the simplified Discounted Cash Flows Income Model that the department referred to as the Stable Growth Yield Capitalization, mentioned above. The formula is stated again here:

$$\text{Value} = NCF_1 / (Y_0 - g).$$

Key – Variables in Equations	
K_E	Cost of Equity
D_1	Expected Dividends
P_0	Recent Stock Price
G_1	Projected 5-year Growth Rate
Y_0	Yield Rate for Current Assessment Period
g	Stable Growth
NCF_1	Net Cash Flows for Next Period

46 Cornell, Bradford, (1999). *The Equity Risk Premium*, Page 105

Instead of solving for value as the Stable Growth Yield Capitalization Model does, the DGM solves for cost of equity.

The dividend and earnings growth rates provided by Value Line Investment Survey were used for the guideline companies for the Railroad, Electric, and Gas Distribution market segments. Value Line Investment Survey provides analysts' estimates of change in earnings and dividends from 2015-2017 to 2021-2023.

Value Line did not provide sufficient data for earnings or dividend growth rates for guideline companies for the Gas Transmission Pipeline and Fluid Transportation Pipeline market segment.

The department used an average of analysts' estimates of earnings growth from Yahoo! Finance, Zacks Investment Research, and S&P Global Stock Reports. We used an average of the available estimates because of the wide variations between sources and across the guideline companies. For example:

- Estimates for the Gas Transmission Pipeline market segment ranged from 6.5% to 40.64%, and Zacks estimated the expected earnings-per-share growth rate for the industry at 7.70%.
- Estimates for the Fluid Transportation Pipeline market segment ranged from -6.7% to 35.8%, and Zacks estimated the expected earnings-per-share growth rate for the industry at 8.25%.

See each market segment's Dividend Growth Model page in the appendices for more information on how the department arrived at the indicated rate.

The growth rate used in the DGM is a short-term growth rate, typically much higher than the growth rate of the U.S. economy. This model is used to calculate value of a company into perpetuity. It is not possible for a company to grow at a growth rate higher than the U.S. economy in the long-term. According to Damodaran, "the amount of cash that U.S. companies are returning to stockholders is unstainable, given the earnings and expectations of growth."[47] Pratt and Grabowski also state, "Long-term growth rates exceeding the real growth in GDP [Gross Domestic Product] plus inflation are generally not sustainable."[48]

Multi-Stage Dividend Growth Model

The department completed a multi-stage dividend growth model (multi-stage DGM) to account for the short-term growth estimates available. Unlike the model discussed in the previous section, the multi-stage DGM assumes that growth is not constant. This allows the department to use analysts' short-term growth estimates, a transition period where the short-term growth estimates adjust to the long-term, sustainable growth estimate, and then a period of long-term sustainable growth.

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[47] Damodaran, A. January 2017 Data Update 9: Dividends and Buybacks Damodaran, February 6, 2017. http://aswathdamodaran.blogspot.com/2017/02/january-2017-data-update-9-dividends.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+blogspot%2FpHUuM+%28Musings+on+Markets%29

[48] Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Page 681

David Parcell (2010) provides the following multi-stage DGM formula in The Cost of Capital – A Practitioner's Guide, published by the Society of Utility and Regulatory Financial Analysts:

$$K_E = (DY \times (1+.5(G)) + 0.67(G_1) + 0.33(g)$$

Key – Variables in Equations	
K_E	Cost of Equity
DY	Dividend Yield
G_1	Projected 5-year Growth Rate
G	Average of G_1 and g
g	Stable Growth

Stock Buybacks

A company's net income represents income that the company can reinvest or distribute to its owners.[49] Dividends are often considered the primary approach for publicly traded firms to return cash or assets to their shareholders. However, companies can also return cash to their stockholders through stock buybacks – buying back outstanding stock in the firm and reduce the number of shares outstanding.[50]

Because a company cannot act as its own shareholder, it absorbs repurchased shares, and the number of outstanding shares on the market is reduced. This increases the relative ownership stake of each investor because there are fewer shares, or claims, on the company earnings. The amount of cash that U.S. companies are returning to stockholders is unsustainable, given the earnings and expectations of growth.

In 2015 and 2016, the companies in the S&P 500 returned more than 100% of earnings to investors.[51] As provided by Sanders and Schumer (2019), "between 2008 and 2017, 466 of the S&P 500 companies spent around $4 trillion on stock buybacks, equal to 53 percent of profits. An additional 40 percent of corporate profits went to dividends."[52] Another article notes, "U.S. companies have spent $1 trillion this year on buying back their own stock – a record figure reached three weeks before year's end."[53]

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[49] Keown, Arthur; Martin, John; and Petty, J., (2014). *Foundations of Finance: The Logic and Practice of Financial Management*, 8th Ed., Page 53

[50] Damodaran, Aswath, Dr. (2015). *Applied Corporate Finance*, 4th Ed., Page 439

[51] Damodaran, Aswath, Dr. (2017, February 06). January 2017 Data Update 9: Dividends and Buybacks. Retrieved February 06, 2017, from http://aswathdamodaran.blogspot.com/2017/02/january-2017-data-update-9-dividends.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A%2Bblogspot%2FpHUuM%2B%28Musings%2Bon%2BMarkets%29

[52] Schumer, C., & Sanders, B. (2019). Schumer and Sanders: Limit Corporate Stock Buybacks. *The New York Times.* Retrieved February 11, 2019 from https://www.nytimes.com/2019/02/03/opinion/chuck-schumer-bernie-sanders.html

[53] Ivanova, I. (2018). U.S. companies spent record $1 trillion buying back own stock this year. *CBS News*. Retrieved February 11, 2019 from https://www.cbsnews.com/news/copmanies-spent-record-1-trillion-buying-back-their-own-stock-this-year/

Given the trend of U.S. companies to include stock buybacks in their dividend payment policies, the department questions the reliability of the expected dividends and expected dividend growth rate inputs of the Dividend Growth Model (DGM).

Market Rate of Debt

Beginning with the 2018 study, the department analyzed the guideline companies' actual cost of debt and used them to estimate debt rates.[54] For the 2019 study, we will continue to analyze the guideline companies' actual cost of debt as an estimate of the cost of debt for each market segment.

We compiled our debt analysis using a majority blend of the market-observed, true cost of each guideline company's debt – using yield to maturity (YTM) calculations as described below – and spread analysis when such data was unavailable. This debt analysis is referenced in the Current Actual Cost of Debt pages for each market segment (see appendices A through E).

The department calculated the YTMs for each guideline company based on the following information: the issuers' stated coupon rate, maturity date, settlement date (3 business days following pricing date, the normal settlement for corporate debt), closing market price, and eventual redemption price. As provided by the Western States Association of Tax Administrators Appraisal handbook,

> *Four basic conditions are present in a bond: (a) coupon rate, (b) period of years to maturity, (c) present value of the bond, and (d) yield to maturity… Effective rates for new issues and yield to maturity rates based on current market prices usually provide an excellent pattern of debt rates to determine the debt costs of a particular industry. The current cost of a closely held bond issue, which is not publicly traded, can be ascertained by comparing it with similar publicly traded bond with the same risk and term to maturity.*[55]

To find each individual guideline company's cost of debt, we:

1. Accessed public information available for specific fixed and/or corporate bond mutual funds – their Quarterly Schedule Of Portfolio Holdings Of Registered Management Investment Company (Form N-Q) on the SEC website
2. Pulled out company-specific marketable debt securities data from Form N-Q, which are mandated by the SEC to include: issue name, coupon rate, maturity date, holding (face) amount, and market value amount.[56]

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[54] In previous years, the department used the following indexes to estimate the market rate of debt for guideline companies:

- Corporate Bond Yield Averages for Public Utility Bonds from Mergent Bond Record, for the Electric and Gas Distribution market segments
- Corporate Bond Yield Averages for Industrial Bonds from Mergent Bond Record, for the Gas Transmission Pipeline, Fluid Transportation Pipeline, and Railroad market segments

[55] Western States Association of Tax Administrators (2009). Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, Pages III-28 -29

[56] Each company's principal executive and financial officers verify and sign off on the data on Form N-Q.

3. Combined the data from Form N-Q – filed December 31, 2018 – with reasonable assumptions (see below) to calculate the cost of debt.
4. Used the above data to derive the Yield to Maturity (YTM) for each company. We calculate a market price (Market Value divided by Face Value). From that point we assume:
   - A T+3 settlement date of January 4, 2018 (January 1 is a Holiday and therefore a non-settlement date.)
   - A redemption price of par ($100.00)
   - A semi-annual interest payment
   - The debt is non-callable (The "make whole" call included in most corporate debt securities favors the issuer and is therefore irrelevant to the company's cost of debt.)

We calculated 30 of the 38 guideline company's cost of debt and YTM using the method outlined above. For the other eight companies, we employed a spread analysis tool using long-term debt information from their most recently published Form 10-K.

We focused on a long-term average industry YTM.[57] To arrive at this average, we built a spot U.S. Treasury zero coupon yield curve and then calculated a Z-spread to build out the data. This "boot-strapping" process is common practice in the financial sector when it comes to pricing new issue corporate debt.

As provided by Pratt & Grabowski:

> *Traditionally, the relevant market "yield" has been either the yield to maturity or the yield-to-call date. Either of these yields represents the total return the debt holder expects to receive over the life of the debt instrument, including current yield and any appreciation or depreciation from the market price, to the redemption of the debt at either its maturity or its call date, if callable. If the stated interest rate is above current market rates, the bond would be excited to sell at a premium. The yield-to-call date would probably be the appropriate yield, because it is likely to be in the issuer's best interest to call it (redeem it) as soon as possible and refinance it at a lower interest cost. If the stated interest rate is below current market rates, then it usually would not be attractive to the issuer to call it, and the yield to maturity would be the most appropriate rate.*[58]

Why use Yield to Maturity?

The Yield to Maturity (YTM) calculation is the most popular measure of yield in the bond market.[59] YTM represents a summation of the present values of the interest cash-flows that equals the current market price of the bond, as well as the accrued interest due on that principle. YTM calculations on

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57 The indexed cost of debt analysis in the Capitalization Rate Studies prior to the 2018 assessment year also used a long-term basis.

58 Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Pages 65-66

59 Fabozzi, Frank Ph.D. CFA, Fixed Income Analysis 2000 p.187

secondary corporate bonds are accepted throughout the financial sector as clear representation of the borrower's current cost of capital for that specific maturity date, no matter the issue date.

We used information filed publicly with the Securities and Exchange Committee to calculate the YTM for each guideline company. We used the YTM as the cost of debt for each market segment.

Yield to Maturity Example

The overarching popularity of the YTM calculation stems from its ability to constantly adjust its yield through various interest rate environments over time. For example, let us assume:

- XYZ Corp. comes to market on January 2, 2010, to borrow money for 20 years.
- XYZ's prevailing cost of debt is 10%, and its bond is issued with a 10% coupon rate.
- A decade later (January 2, 2020), XYZ's cost of debt is now 5%.

An investor will pay more for the XYZ Corp. bond on January 2, 2020, because the coupon rate of 10% is higher than the market rate of 5%. In this example, the price is $142 – as shown in the table below – a $42 premium over the original (par) value of $100.

Purchase Date	Market Rate	Coupon	Maturity Date	Market Price	Yield to Maturity
January 2, 2010	10.0%	10.0%	January 2, 2030	$100.00	10.0%
January 2, 2020	5.0%	10.0%	January 2, 2030	$142.00	5.0%

This premium will disappear as time progresses and the bond eventually matures at its par value of $100 on January 2, 2030. An investor who purchases the bond in 2020 does not recover the $42 premium. The bond yields 10% interest each year, but the premium reduces the investor's actual yield for the 10 years they hold the bond to 5% – the bond's YTM.

This behavior explains why cost-of-debt indexes rely on YTM calculations to ensure accuracy in the face of changing market rates. The YTM tracks a company's current cost of debt – even if company is not currently looking to borrow capital or has not borrowed capital in quite some time.

Market Rate of Preferred Stock

Preferred stock makes up a minimal percentage of the capital structure for all market segments. The amount of capital structure attributable to preferred stock was not materially significant and was not included in indicated capital structure for each market segment.

Direct Capitalization Rate (Direct Rate)

Direct capitalization is used to convert an estimate of a single year's net operating income expectancy into an indication of value in one direct step.[60]

[60] Western States Association of Tax Administrators (2009). Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, Page III-8

The direct rate (D_0) is an expression of the market observed relationship between price and income.

This market observed direct rate is applied to the net operating income (NOI) of the property to indicate the market value (value).

$$Value = NOI_1 / D_0$$

Key – Variables in Equations	
D_0	Direct Rate
NOI_1	Net Operating Income for the next year
Value	Market Value

Guideline Companies

When selecting guideline companies, the department reviews the Standard Industrial Classification Code and market segments listed by Value Line Investment Survey. We use the Value Line survey because it is a well-respected, widely used publication.

Value Line classifies companies into 100 unique industries and groupings based on their operations, products, customers, and competitors. Value Line constantly evaluates every company tracked in the survey to make sure they are located in the proper sector.[61]

The department reviewed companies in the following Value Line industries as possible guideline companies in our market segments:

Value Line's Industry	Department's Market Segment
Electric Utility (Central, East, and West)	Electric
Natural Gas Utility	Gas Distribution
Pipeline MLPs, Natural Gas Diversified, Oil/Gas Distribution	Fluid Transportation Pipeline or Gas Transmission Pipeline
Railroad	Class I Railroad or Other Railroad

The department reviewed possible guideline companies for comparability in their market segments to the companies doing business in Minnesota. We generally exclude companies that underwent a merger or acquisition in the previous calendar year, or companies that have announced an upcoming merger or acquisition during the current year.

Guideline Company Updates

The department updates the list of guideline companies for this study each year, depending on mergers and acquisitions, market activities, and other factors. This year's changes are summarized below. For details on the companies reviewed for each segment, see Guideline Company Selection (page H-1).

Electric Market Segment

The department removed CenterPoint Energy Inc. and Vectren Corp. as guideline companies. These companies completed a merger on February 1, 2019.

Gas Distribution Market Segment

[61] Severo Nieves, (9 March 2016). Value Line Institutional Services, Institutional Sales & Marketing, Analyst, email

The department:

- Removed RGC Resources Inc. as a guideline company because there are not enough analysts' forecasts available.
- Added ONE Gas Inc. as a guideline company.

Gas Transmission Pipeline Market Segment
The department changed from using partnerships to corporations as guideline companies for the Gas Transmission Pipeline market segment, given the recent transitions in this market segment. [62] We:

- Removed Enterprise Products Partners L.P. and TC PipeLines L.P. as guideline companies because the department is going to use corporations as guideline companies.
- Removed Boardwalk Pipeline Partners L.P. and Williams Partners L.P. because the companies are no longer publicly traded.
- Added ONEOK Inc., TransCanada Corp., and The Williams Companies for a total of four guideline companies for this market segment.[63]

Note: Though Williams Companies Inc. and Williams Partners L.P. merged in August 2018, the department still used Williams Companies Inc. as a guideline company for the Gas Transmission Pipeline market segment and considered the merger when selecting the rates for this market segment.

Fluid Transportation Pipeline Market Segment
The department:

- Removed Enbridge Energy Partners LP because it is no longer publicly traded.
- Removed NuStar Energy LP because it was recently involved in a reorganization or merger with a related company that completed on July 20, 2018.
- Added Phillips 66 Partners LP as a guideline company.

Class I Railroad and Other Railroad Market Segments
The department did not make any changes to the guideline companies in the Class I Railroads and Other Railroads market segments.

Equity Component

The department used an inverse of the Price to Earnings (P/E) Ratio to estimate the equity component in the direct rate. For this estimate, we used the Price to Earnings Ratio (P/E Ratio) as calculated by Value Line Investment Survey; if the P/E Ratio was not calculated, we used the Trailing P/E Ratio as

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[62] For the 2018 assessment year, the department used five guideline companies for the Gas Transmission Pipeline market segment. Four of those companies are limited partnerships. However, two of them have reorganized into their parent corporation and are no longer publicly traded, which left only two partnerships we could have used for this market segment.

[63] The department has received comments in the past related to not including a wider range of guideline companies in the Gas Transmission Pipeline market segment. However, the department does not believe we should select a wider range to provide more guideline companies in this or other market segments. The purer the guideline company selection, the better indication for that market segment.

calculated by Value Line. We selected the P/E ratio most indicative of the market segment data. The inverse of the selected ratio is the equity component of the direct rate.

See each market segment's Direct Equity Component page in the appendices for more information on how the department arrived at the indicated equity component.

Debt Component

Beginning with the 2018 study, the department analyzed the guideline companies' actual cost of debt and used them to estimate debt rates.[64] For the 2019 study, we will continue to analyze the guideline companies' actual cost of debt as an estimate of the cost of debt for each market segment.

We compiled our debt analysis using a majority blend of the market-observed, true cost of each guideline company's debt – using yield to maturity (YTM) calculations as described below – and spread analysis when such data was unavailable. This debt analysis is referenced in the Current Actual Cost of Debt pages for each market segment (see appendices A through E).

The department calculated the YTMs for each guideline company based on the following information: the issuers' stated coupon rate, maturity date, settlement date (3 business days following pricing date, the normal settlement for corporate debt), closing market price, and eventual redemption price. As provided by the Western States Association of Tax Administrators Appraisal handbook,

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65 Western States Association of Tax Administrators (2009). Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, Pages III-28 -29

2. Pulled out company-specific marketable debt securities data from Form N-Q, which are mandated by the SEC to include: issue name, coupon rate, maturity date, holding (face) amount, and market value amount.[66]
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We focused on a long-term average industry YTM.[67] To arrive at this average, we built a spot U.S. Treasury zero coupon yield curve and then calculated a Z-spread to build out the data. This "boot-strapping" process is common practice in the financial sector when it comes to pricing new issue corporate debt.

As provided by Pratt & Grabowski:

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[66] Each company's principal executive and financial officers verify and sign off on the data on Form N-Q.

[67] The indexed cost of debt analysis in the Capitalization Rate Studies prior to the 2018 assessment year also used a long-term basis.

interest rate is below current market rates, then it usually would not be attractive to the issuer to call it, and the yield to maturity would be the most appropriate rate.[68]

Why use Yield to Maturity?

The Yield to Maturity (YTM) calculation is the most popular measure of yield in the bond market.[69] YTM represents a summation of the present values of the interest cash-flows that equals the current market price of the bond, as well as the accrued interest due on that principle. YTM calculations on secondary corporate bonds are accepted throughout the financial sector as clear representation of the borrower's current cost of capital for that specific maturity date, no matter the issue date.

We used information filed publicly with the Securities and Exchange Committee to calculate the YTM for each guideline company. We used the YTM as the cost of debt for each market segment.

Yield to Maturity Example

The overarching popularity of the YTM calculation stems from its ability to constantly adjust its yield through various interest rate environments over time. For example, let us assume:

- XYZ Corp. comes to market on January 2, 2010, to borrow money for 20 years.
- XYZ's prevailing cost of debt is 10%, and its bond is issued with a 10% coupon rate.
- A decade later (January 2, 2020), XYZ's cost of debt is now 5%.

An investor will pay more for the XYZ Corp. bond on January 2, 2020, because the coupon rate of 10% is higher than the market rate of 5%. In this example, the price is $142 – as shown in the table below – a $42 premium over the original (par) value of $100.

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January 2, 2020	5.0%	10.0%	January 2, 2030	$142.00	5.0%

This premium will disappear as time progresses and the bond eventually matures at its par value of $100 on January 2, 2030. An investor who purchases the bond in 2020 does not recover the $42 premium. The bond yields 10% interest each year, but the premium reduces the investor's actual yield for the 10 years they hold the bond to 5% – the bond's YTM.

This behavior explains why cost-of-debt indexes rely on YTM calculations to ensure accuracy in the face of changing market rates. The YTM tracks a company's current cost of debt – even if company is not currently looking to borrow capital or has not borrowed capital in quite some time.

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[68] Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Pages 65-66

[69] Fabozzi, Frank Ph.D. CFA Fixed Income Analysis 2000 p.187

Flotation Costs

Flotation costs are costs incurred when a company issues a new security, including fees to an investment banker, legal fees, accounting, and other out of pocket expenses. The market-determined opportunity cost of capital is not affected by the flotation costs of a particular firm.[70] The correct procedure for the economic analysis of flotation costs does not alter the weighted average cost of capital.[71]

The yield rates and direct rates in this study are market derived, using market data. Unlike for determining allowable rates of return in rate cases, the recovery of previously incurred costs is not added to the yield rates or direct rates used for estimating market value. The yield rate and direct rate are not recovery mechanisms for the costs of doing business. Flotation cost adjustments were not made to the yield rate or direct rate in this study.

Dr. Richard Simonds stated in his paper published in the Journal of Property Tax Assessment & Administration, "When capitalizing net operating income in the income approach, a flotation-cost adjustment cannot be applied to the cost of capital. Advocates of an adjustment may be confusing the concept of the allowed rate of return on invested capital in a rate-regulated environment with the concept of the market-determined opportunity cost of capital."[72]

Thomas Copeland and Fred Weston find that adjusting for flotation costs in the rate of return is incorrect because it implicitly adjusts the opportunity cost of funds supplied to the firm. The true market-determined opportunity cost is unaffected by the flotation costs of a particular firm.[73]

The department does not include an adjustment for flotation costs based on recent decisions from the Minnesota Tax Court. We estimate the market cost of capital for each market segment, under Minnesota Rules 8100 and 8106.

Company-Specific Risk

We estimate the market cost of capital for each market segment, under Minnesota Rules 8100 and 8106. The department does not include an adjustment for company-specific risk or a size premium adjustment for a specific company.

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[70] Western States Association of Tax Administrators, (2009). Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, Page III-31

[71] Copeland, Thomas E., and Weston, Fred J. (1988). Financial Theory and Corporate Policy (3rd Ed.). Addison-Wesley Publishing Company.

[72] Simonds, Richard R., Dr. (2006). "Income Capitalization, Flotation Costs, and the Cost of Capital." Journal of Property Tax Assessment & Administration, Volume 3, Issue 4.

[73] Copeland and Weston. *Financial Theory and Corporate Policy* (3rd Ed.). Page 534

The department does not agree with a size premium adjustment based on the guideline companies' average market capitalization size; we do not find this to be generally accepted practice. Damodaran points out several reasons why a size adjustment to the CAPM is not appropriate, concluding that the empirical evidence is not as conclusive as it was initially thought to be.[74] He also finds that forward-looking risk premiums are yielding no premiums for small cap [market capitalization] stocks and much of the additional risk is either diversifiable or double counted.[75]

Eugene Fama and Kenneth French analyzed size premiums of companies that move to different market capitalizations and found, "the size premium is almost entirely a result of the extreme positive returns of small-cap [market capitalization] stocks that move to a big-cap [market capitalization] portfolio from one year to the next."[76]

Similarly, the equity risk premium surveys by Graham and Harvey find no evidence that the weighted average cost of capital is larger for smaller firms.[77]

Illiquidity

The department does not adjust capitalization rates for illiquidity. As the Appraisal Institute explains:

> *A discount rate reflects the relationship between income and the value that a market will attribute to that income. The financial and economic concepts implicitly in a discount rate are complex and have been the subject of significant analysis for more than a century. Although four key components can be identified within a discount rate – the safe rate plus considerations of illiquidity, management, and various risks – a discount rate that is constructed by adding allowances for these components can be misleading and inaccurate" (p. 458).*[78]

Growth

The importance of the growth rate is that it affects the yield model, explained in the Yield Capitalization Rate section. Minnesota Rules, 8100 and 8106 imply a Zero Percent Growth Yield model. If the assumption that income streams remain equal over time is incorrect, the model may not accurately reflect the market value of the company.

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74 Damodaran, Aswath, Dr. "Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2011 Edition." Retrieved from: http://people.stern.nyu.edu/adamodar/pdfiles/papers/ERP2011.pdf

75 Damodaran, Aswath, Dr. (11 April 2015). "The small cap premium: Where is the beef?" Retrieved from: http://aswathdamodaran.blogspot.com/2015/04/the-small-cap-premium-fact-fiction-and.html.

76 Fama, Eugene F. and French, Kenneth R. (2007). "Migration." Financial Analysts Journal, Volume 63, Number 3. CFA Institute.

77 Graham, J. R., and Harvey, C. R. (28 March 2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

78 Appraisal Institute (2013). The Appraisal of Real Estate, 14th Edition, Page 458

For a company with a changing income streams, a Discounted Cash Flows model or Stable Growth Yield model may be better at estimating the value for the company under review. The Discounted Cash Flows model uses explicit forecasts of anticipated net cash flows for each period. These inputs can be estimated by the department if they are not provided by the company.

The Implied Growth Rate is the difference between the yield rate and the direct rate. The direct rate is the relationship between an estimate of a single year's net operating income and the value of the property, while the yield rate converts income from future periods into present value.

The Western States Association of Tax Administrators Appraisal Handbook states, "direct capitalization is not affected by the appraiser's view of the future income."[79] In addition, Unit Valuation Insights states, "The direct capitalization rate is typically calculated as the yield capitalization rate minus an expected long-term growth rate."[80]

Short-Term Growth Rate

The department reviewed short-term growth rates from several sources to derive an estimate of a short-term growth rate for each market segment.

Zacks Investment Research provides expected earnings per share growth (3-5 year) for the market segments as follows (as of January 2, 2019):

Electric	Gas Distribution	Gas Transmission Pipeline	Fluid Transportation Pipeline	Class I Railroads	Other Railroads
6.60%	6.30%	7.70%	8.80%	10.30%	10.30%

Value Line Investment Survey provides analysts' estimates of change in earnings and dividends from 2015-2017 to 2021-2023. The median growth rates for the guideline companies in each market segment provided by Value Line are as follows:

	Electric	Gas Distribution	Class I Railroads	Other Railroads
Earnings Growth Rate	6.50%	9.50%	11.50%	6.00%
Dividend Growth Rate	5.75%	6.50%	9.75%	---

Value Line did not have sufficient data for earnings or dividend growth rates in the Gas and Fluid Transmission Pipeline segments. For these segments, the department reviewed three other sources to estimate the median growth rate of the guideline companies in these segments as follows:

79 Ibid., Page III-9

80 Schweihs, Robert P. & Reilly, Robert F. (Spring 2014). Unit Valuation Insights, Issues Related to the Unit Valuation Principle, Page 77

	Gas Transmission Pipeline	Fluid Transportation Pipeline
Growth Estimate	12.33%	12.78%

Note: Analysts' growth estimates for the guideline companies ranged from 6.5% to 40.64% in the Gas Transmission Pipeline segment, and from -6.7% to 35.8% in the Fluid Transportation Pipeline segment. Given this wide range, the growth estimate for each guideline company is an average of:

- 3-year projected earnings per share (compound annual growth) from S&P Global Stock Report
- Next 5 years (per annum) earnings grown from Yahoo! Finance
- Expected earnings per share growth (3-5 years) from Zacks Investment Research

Based on the sources above, the indicated short-term growth rate for each market segment is as follows:

Electric	Gas Distribution	Gas Transmission Pipeline	Fluid Transportation Pipeline	Class I Railroads	Other Railroads
6.50%	9.50%	12.33%	12.78%	11.50%	6.00%

This evidence indicates that there is significant short-term growth in each market segment.

Long-Term Growth Rate

The department reviewed long-term growth rates from several sources to derive an estimate of long-term growth for the market as a whole. "Since no firm can grow forever at a rate higher than the growth rate of the economy in which it operates, the constant growth rate cannot be greater than the overall growth rate of the economy."[81] These sources indicate varying rates of growth in the U.S. economy over the long-term:

- The market yield on 30-year U.S. Treasury was 2.97% on January 2, 2019.[82]

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[81] Damodaran, Aswath, Dr. (n.d.) The Stable Growth Rate, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/valquestions/stablegrowthrate.htm

[82] Board of Governors of the Federal Reserve System, H.15, Selected Interest Rates, Market Yield on U.S. Treasury Securities 30-year constant maturity quoted on investment bases, daily observations, January 2, 2019. Accessed on January 22, 2019 from http://www.federalreserve.gov/

- The Federal Reserve Bank projects their "longer run" estimate of change in U.S. real Gross Domestic Product (GDP) at 1.9%[83].
- The World Bank forecasts U.S. GDP will grow 2.5% in 2019, 1.7% in 2020, and 1.6% in 2021.[84]
- Trading Economics projects the U.S. GDP annual growth rate to trend around 1.90% in 2020.[85]
- The Economist Intelligence Unit forecasts U.S. real GDP will grow 1.9% from 2018 to 2050.[86]
- The Congressional Budget Office projects that real GDP will grow 2.3% in 2019, an average of 1.7% through 2023, and 1.8% from 2024 to 2029.[87]
- The International Monetary Fund projects U.S. real GDP growth at 1.4% in 2023.[88]

After considering the above sources, the department finds the indicated long-term nominal growth rate of the U.S. economy to be 1.90%.

Inflation

Inflation makes future income less valuable than today's income. Inflation is the percentage change in the value of the Wholesale Price Index (WPI) on a year-to-year basis. It effectively measures the change in the prices of a basket of goods and services in a year.[89]

83 Board of Governors of the Federal Reserve System, Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy. December 2018 Retrieved February 20, 2019 from https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20181219.pdf

84 World Bank Group Flagship Report, Global Economic Prospects – Darkening Skies. January 2019. Page 4. Retrieved from http://www.worldbank.org/en/publication/global-economic-prospects

85 Trading Economics, United States GDP Growth Rate Forecast. Retrieved January 28, 2019 from https://tradingeconomics.com/united-states/gdp-growth

86 The Economist Intelligence Unit. September 17, 2018 Retrieved January 28, 2019 from http://country.eiu.com/article.aspx?articleid=1647186748&Country=United States&topic=Economy&subtopic=Long-term+outlook&subsubtopic=Summary#

87 Congressional Budget Office. (January 2019). The Budget and Economic Outlook: 2018 to 2028. Retrieved on January 28, 2019 from https://www.cbo.gov/publication/54918

88 International Monetary Fund. World Economic Outlook: Challenges to Steady Growth. October 2018. Retrieved on February 20, 2019 from https://www.imf.org/en/Publications/WEO/Issues/2018/09/24/world-economic-outlook-october-2018

89 http://economictimes.indiatimes.com/definition/inflation

According to Arthur Keown, John Martin, and J. William Petty, "investors require nominal (or quoted) rate of interest that exceeds the inflation rate or else their realized real return will be negative."[90] According to Damodaran, "An inflation-indexed Treasury security does not offer a guaranteed nominal return to buyers, but instead provides a guaranteed real return."[91]

According to Cornell, "inflation is not considered explicitly when using the equity risk premium to forecast long-run future stock returns because it is already included in the interest rates that go into the calculation."[92] Cornell continues, "When investors invest, their goal is to increase future consumption. Consequently, the success of an investment is measured not in nominal dollars but real dollars… investors are concerned with real returns, defined as the percent increase in purchasing power, not nominal returns."[93]

The U.S. Treasury issues inflation-indexed securities. Comparing the inflation-indexed securities to the non-inflation indexed securities, one can calculate the inflation rate. Using the 10-year, 20-year, and 30-year securities, the department calculated the inflation rates as of January 2, 2019 as shown below.[94]

	10-Year	20-Year	30-Year
Calculated Inflation	1.70%	1.76%	1.78%

The Budget and Economic Outlook: 2019-2029, published by the Congressional Budget Office (CBO), estimates that inflation for personal consumption expenditures will change from fourth quarter to fourth quarter by 1.9% in 2019 and 2.2% in 2020. The CBO expects the inflation rate to be 2.0% between 2024 and 2029.[95]

90 Keown, Arthur; Martin, John; and Petty, J. William, (2014). *Foundations of Finance: The Logic and Practice of Financial Management*, 8th Ed., Page 35

91 Damodaran, Aswath, Dr. (2015). Applied Corporate Finance, 4th Ed., Page 90

92 Cornell, Bradford, (1999). *The Equity Risk Premium,* Page 29

93 Ibid. Page 31

94 Difference between inflation-indexed and non-inflation indexed securities for 10-year, 20-year, and 30-year daily rates as of January 2, 2019. Retrieved on January 17, 2019 from www.federalreserve.gov

95 Congressional Budget Office. (January 2019). The Budget and Economic Outlook: 2018 to 2028. Retrieved on January 28, 2019 from https://www.cbo.gov/publication/54918

The department used the expected, longer-run personal consumption expenditures inflation rate of 2.0% estimated by the Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy.[96].

Given the indicated long-term nominal growth rate of 1.90% and the expected inflation rate of 2.0%, the department estimates the long-term real growth rate at 3.90%.

Market-to-Book Ratios

The department analyzes market-to-book ratios of publicly traded stock and debt securities by market segment, as data is available. This analysis indicates how the market perceives the value of these assets relative to the book value. A market-to-book ratio below one indicates that there may be obsolescence affecting that market segment; a ratio over one would indicate that there is no obsolescence.

For more information, see each market segment's Market-to-Book Ratio analysis in the appendices of this report.

In addition to market-to-book ratios, the department reviewed the Houlihan Lokey 2017 Purchase Price Allocation Study, published in December 2018.[97] Houlihan Lokey reviewed public filings for 1,266 completed transactions in 2017. Search criteria included transactions that closed in 2017, acquirer was a U.S. publicly traded company, ownership percentage sought by acquirer was 50% or greater, and base equity purchase price was disclosed. There was sufficient disclosures for 404 transactions.

The Houlihan Lokey study reviews the amount of purchase consideration allocated to tangible assets, identifiable intangible assets, and goodwill.[98] The 2017 study finds that:

- The median percentage of purchase consideration allocated to intangible assets in 2017 and 2016 was 35% and 33%, respectively (p. 17).
- The median percentage of purchase consideration allocated to goodwill in 2017 and 2016 was 40% and 36%, respectively (p. 17).
- Larger transactions generally recorded lower allocations to intangible assets and higher allocations to goodwill (p. 24).
- Indefinite-lived intangible assets accounted for approximately 12% of the total intangible asset value. Trademarks and trade names were the most common intangible assets to be considered indefinite lived (p. 27).

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[96] Board of Governors of the Federal Reserve System, Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy. December 2018 Retrieved February 20, 2019 from https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20181219.

[97] Houlihan Lokey. (December 2018). *2017 Purchase Price Allocation Study*. Retrieved February 6, 2019 from https://houlihanlokey.lpages.co/2017-purchase-price-allocation-study/

[98] "PC [purchase consideration] is defined as the sum of the purchase price paid and liabilities assumed in connection with a business combination. PC is equivalent to the fair value of the total assets of the target" *Ibid*, page 15.

- Notable transaction activities in the Energy industry included:
  - Enbridge Inc. acquiring Spectra Energy Corp, with a purchase consideration of $62,158 million with 2% allocated to intangible assets
  - EQT Corporation acquiring Rice Energy Inc. with a purchase consideration of $11,675 million with 6% allocated to intangible assets.
- Seventy one percent of the transactions allocated 25% or more of purchase consideration to goodwill. The mean and median allocations of purchase considerations to goodwill were 40% and 39%, respectively (p. 47).

State Assessed Property Spring Forum

The department held the 2019 State Assessed Property Spring Forum on March 5, 2019. We received feedback at the forum during the discussion and a presentation about the electric market segment.

The department presented data and received feedback related to that data. We considered all comments, information, and input provided at the forum in this Draft Capitalization Rate Study. We thank everyone that participated in the forum.

Below is a summary of the observations, positions, and suggestions from the forum, along with our response. The department considered this feedback and incorporated it throughout the relevant sections of this draft study.

This section of feedback is related to the electric market segment presentation provided by an electric utility representative at the forum.

1. Feedback: Capital structure for the electric market segment for the 2019 assessment year is similar to the department's 2018 study.

   Response: The department also found similar capital structures for the 2018 and 2019 assessment years. The capital structure for the electric market segment in the 2018 study was 32% debt and 68% equity. For this draft 2019 study, the capital structure is 34% debt and 66% equity. See Appendix A.

2. Feedback: The department should use debt yield averages instead of yield-to-maturity calculations of the selected guideline companies.

   Response: The department believes the yield-to-maturity calculations provide the most accurate estimate of the cost of debt for the guideline companies and market segments. The department reviewed yield-to-maturity calculations based on feedback received from companies in previous years. Those comments suggested the department use actual cost of debt yields instead of the indexing the department had used during those years. The department still analyzes the indexing rates for cost of debt in addition to the yield to maturity calculations. See Market Rate of Debt section (page 18) for detailed explanations and each market segments appendix for detailed calculations (Appendices A-E: pages A-3 – A-7, B-3 – B-6, C-3 – C-6, D-3 – D-6, E-3 – E-7).

3. Feedback: The low beta indicated by the guideline companies for the electric market segment is an anomaly and the department should use the historical beta or a normalized beta.

Response: The department reviewed Value Line Tear Sheets for 11 of the 14 guideline companies for the next quarter. There is not a significant amount of change in financials from the quarter we used to the new quarter to determine that the electric market segment beta used is an anomaly. In the next quarter's financials, six of the companies reported the same beta, three companies reported a beta 0.05 higher, and one reported a beta 0.05 lower.

4. Feedback: The department should use an ex ante equity risk premium calculation similar to Xcel Energy and other state jurisdictions.

   Response: Xcel Energy and other state jurisdictions (Colorado and Oklahoma were mentioned) use a single-stage ex ante calculation. This single-stage calculation uses analysts' short-term growth estimates, assuming the growth estimate will continue into perpetuity.

   The department also uses analysts' short-term growth estimates. However, the department uses the short-term growth estimate for a short period of time, lining up with analysts' expectations. Then, the department uses a second stage where the short-term growth estimates adjust to the long-term, sustainable growth estimate. Finally, the department includes a third stage; a period of long-term sustainable growth.

   The department applies the yield rate derived, in part from the ex ante calculation, to an income model that assumes zero growth. The department's multi-stage model more closely matches the assumptions in the income model than the single-stage model. Also, other state jurisdictions use models similar to the department's model. See the department's ex ante equity risk premium calculation, Appendix F.

5. Feedback: The department should place most reliance on the dividend growth model (earnings growth) when selecting the cost of equity for the electric market segment.

   Response: The department considered this feedback and placed the most reliance on the dividend growth model (earnings growth) when selecting the cost of equity for every market segment. The department also placed most reliance on the dividend growth model in past assessment years. See each market segment's indicated rate of equity calculation in Appendices A – E (pages A-8, B-7, C-7, D-7, E-8, and E-9).

6. Feedback: The ex post equity risk premium should not be given any weight due to the low beta for the electric market segment and issue with the risk-free rate.

   Response: The equity risk premium, beta, and risk-free rate are independent variables of the capital asset pricing model. The ex post equity risk premium and the capital asset pricing models are widely used calculations. The comments (item 4) also suggest the department place secondary reliance on the single-stage ex ante equity risk premium, which uses the same beta and risk-free rate in the capital asset pricing model. See Risk Free Rate section (page 6) and Equity Risk Premium section (page 10).

7. Feedback: The empirical capital asset pricing model and the equity risk premium by Dr. Damodaran should not be used.

Response: The department believes the empirical capital asset pricing model and Dr. Damodaran's equity risk premiums are valid calculations. The department uses these models to establish a range of acceptability, including several other equity risk premium calculations, the traditional capital asset pricing model, and dividend growth models. The department placed most reliance on the Dividend Growth Model and Capital Asset Pricing Model (Ex Post) to arrive at the indicated rate of equity for each market segment.

8. Feedback: The multi-stage dividend growth model used by the department to calculate the ex ante equity risk premium is difficult to support because of the long-term, stable growth assumption.

   Response: The single-stage dividend growth model calculation uses a short-term growth forecast to estimate growth into perpetuity. However, the short-term growth estimates are typically much larger than the long-term growth estimates. The department applies the yield rate derived, in part from the ex ante calculation, to an income model that assumes zero growth. The department's multi-stage model more closely matches the assumptions in the income model than the single-stage model. See Growth section (page 27) and Appendix F.

9. Feedback: Cost of Equity should be similar to last year. The Value Line publication includes a return on common equity for the guideline companies that indicated an average return on common equity of 9.59%. The average return on common equity can be used as an indication of cost of equity.

   Response: The department notes an average return on common equity for electric segment guidelines companies in 2018 is 10.50%, as listed in Value Line. The return on equity is a measure of a company's profitability. The cost of equity is the rate of return investors require on an equity investment in a firm.[99] The department is establishing the cost of equity for each market segment, not return on equity. As provided by Brealey, Myers, & Marcus (2009), "A firm that earns more than the cost of equity makes its shareholders better off" (p. 84).[100] Return on equity[101] should be greater than the cost of equity in order to make a company's shareholders better off.

10. Feedback: The market-to-book ratio used by the department to analyze each market segment for indication of obsolescence is not valid. A market-to-book ratio below one indicates a company is going out of business or has been hit with a catastrophic event, not obsolescence. Economic obsolescence is not impairment or insolvency, but must be from an outside source.

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[99] Damodaran, A. (2002). *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset.* 2nd Ed. John Wiley & Sons, Hoboken, New Jersey. P. 182.

[100] Brealey, R., Myers, S., Marcus, A. (2009). *Fundamentals of Corporate Finance.* 6th Ed. McGraw-Hill Irwin, New York, New York. ISBN 978-0-07-338230-2

[101] "Return on equity is the amount, expressed as a percentage, earned on a company's common equity for a given period." Pratt, Shannon and Grabowski, Roger, (2010). *Cost of Capital Applications and Examples,* 4th Ed., Page 744

Response: The department views the market-to-book ratio analysis for each market segment as an acceptable calculation to compare a company's book value to its market value. The department also reviews Houlihan Lokey Purchase Price Allocation studies. The most recent study indicates that 71% of the transactions reviewed allocated 25% or more of purchase consideration to goodwill. This indicates that the purchase price for companies are over the book value of the assets by at least 25%. See Market-to-Book Ratios (page 32).

11. Feedback: If an income approach is less than net book value, there is likely some level of economic obsolescence present.

    Response: The department considers quantity and quality of the inputs to the cost, income, and market valuation models and the applicability and reliability of each model with reconciling the unit value during each valuation.

12. Feedback: The department's electric market segment capitalization rates are the lowest when compared to neighboring states and the states where the selected guideline companies are located.

    Response: The department also reviews other studies, as available, such as from states and companies. The department is not always able to compare the income model used by each jurisdiction and company, which makes the comparison incomplete. The department completes its study independently based on the market evidence as provided in the study. When the department posts the final version of this study, it will include Appendix I, Summary of Data Points from Other Studies.

13. Feedback: Recommendation for the department to use a capital structure of 32% debt, 68% equity, cost of debt between 4.50% and 5.00%, and a cost of equity between 9.20% and 9.30% for the electric market segment. Resulting in a yield rate for the electric market segment between 7.70% and 7.92%.

    Response: The department's yield rate for the electric market segment as shown in this draft publication uses a capital structure of 34% debt and 66% equity, cost of debt of 4.59%, and a cost of equity of 8.50%. Resulting in a yield rate of 7.20%.

This section of feedback is related to an open discussion after the department and industry presentations.

1. Feedback: The department's ex ante calculation assumes stable growth for the U.S. economy at an unrealistic length because growth is not likely to remain stable for that length of time.

   Response: The single-stage dividend growth model calculation uses a short-term growth forecast to estimate growth into perpetuity. However, the short-term growth estimates are typically much larger than the long-term growth estimates. The department applies the yield rate derived, in part from the ex ante calculation, to an income model that assumes zero growth. The department's multi-stage model more closely matches the assumptions in the income model than the single-stage model. See Growth section (page 27) and Appendix F.

2. Feedback: The department's yield-to-maturity calculation includes secured and unsecured debt.

Response: The department believes that if guideline companies are using both secured and unsecured debt as part of their financing, then the cost of debt should reflect that.

3. Feedback: The department's yield-to-maturity calculation does not include all of the debt issuances of the guideline companies. In one instance, it only includes a portion of one of the guideline company's debt.

   Response: The department analyzes a large amount of debt issuances of the guideline companies, as available. Each market segment's appendix includes a Current Actual Cost of Debt section that provides details of the debt issuances used. See Market Rate of Debt (page 18) and Appendix A – E (pages A-4 – A-7, B-4 – B-6, C-4 – C-6, D-4 – D-6, E-4 – E-7).

4. Feedback: A single-stage dividend growth model of the S&P 500 should be used instead of the department's 3-stage dividend growth model to calculate the ex ante equity risk premium. The single-stage is used by Colorado, Oklahoma, and possibly California.

   Response: The department's 3-stage dividend growth model uses the short-term growth expectations as the single stage model does and then utilizes a second stage to adjust that short-term growth estimate to the long-term, sustainable growth estimate and a third stage of a period of long-term sustainable growth. The single-stage model assumes the short-term growth estimate will continue into perpetuity. As discussed in the Growth section (page 27), a growth rate into perpetuity over the rate of growth in the economy is not sustainable.

   The department applies the yield rate derived, in part from the ex ante calculation, to an income model that assumes zero growth. The department's multi-stage model more closely matches the assumptions in the income model than the single-stage model. Also, other state jurisdictions use models similar to the department's model. See the department's ex ante equity risk premium calculation, Appendix F.

5. Feedback: The department's 3-stage dividend growth model needs to have the payout ratio adjusted; some sort of adjustment for type payout ratio.

   Response: The department does not currently adjust our 3-stage dividend growth model for a payout ratio.

   Note: After receiving comments during the Spring Forum about this topic, the department welcomed further information or feedback on this adjustment; we did not receive any in response to the Draft Study. We are willing to review research and calculations related to a payout adjustment, but will not be able to consider it in time for the 2019 assessment year.

Public Comments on Draft Study

The department posted the Draft 2019 Capitalization Rate Study on our website April 3, 2019. We accepted comments on the Draft Study until April 18, 2019. We appreciate the thoughtful responses we received. Your opinions and feedback are important, and we carefully considered every comment.

We received comments from ALLETE, Inc. (electric), Northern States Power (electric), Greater Minnesota Gas (gas distribution), Greater Minnesota Transmission (gas transmission pipeline), Northern Natural Gas (gas transmission Pipeline), Mid-American Pipeline (fluid transportation pipeline), BNSF Railway (railroad), and Union Pacific Railroad (railroad).

Below, we summarized the comments we received on the Draft Study, including our responses.

Cost of Equity

Several comments related to the selected cost of equity. These comments, although using different means, would result in a higher cost of equity. The comments about the cost of equity are summarized in the following topics:

- Less or no reliance on the Capital Asset Pricing Model.
- Include a size premium adjustment to the Capital Asset Pricing Model – Ex Post
- Adding additional models (Retention or Plow Back Model).
- Utilizing a company's allowed rate of return as an indication of the cost of equity.
- Utilizing a Cost of Equity Closer to the Interstate Natural Gas Pipeline Industry Study

Less reliance on the Capital Asset Pricing Model

Several comments suggest the department should place less reliance on the Capital Asset Pricing Model when selecting the indicated rate of equity, or cost of equity, for several market segments. These comments included reasons why the commenters do not agree with the CAPM and other models that the commenters find more reliable.

More reliance on the Dividend Growth Model (DGM) – Earnings

Some comments suggest the department should place more reliance on the DGM-Earnings model when selecting the cost of equity for several market segments.

For the electric market segment, one company noted that:

- For the 2018 study, the DGM-Earnings indicated a cost of equity of 9.10% and the selected cost of equity was 8.33%.
- For the 2019 study, the DGM-Earnings indicated a cost of equity of 9.65% and the selected cost of equity is 8.54%.

However, the selected cost of equity may not have increased as much as the company anticipated due to the decrease in the CAPM – Ex Post from 8.04% in the 2018 study to 7.19% in the 2019 study.

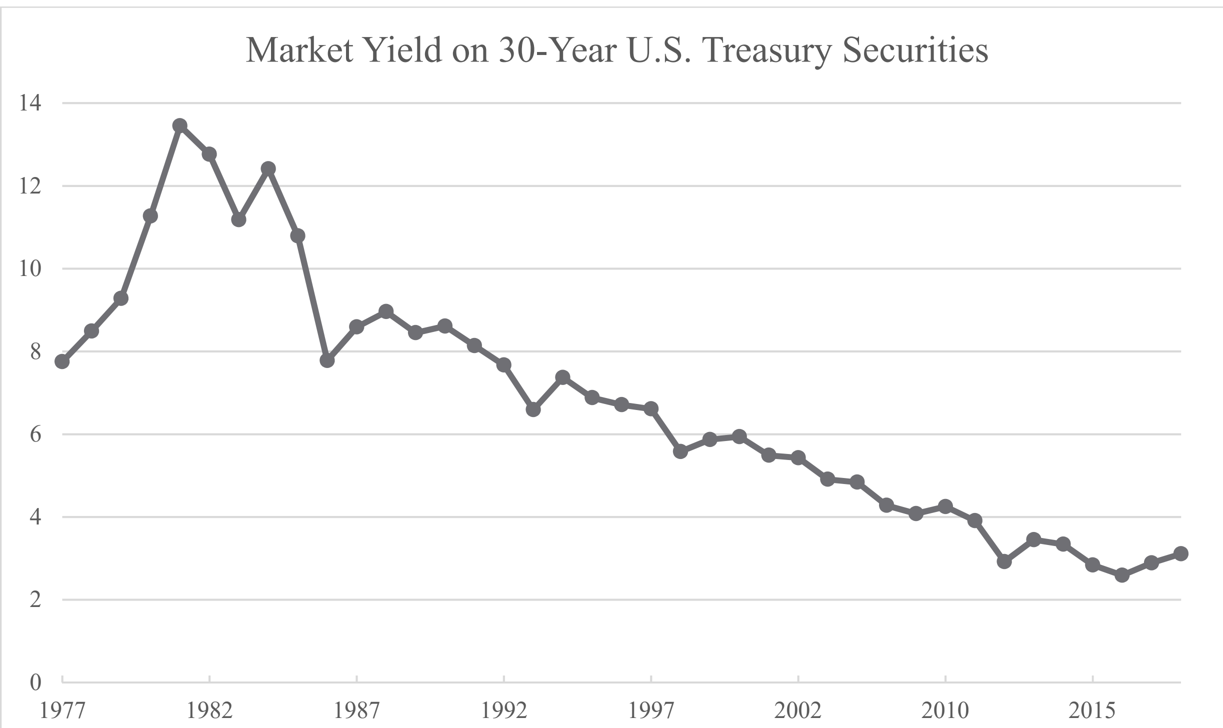
Another comment notes that the department questions the reliability of the DGM due to the growth in stock buybacks.

However, the department notes, the DGM – Earnings Model is a more reliable model because it uses the analysts' forecasts for growth in earnings as opposed to growth in dividends. We placed most reliance on the DGM – Earnings model when selecting the cost of equity for each market segment, except Other Railroads.[102]

The DGM – Earnings model uses analysts' short-term growth estimates and assumes the growth rate will continue into perpetuity. The selected rate is then used in an income model that assumes zero percent growth into perpetuity. The department hesitates to rely any further on a model that uses a short-term growth rate in an income model that assumes zero percent growth.

The risk-free rate in the CAPM is historically low
Some comments questioned the validity of the risk-free rate given that it is near historical lows, due to monetary policy. However, the downward trend in yields has continued for years.

Below is a chart of the historic yields on 30-Year U.S. Treasury Securities, downloaded from the Board of Governors of the Federal Reserve System's Data Download Program.[103] This chart clearly shows the long-term decline in yields.



The department includes an extensive discussion on the Risk-Free Rate (page 6).

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[102] The guideline companies for the Other Railroads market segment include Class I Railroads that pay dividends and a Class II and III Railroad company that does not pay dividends.

[103] Board of Governors of the Federal Reserve System. Data Download Program. Retrieved April 23, 2019 from https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15.

More reliance on the Empirical Capital Asset Pricing Model (ECAPM) as opposed to the traditional Capital Asset Pricing Model.
Some comments suggest the department should place more reliance on the ECAPM models instead of the traditional CAPM to reduce the impact of the beta – specifically in the electric market segment, where the beta is significantly lower than in the 2018 study. We have received comments in the past about not placing reliance on the ECAPM. However, the department notes that:

- Relying more on the ECAPM would result in a lower cost of capital for several market segments (those market segments with a beta greater than one).
- Comments from other market segments stated that our cost of equity is too low.

The department will not lower the cost of equity for some market segments by placing reliance on the ECAPM at this time. The department posted the Draft Study with an open comment period. Those market segments whose cost of equity would decrease by placing more weight on the ECAPM have advocated for a higher cost of equity during the comment period. Therefore, the department will not place more reliance on the ECAPM (lowering the cost of equity for some market segments).

Include a size premium adjustment to the Capital Asset Pricing Model – Ex Post
Some comments suggest the department should include size premium adjustment in the Capital Asset Pricing Model – Ex Post. We do not agree with making a size premium adjustment. See Company-Specific Risk (page 26).

Adding additional equity models
One comment suggested the department should consider a Retention Growth or Plowback model as another indicator for the cost of equity. This model, the commenter stated, is commonly considered by other states to determine the cost of equity or is a commonly accepted model presented to other states for their consideration.

Similar to the DGM, the Retention Growth model uses the sum of the guideline companies' dividend yields and a growth rate. The growth rate is calculated as the return on equity times the retention ratio for each guideline company.

However, the department notes that Brealey, Myers, & Marcus (2009) identify a similar calculation to measure the sustainable growth rate, but do not see it as a reasonable long-term prospect.[104] Their analysis indicates significant growth –further supporting the fact that, at this time, it is not a reasonable long-term prospect to use as a growth rate into perpetuity. We will continue to research this model.

Utilizing a company's allowed rate of return as an indication of the cost of equity.
Some comments suggest that in the regulated market segments – electric specifically – the indicated cost of equity should be in line with the allowed rate of return by state regulators.

Commenters stated that investors require the company to return at least the allowed rate of return to investors, or else they will go elsewhere with their investments. They note that it would be unusual for a

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[104] Brealey, R., Myers, S., Marcus, A. (2009). *Fundamentals of Corporate Finance.* 6th Ed. McGraw-Hill Irwin, New York, New York. ISBN 978-0-07-338230-2 p. 95.

utility to move forward with a potential project that it knows will not earn its allowed rate of return – because doing so would reduce the expected return for investors.

However, in the department's perspective, this process seems like the company may be treating the allowed rate of return as the hurdle rate when deciding which projects to move forward. This process for company decisions is not the same as the cost of capital established in this study.

One commenter noted that in a recent rate case, an expert for the Minnesota Public Utilities Commission (MPUC) testified that returns on equity less than 7% would not be reasonable and the MPUC approved 9.20% as the allowed return on equity for this company's current rate.

Another commenter noted that in its recent rate case, the MPUC approved 9.25% as the allowed return on equity and that the MPUC has granted higher allowed returns on equity for other utilities.

The department's cost of equity in this study for the electric market segment is 8.54%.

Utilizing a Cost of Equity Closer to the Interstate Natural Gas Pipeline Industry Study

Some comments suggest the indicated rate of equity should be similar to the cost of equity indicated in the Interstate Natural Gas Pipeline Industry Study. Commenters stated that the Interstate Study uses a method preferred by the Federal Energy Regulatory Commission (FERC) and methods adopted in a recent Tax Court decision.

Commenters noted that the department develops several models including two that, unlike the Interstate Study, utilize surveys (page 12). We use these different models to establish a range of acceptable value. We placed most reliance on the Dividend Growth Model (DGM) – Earnings and secondary reliance on the Capital Asset Pricing Model – Ex Post[105]. Similar to the Interstate Study, we completed a model similar to the model used by FERC. See Multi-Stage DGM (page 16).

Cost of Debt

The department received comments on our Yield to Maturity (YTM) calculation used as an indication of the cost of debt. The commenters stated that it appears that some companies' true debt portfolio is misrepresented in the YTM analysis, which:

- Only uses a few debt issues that may not give a clear picture of current long-term debt.
- Assumes that all debt issued by the guideline companies is standard, unsecured public debt – when in fact, it is not.

However, the department notes, at the State Assessed Property Spring Forum earlier this year, one presenter suggested a range for the cost of debt for the electric market segment between 4.50% and 5.0%. Our cost of debt is within that range at 4.59%.

Analyzing Cost of Debt

The department completes two analyses in calculating the cost of debt:

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[105] The guideline companies for the Other Railroads market segment include Class I Railroads that pay dividends and a Class II and III Railroad company that does not pay dividends.

- An indexing rate based on industrial and public utility bond yield averages listed in the Mergent Bond Record based on the debt ratings for each guideline company
- A YTM analysis

The averages listed in the Mergent Bond Record are for a wider industry (corporate, industrial, and public utility), than the market segments used by the department. With the YTM analysis, the department is able to use information specific to the guideline companies selected for each segment.

The department is not sure of the companies used in the Mergent Bond Record analysis. Below are two examples of issues using the indexing from Mergent Bond Record when we are unsure of the analysis behind the calculation:

1. PG&E Corp. and its primary operating subsidiary, Pacific Gas and Electric Co. filed voluntary petitions under Chapter 11 of the U.S. Bankruptcy Code in the U.S. Bankruptcy Court for the Northern District of California on January 29, 2019.[106] We do not know if this company was included in the Mergent Bond Record yield averages.
2. We analyze several potential guideline companies for each market segment. For the electric segment, we analyzed 44 companies and selected 14 as guideline companies. We selected 4 guideline companies for the gas transmission pipeline segment and 6 for the fluid transportation pipeline segment; we did not include 83 other companies that we did not use as guideline companies. See Appendix H – Guideline Company Selection (beginning on page H-1).

The department provides an extensive discussion on our analyses. We have provided presentations at the last two State Assessed Property Spring Forums and we provide details of the information used in each market segment's appendix. See Market Rate of Debt (page 18, A-3, B-3, C-3, D-3, and E-3).

Direct Capitalization Rate

Some comments suggest that the direct capitalization rate is not applicable to the appraisal of rate-regulated companies. They specifically mention that:

- Potential liquidity issues are inherent in the equity component but not in the underlying assets the department is valuing.
- The direct rate may include intangible value.
- Support for this method is not found in any appraisal text, and applying rates from the stock market to regulated, fixed assets is mixing apples and oranges.

The department also received comments that the direct capitalization rate is not the same as the capitalization technique described in appraisal texts, which uses property transactions.

However, the department notes that several other states utilize a direct capitalization rate model and the Western States Association of Tax Administrator's Appraisal Handbook discusses the applicability of

[106]https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20190129_pge_files_for_reorganization_under_chapter_11, accessed 2/20/2019.

the direct capitalization rate model. The department will continue to develop a direct capitalization rate and apply it in a direct capitalization model.

While the department uses the direct capitalization rate to establish a range of value for each company, we have not historically placed significant reliance on the direct capitalization model. Also, the yield rates developed in this study also use information derived from the stock market.

The department discusses liquidity in another section of this study. See Illiquidity (page 27).

Different rates for rural and urban systems

One comment suggested the department should use different costs of capital for urban and rural gas distribution and gas transmission pipeline systems. The comments stated:

> *The department considers the valuation of rural and urban systems identically; and it does so by considering the actual depreciated cost of the system and the discounted cash flow of the system. The comments continued that the approach, in theory, tracks the process used by rate makers in establishing rates, the system fails to fairly recognize the differences in value of the systems due to the underlying franchise rights secured by location. A distribution system built to serve a market with existing sewer and water services present indicate continued development in that area. A distribution systems built in an area that is not developed area is based on agreements that predicate the longevity and profitability of the system on the economic viability of the enterprises being served and for which the system is specifically built. It is much less likely for additional or replacement enterprises to develop in rural Minnesota than in developed areas with existing water and sewer services.*

The department will continue to use the same yield and direct rate for each company within a market segment as outlined in this report. See Company-Specific Risk (page 26).

In addition, the department notes that some gas distribution companies serve both urban and rural areas. To analyze the impacts of serving different market areas is beyond the scope of this study. However, we value these properties following Minnesota Rules, part 8100. This rule calls for a three-year weighted average of net operating income as an estimation of the company's future earnings.

This backward-looking estimating of future earnings means the department is not considering the same growth potential for every company. Instead we use the companies' actual earnings, on an individual basis, for individual valuations. The earnings of each individual company would reflect locational factors.

Flotation Costs

Some comments suggest the department should include a flotation cost adjustment in the cost of capital. However, the department does not agree with using flotation costs adjustments, as outlined in this report. See Flotation Costs (page 26).

Other States Use a Higher Cost of Equity or Cost of Capital

Some comments note that other states have concluded higher costs of equity or higher costs of capital in their own studies and also industry-presented studies.

The department appreciates the studies provided and has researched other studies in addition to the studies or rates presented. We review these studies to understand what rates others are calculating as well as the different models and inputs these rates are based on. We compiled information available in other academic, industry, or state agency studies in Appendix I – Summary of Data Points from Other Studies (beginning on page I-1).

However, it's important to note: While other studies also estimate the cost of capital, those completing the studies may use them for different purposes or models – or may apply the results to different income levels – than the department.

The department also notes that the U.S. Surface Transportation Board determined that four class I railroads (including BNSF Railway, Soo Line Corporation, and Union Pacific Railroad Company) are revenue adequate for the year 2017. The ruling means "those railroads achieved a rate of return equal to or greater than the Board's calculation of the average cost of capital to the freight rail industry."[107]

Guideline Companies

Some comments suggest the department should consider more guideline companies for the Gas Transmission Pipeline market segment, though the commenter agrees with the department's use of corporations as opposed to master limited partnerships.

However, the department does not believe using the Value Line groupings as guideline companies for a particular market segment will allow the best group of guideline companies. We go through extensive review of each company to ensure it is a proper guideline company for the market segment. See Appendix H – Guideline Company Selection (beginning on page H-1).

Capital Structure

Some comments suggest the department should adjust the capital structure for the Railroad Class I market segment to more closely align with the median rates of the selected guideline companies.

The department agrees and adjusted the capital structure in this study for the Railroad Class I market segment to 19% long-term debt and 81% equity, resulting in a yield rate of 10.73%. The draft study used a capital structure of 20% long-term debt and 80% equity, resulting in a yield rate of 10.66%.

Liquidity/Illiquidity Adjustments

Some comments suggest the department should include an illiquidity adjustment in the cost of capital, both cost of debt and cost of equity, as the department is valuing less-liquid assets than those used to derive the rates.

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[107] Surface Transportation Board, Railroad Revenue Adequacy – 2017 Determination, Docket No. EP 552 (Sub-No. 22), December 21, 2018. Retrieved from https://www.stb.gov/Decisions/readingroom.nsf/WEBUNID/0678915D87F0444F85258367007749E5?OpenDocument.

However, the department notes that several recent transactions for companies in the same market segments included in this study were stock transactions. Below are some of the recent transactions:

- Enbridge Inc. announced December 20, 2018, that it completed mergers with Enbridge Energy Partners L.P. (EEP) and Enbridge Energy Management LLC (EEQ). Enbridge acquired all outstanding public Class A common units of EEP and all outstanding public Listed Shares of EEQ; both EEP and EEQ became wholly owned subsidiaries of Enbridge[108]
- Enbridge Inc. announced December 17, 2018, that it completed a merger with Spectra Energy Partners LP. Enbridge acquired all outstanding public common units of SEP, which became a wholly owned subsidiary of Enbridge.[109]
- Encana Corp. announced February 13, 2019, that it completed its acquisition of Newfield Exploration Co. in an all-stock transaction.[110]
- Dominion Energy Inc. and Dominion Energy Midstream Partners LP completed their proposed merger on January 28, 2019. Dominion Energy acquired all outstanding public common units of Dominion Energy Midstream Partners, which became a wholly owned subsidiary of Dominion Energy. [111]
- Great Plains Energy Inc., which serves customers as KCP&L and Westar Energy Inc., announced May 24, 2018, that it received final regulatory approval of an all-stock merger from the Kansas Corporation Commission and Missouri Public Service Commission. The stock-for-stock merger creates a holding company, Every Inc., with about $15 billion equity value. Its principal business will be conducted by the operating companies Westar and KCP&L.[112]

The department does not agree with adding an adjustment for illiquidity. See Illiquidity (page 27).

Questions?

If you have questions about the 2019 Capitalization Rate Study, contact Holly Soderbeck at 651-556-6119 or sa.property@state.mn.us.

[108] https://www.enbridgepartners.com/Media-Center/News.aspx?queryYear=2018&ReleaseId=123009, accessed 3/6/2019.

[109] https://www.enbridge.com/media-center/news/details?id=123546&lang=en, accessed 3/6/2019.

[110] https://www.encana.com/news-stories/news-releases/details.html?release=17261, accessed 3/8/2019.

[111] http://www.dommidstream.com/, accessed 2/27/2019.

[112] http://www.evergyinc.com/news-releases/news-release-details/merger-great-plains-energy-and-westar-energy-approved-paving-way, accessed 2/20/2019.

Appendix A - Electric

Yield Rate

	Capital Structure	Rate	Composite
Long-Term Debt	34.00%	4.59%	1.56%
Common Equity	66.00%	8.54%	5.64%
Yield Rate			**7.20%**

Electric Yield Rate	**7.20%**

Capital Structure

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
ALLETE Inc.	1,461,700,000	None	4,120,133,744	5,581,833,744	26.19%	None	73.81%
Alliant Energy Corp	5,248,200,000	400,000,000	10,893,185,758	16,541,385,758	31.73%	2.42%	65.85%
Ameren Corp	7,614,000,000	142,000,000	17,110,477,272	24,866,477,272	30.62%	0.57%	68.81%
American Electric Power Co Inc.	20,870,000,000	None	38,669,594,213	59,539,594,213	35.05%	None	64.95%
Black Hills Corp	2,951,400,000	None	3,824,581,517	6,775,981,517	43.56%	None	56.44%
CMS Energy Corp	8,944,000,000	37,000,000	14,891,263,497	23,872,263,497	37.47%	0.15%	62.38%
DTE Energy Co	13,620,000,000	None	21,680,005,110	35,300,005,110	38.58%	None	61.42%
Entergy Corp	15,802,000,000	197,800,000	16,118,034,291	32,117,834,291	49.20%	0.62%	50.18%
MGE Energy Inc.	494,400,000	None	2,242,350,172	2,736,750,172	18.07%	None	81.93%
NorthWestern Corp	2,038,900,000	None	3,067,570,964	5,106,470,964	39.93%	None	60.07%
OGE Energy Corp	2,896,800,000	None	8,003,273,862	10,900,073,862	26.58%	None	73.42%
Otter Tail Corp	590,000,000	None	1,899,154,646	2,489,154,646	23.70%	None	76.30%
WEC Energy Group	9,119,000,000	30,400,000	23,121,749,017	32,271,149,017	28.26%	0.09%	71.65%
Xcel Energy Inc.	16,501,000,000	None	25,735,694,237	42,236,694,237	39.07%	None	60.93%

Mean	33.43%	0.77%	66.30%
Median	33.39%	0.57%	65.40%

Indicated Industry Capital Structure	**34.00%**	**0%**	**66.00%**

We placed more reliance on the median when selecting the indicated capital structure for the market segment, rounding to 34% debt and 66% equity.

Indexed Rate of Debt

Company	Debt Rating	Long-Term Debt Rate
ALLETE Inc.	A3	4.37%
Alliant Energy Corp	Baa1	4.92%
Ameren Corp	Baa1	4.92%
American Electric Power Co Inc.	Baa1	4.92%
Black Hills Corp	Baa2	4.92%
CMS Energy Corp	Baa1	4.92%
DTE Energy Co	Baa1	4.92%
Entergy Corp	Baa2	4.92%
MGE Energy Inc.	A1	4.37%
NorthWestern Corp	A3	4.37%
OGE Energy Corp	Baa1	4.92%
Otter Tail Corp	Baa2	4.92%
WEC Energy Group	Baa1	4.92%
Xcel Energy Inc.	Baa1	4.92%

Mean	4.80%
Median	4.92%
Mode	4.92%

Public Utility Bond Yield Averages from Mergent Bond Record, January 2019 Edition

Public Utility Bond Averages, December 2018

Mergent	S&P	Yield Avg.
Aaa	AAA	
Aa1	AA+	
Aa2	AA	
Aa3	AA-	4.24
A1	A+	
A2	A	
A3	A-	4.37
Baa1	BBB+	
Baa2	BBB	
Baa3	BBB-	4.92

Current Actual Cost of Debt

Yield-to-Maturities (YTMs) are based on year-end filings of Form N-Q or 10-K with the SEC.

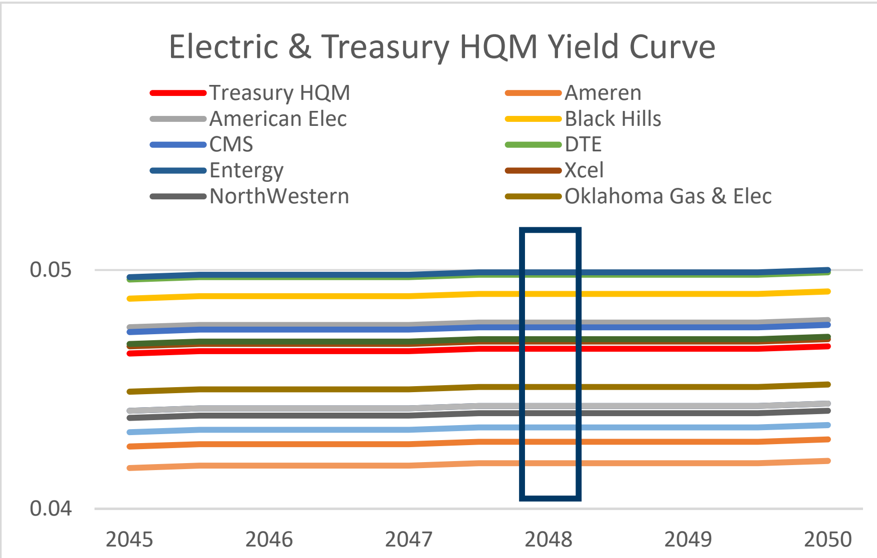
$$p = \sum_{i=1}^{n} d(t_i)c_i + \sum_{j=1}^{m} b_j x_j + e$$

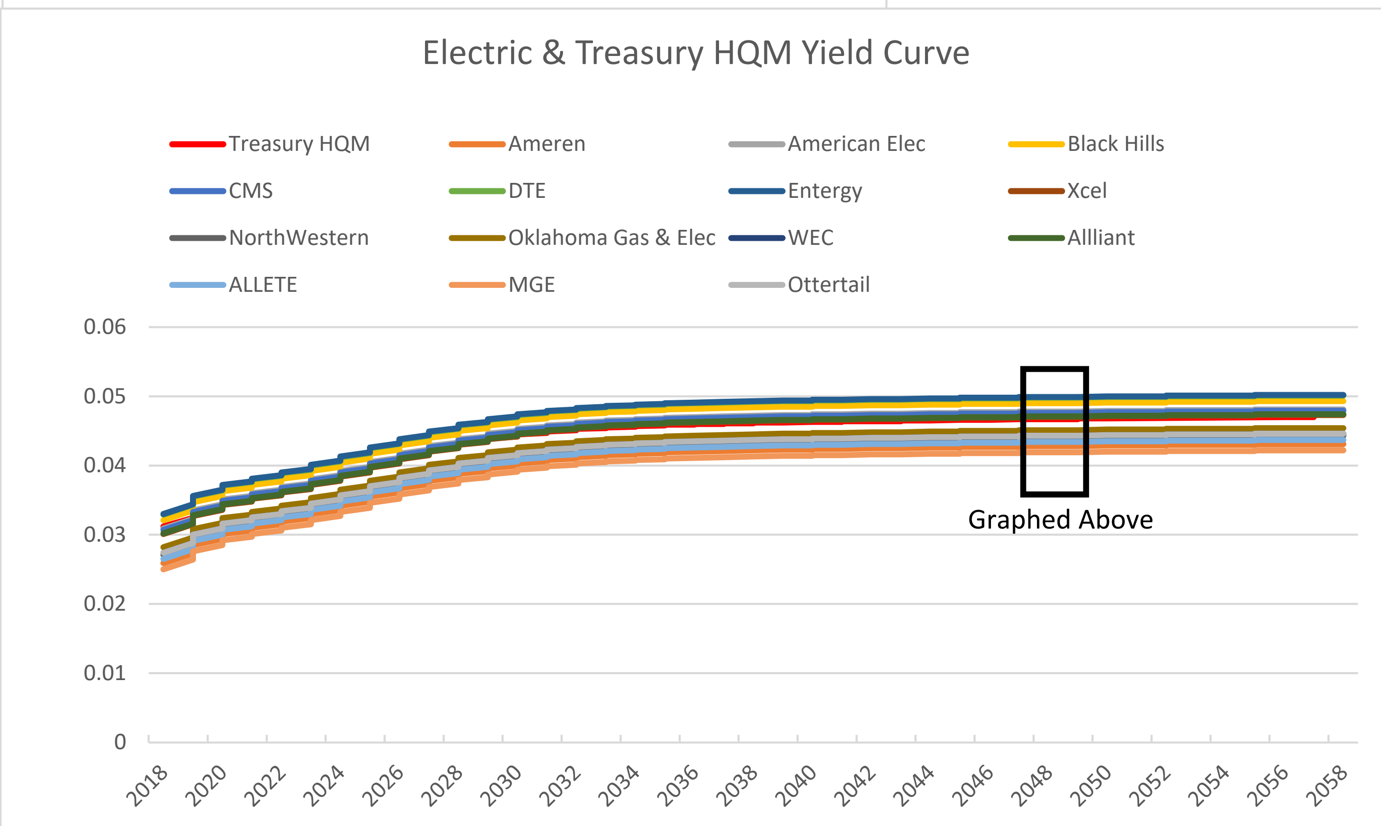
30-year YTMs are based on an observed spread to the Treasury Quality Market Corporate Bond Spot rate curve (equation to the left) and followed out to 30 years.

Indicated Rate of Debt	4.59%

Average YTM at 2048 in below graph.

See Appendix G for more information about debt issuances.





	Treasury HQM	ALLETE	Alliant	Ameren	American Elec	Black Hills	CMS	DTE	Entergy	MGE	NorthWestern	Oklahoma Gas & Ele	Ottertail	WEC	Xcel
2018.5	2.98%	2.65%	3.02%	2.59%	3.09%	3.21%	3.07%	3.29%	3.30%	2.50%	2.71%	2.82%	2.65%	2.74%	3.01%
2019	3.12%	2.79%	3.16%	2.73%	3.23%	3.35%	3.21%	3.43%	3.44%	2.64%	2.85%	2.96%	2.79%	2.88%	3.15%
2019.5	3.24%	2.91%	3.28%	2.85%	3.35%	3.47%	3.33%	3.55%	3.56%	2.76%	2.97%	3.08%	2.91%	3.00%	3.27%
2020	3.33%	3.00%	3.37%	2.94%	3.44%	3.56%	3.42%	3.64%	3.65%	2.85%	3.06%	3.17%	3.00%	3.09%	3.36%
2020.5	3.40%	3.07%	3.44%	3.01%	3.51%	3.63%	3.49%	3.71%	3.72%	2.92%	3.13%	3.24%	3.07%	3.16%	3.43%
2021	3.45%	3.12%	3.49%	3.06%	3.56%	3.68%	3.54%	3.76%	3.77%	2.97%	3.18%	3.29%	3.12%	3.21%	3.48%
2021.5	3.49%	3.16%	3.53%	3.10%	3.60%	3.72%	3.58%	3.80%	3.81%	3.01%	3.22%	3.33%	3.16%	3.25%	3.52%
2022	3.54%	3.21%	3.58%	3.15%	3.65%	3.77%	3.63%	3.85%	3.86%	3.06%	3.27%	3.38%	3.21%	3.30%	3.57%
2022.5	3.58%	3.25%	3.62%	3.19%	3.69%	3.81%	3.67%	3.89%	3.90%	3.10%	3.31%	3.42%	3.25%	3.34%	3.61%
2023	3.63%	3.30%	3.67%	3.24%	3.74%	3.86%	3.72%	3.94%	3.95%	3.15%	3.36%	3.47%	3.30%	3.39%	3.66%
2023.5	3.69%	3.36%	3.73%	3.30%	3.80%	3.92%	3.78%	4.00%	4.01%	3.21%	3.42%	3.53%	3.36%	3.45%	3.72%
2024	3.75%	3.42%	3.79%	3.36%	3.86%	3.98%	3.84%	4.06%	4.07%	3.27%	3.48%	3.59%	3.42%	3.51%	3.78%
2024.5	3.81%	3.48%	3.85%	3.42%	3.92%	4.04%	3.90%	4.12%	4.13%	3.33%	3.54%	3.65%	3.48%	3.57%	3.84%
2025	3.87%	3.54%	3.91%	3.48%	3.98%	4.10%	3.96%	4.18%	4.19%	3.39%	3.60%	3.71%	3.54%	3.63%	3.90%
2025.5	3.94%	3.61%	3.98%	3.55%	4.05%	4.17%	4.03%	4.25%	4.26%	3.46%	3.67%	3.78%	3.61%	3.70%	3.97%
2026	4.00%	3.67%	4.04%	3.61%	4.11%	4.23%	4.09%	4.31%	4.32%	3.52%	3.73%	3.84%	3.67%	3.76%	4.03%
2026.5	4.06%	3.73%	4.10%	3.67%	4.17%	4.29%	4.15%	4.37%	4.38%	3.58%	3.79%	3.90%	3.73%	3.82%	4.09%
2027	4.12%	3.79%	4.16%	3.73%	4.23%	4.35%	4.21%	4.43%	4.44%	3.64%	3.85%	3.96%	3.79%	3.88%	4.15%
2027.5	4.17%	3.84%	4.21%	3.78%	4.28%	4.40%	4.26%	4.48%	4.49%	3.69%	3.90%	4.01%	3.84%	3.93%	4.20%
2028	4.22%	3.89%	4.26%	3.83%	4.33%	4.45%	4.31%	4.53%	4.54%	3.74%	3.95%	4.06%	3.89%	3.98%	4.25%
2028.5	4.27%	3.94%	4.31%	3.88%	4.38%	4.50%	4.36%	4.58%	4.59%	3.79%	4.00%	4.11%	3.94%	4.03%	4.30%
2029	4.31%	3.98%	4.35%	3.92%	4.42%	4.54%	4.40%	4.62%	4.63%	3.83%	4.04%	4.15%	3.98%	4.07%	4.34%
2029.5	4.35%	4.02%	4.39%	3.96%	4.46%	4.58%	4.44%	4.66%	4.67%	3.87%	4.08%	4.19%	4.02%	4.11%	4.38%
2030	4.39%	4.06%	4.43%	4.00%	4.50%	4.62%	4.48%	4.70%	4.71%	3.91%	4.12%	4.23%	4.06%	4.15%	4.42%
2030.5	4.42%	4.09%	4.46%	4.03%	4.53%	4.65%	4.51%	4.73%	4.74%	3.94%	4.15%	4.26%	4.09%	4.18%	4.45%
2031	4.45%	4.12%	4.49%	4.06%	4.56%	4.68%	4.54%	4.76%	4.77%	3.97%	4.18%	4.29%	4.12%	4.21%	4.48%
2031.5	4.47%	4.14%	4.51%	4.08%	4.58%	4.70%	4.56%	4.78%	4.79%	3.99%	4.20%	4.31%	4.14%	4.23%	4.50%
2032	4.49%	4.16%	4.53%	4.10%	4.60%	4.72%	4.58%	4.80%	4.81%	4.01%	4.22%	4.33%	4.16%	4.25%	4.52%
2032.5	4.51%	4.18%	4.55%	4.12%	4.62%	4.74%	4.60%	4.82%	4.83%	4.03%	4.24%	4.35%	4.18%	4.27%	4.54%
2033	4.53%	4.20%	4.57%	4.14%	4.64%	4.76%	4.62%	4.84%	4.85%	4.05%	4.26%	4.37%	4.20%	4.29%	4.56%
2033.5	4.54%	4.21%	4.58%	4.15%	4.65%	4.77%	4.63%	4.85%	4.86%	4.06%	4.27%	4.38%	4.21%	4.30%	4.57%
2034	4.55%	4.22%	4.59%	4.16%	4.66%	4.78%	4.64%	4.86%	4.87%	4.07%	4.28%	4.39%	4.22%	4.31%	4.58%
2034.5	4.56%	4.23%	4.60%	4.17%	4.67%	4.79%	4.65%	4.87%	4.88%	4.08%	4.29%	4.40%	4.23%	4.32%	4.59%
2035	4.57%	4.24%	4.61%	4.18%	4.68%	4.80%	4.66%	4.88%	4.89%	4.09%	4.30%	4.41%	4.24%	4.33%	4.60%
2035.5	4.58%	4.25%	4.62%	4.19%	4.69%	4.81%	4.67%	4.89%	4.90%	4.10%	4.31%	4.42%	4.25%	4.34%	4.61%
2036	4.59%	4.26%	4.63%	4.20%	4.70%	4.82%	4.68%	4.90%	4.91%	4.11%	4.32%	4.43%	4.26%	4.35%	4.62%
2036.5	4.59%	4.26%	4.63%	4.20%	4.70%	4.82%	4.68%	4.90%	4.91%	4.11%	4.32%	4.43%	4.26%	4.35%	4.62%
2037	4.60%	4.27%	4.64%	4.21%	4.71%	4.83%	4.69%	4.91%	4.92%	4.12%	4.33%	4.44%	4.27%	4.36%	4.63%
2037.5	4.60%	4.27%	4.64%	4.21%	4.71%	4.83%	4.69%	4.91%	4.92%	4.12%	4.33%	4.44%	4.27%	4.36%	4.63%
2038	4.61%	4.28%	4.65%	4.22%	4.72%	4.84%	4.70%	4.92%	4.93%	4.13%	4.34%	4.45%	4.28%	4.37%	4.64%
2038.5	4.61%	4.28%	4.65%	4.22%	4.72%	4.84%	4.70%	4.92%	4.93%	4.13%	4.34%	4.45%	4.28%	4.37%	4.64%

2039	4.62%	4.29%	4.66%	4.23%	4.73%	4.85%	4.71%	4.93%	4.94%	4.14%	4.35%	4.46%	4.29%	4.38%	4.65%
2039.5	4.62%	4.29%	4.66%	4.23%	4.73%	4.85%	4.71%	4.93%	4.94%	4.14%	4.35%	4.46%	4.29%	4.38%	4.65%
2040	4.62%	4.29%	4.66%	4.23%	4.73%	4.85%	4.71%	4.93%	4.94%	4.14%	4.35%	4.46%	4.29%	4.38%	4.65%
2040.5	4.63%	4.30%	4.67%	4.24%	4.74%	4.86%	4.72%	4.94%	4.95%	4.15%	4.36%	4.47%	4.30%	4.39%	4.66%
2041	4.63%	4.30%	4.67%	4.24%	4.74%	4.86%	4.72%	4.94%	4.95%	4.15%	4.36%	4.47%	4.30%	4.39%	4.66%
2041.5	4.63%	4.30%	4.67%	4.24%	4.74%	4.86%	4.72%	4.94%	4.95%	4.15%	4.36%	4.47%	4.30%	4.39%	4.66%
2042	4.64%	4.31%	4.68%	4.25%	4.75%	4.87%	4.73%	4.95%	4.96%	4.16%	4.37%	4.48%	4.31%	4.40%	4.67%
2042.5	4.64%	4.31%	4.68%	4.25%	4.75%	4.87%	4.73%	4.95%	4.96%	4.16%	4.37%	4.48%	4.31%	4.40%	4.67%
2043	4.64%	4.31%	4.68%	4.25%	4.75%	4.87%	4.73%	4.95%	4.96%	4.16%	4.37%	4.48%	4.31%	4.40%	4.67%
2043.5	4.64%	4.31%	4.68%	4.25%	4.75%	4.87%	4.73%	4.95%	4.96%	4.16%	4.37%	4.48%	4.31%	4.40%	4.67%
2044	4.65%	4.32%	4.69%	4.26%	4.76%	4.88%	4.74%	4.96%	4.97%	4.17%	4.38%	4.49%	4.32%	4.41%	4.68%
2044.5	4.65%	4.32%	4.69%	4.26%	4.76%	4.88%	4.74%	4.96%	4.97%	4.17%	4.38%	4.49%	4.32%	4.41%	4.68%
2045	4.65%	4.32%	4.69%	4.26%	4.76%	4.88%	4.74%	4.96%	4.97%	4.17%	4.38%	4.49%	4.32%	4.41%	4.68%
2045.5	4.66%	4.33%	4.70%	4.27%	4.77%	4.89%	4.75%	4.97%	4.98%	4.18%	4.39%	4.50%	4.33%	4.42%	4.69%
2046	4.66%	4.33%	4.70%	4.27%	4.77%	4.89%	4.75%	4.97%	4.98%	4.18%	4.39%	4.50%	4.33%	4.42%	4.69%
2046.5	4.66%	4.33%	4.70%	4.27%	4.77%	4.89%	4.75%	4.97%	4.98%	4.18%	4.39%	4.50%	4.33%	4.42%	4.69%
2047	4.66%	4.33%	4.70%	4.27%	4.77%	4.89%	4.75%	4.97%	4.98%	4.18%	4.39%	4.50%	4.33%	4.42%	4.69%
2047.5	4.67%	4.34%	4.71%	4.28%	4.78%	4.90%	4.76%	4.98%	4.99%	4.19%	4.40%	4.51%	4.34%	4.43%	4.70%
2048	**4.67%**	**4.34%**	**4.71%**	**4.28%**	**4.78%**	**4.90%**	**4.76%**	**4.98%**	**4.99%**	**4.19%**	**4.40%**	**4.51%**	**4.34%**	**4.43%**	**4.70%**
2048.5	4.67%	4.34%	4.71%	4.28%	4.78%	4.90%	4.76%	4.98%	4.99%	4.19%	4.40%	4.51%	4.34%	4.43%	4.70%
2049	4.67%	4.34%	4.71%	4.28%	4.78%	4.90%	4.76%	4.98%	4.99%	4.19%	4.40%	4.51%	4.34%	4.43%	4.70%
2049.5	4.67%	4.34%	4.71%	4.28%	4.78%	4.90%	4.76%	4.98%	4.99%	4.19%	4.40%	4.51%	4.34%	4.43%	4.70%
2050	4.68%	4.35%	4.72%	4.29%	4.79%	4.91%	4.77%	4.99%	5.00%	4.20%	4.41%	4.52%	4.35%	4.44%	4.71%
2050.5	4.68%	4.35%	4.72%	4.29%	4.79%	4.91%	4.77%	4.99%	5.00%	4.20%	4.41%	4.52%	4.35%	4.44%	4.71%
2051	4.68%	4.35%	4.72%	4.29%	4.79%	4.91%	4.77%	4.99%	5.00%	4.20%	4.41%	4.52%	4.35%	4.44%	4.71%
2051.5	4.68%	4.35%	4.72%	4.29%	4.79%	4.91%	4.77%	4.99%	5.00%	4.20%	4.41%	4.52%	4.35%	4.44%	4.71%
2052	4.68%	4.35%	4.72%	4.29%	4.79%	4.91%	4.77%	4.99%	5.00%	4.20%	4.41%	4.52%	4.35%	4.44%	4.71%
2052.5	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2053	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2053.5	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2054	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2054.5	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2055	4.69%	4.36%	4.73%	4.30%	4.80%	4.92%	4.78%	5.00%	5.01%	4.21%	4.42%	4.53%	4.36%	4.45%	4.72%
2055.5	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%
2056	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%
2056.5	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%
2057	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%
2057.5	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%
2058	4.70%	4.37%	4.74%	4.31%	4.81%	4.93%	4.79%	5.01%	5.02%	4.22%	4.43%	4.54%	4.37%	4.46%	4.73%

Indicated Rate of Equity

Model	Rate
CAPM - Ex Post	7.19%
CAPM - Supply Side	6.72%
CAPM - Three Stage Ex Ante	6.42%
CAPM - Damodaran	6.61%
CAPM - Duff & Phelps	6.86%
CAPM - Graham and Harvey	5.67%
CAPM - Fernandez, Pershin, and Acin	6.26%
Empirical CAPM - Ex Post	7.86%
Empirical CAPM - Supply Side	7.31%
Empirical CAPM - Three Stage Ex Ante	6.97%
Empirical CAPM - Damodaran	7.19%
Empirical CAPM - Duff & Phelps	7.39%
Empirical CAPM - Graham and Harvey	6.10%
Empirical CAPM - Fernandez, Pershin, and Acin	6.79%
DGM - Dividend Growth	8.80%
DGM - Earnings Growth	9.65%
Multi-Stage DGM	8.77%
Indicated Rate of Equity	**8.54%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance on the Dividend Growth Model - Earnings Growth and secondary reliance on the Capital Asset Pricing Model using the Ex Post equity risk premium.

Direct Rate and Growth

	Capital Structure	Rate	Composite
Debt Component	34.00%	4.59%	1.56%
Equity Component	66.00%	4.80%	3.17%
Direct Rate			**4.73%**

Direct Rate	**4.73%**

Yield Rate	7.20%
Direct Rate	4.73%
Implied Industry Growth Rate	**2.47%**

Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	0.61	4.22%	2.97%	7.19%
Supply Side[3]	6.14%	0.61	3.75%	2.97%	6.72%
Three Stage Ex Ante[4]	5.65%	0.61	3.45%	2.97%	6.42%
Dr. Damodaran ERP[5]	5.96%	0.61	3.64%	2.97%	6.61%
Duff & Phelps[6]	5.50%	0.61	3.36%	3.50%	6.86%
Graham and Harvey[7]	4.42%	0.61	2.70%	2.97%	5.67%
Fernandez, Pershin and Acin[8]	5.40%	0.61	3.29%	2.97%	6.26%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	0.61	3.16%	1.73%	2.97%	**7.86%**
Supply Side[3]	6.14%	0.61	2.81%	1.54%	2.97%	**7.31%**
Three Stage Ex Ante[4]	5.65%	0.61	2.58%	1.41%	2.97%	**6.97%**
Dr. Damodaran ERP[5]	5.96%	0.61	2.73%	1.49%	2.97%	**7.19%**
Duff & Phelps[6]	5.50%	0.61	2.52%	1.38%	3.50%	**7.39%**
Graham and Harvey[7]	4.42%	0.61	2.02%	1.11%	2.97%	**6.10%**
Fernandez, Pershin and Acin[8]	5.40%	0.61	2.47%	1.35%	2.97%	**6.79%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

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7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Dividend Growth Model

Company	Current Dividend Yield (DY)	Projected Short-term EPS Growth Rate (EG)	Projected Short-term Dividend Growth Rate (DG)	Cost of Equity Earnings Growth DY + EG	Cost of Equity Dividend Growth DY + EG
ALLETE Inc.	2.90%	3.50%	4.50%	6.40%	7.40%
Alliant Energy Corp	2.90%	6.50%	6.00%	9.40%	8.90%
Ameren Corp	2.80%	7.50%	5.50%	10.30%	8.30%
American Electric Power Co Inc.	3.50%	4.50%	6.00%	8.00%	9.50%
Black Hills Corp	3.20%	6.50%	6.00%	9.70%	9.20%
CMS Energy Corp	2.90%	7.00%	7.00%	9.90%	9.90%
DTE Energy Co	3.20%	7.50%	6.50%	10.70%	9.70%
Entergy Corp	4.10%	1.00%	2.00%	5.10%	6.10%
MGE Energy Inc.	2.10%	7.50%	5.00%	9.60%	7.10%
NorthWestern Corp	3.80%	2.50%	4.50%	6.30%	8.30%
OGE Energy Corp	3.70%	6.00%	8.00%	9.70%	11.70%
Otter Tail Corp	2.90%	9.00%	3.50%	11.90%	6.40%
WEC Energy Group	3.20%	7.00%	6.00%	10.20%	9.20%
Xcel Energy Inc.	3.20%	5.50%	5.50%	8.70%	8.70%
Mean	3.17%	5.82%	5.43%	8.99%	8.60%
Median	3.20%	6.50%	5.75%	9.65%	8.80%

DGM - Dividend Growth, Indicated Rate	**8.80%**
DGM - Earnings Growth, Indicated Rate	**9.65%**

We placed more reliance on the median to arrive at the indicated rates for DGM - Earnings Growth and DGM - Dividend Growth.

Notes:

Dividend Yield and growth rates provided by Value Line

Multi-Stage Dividend Growth Model

$K_E = (DY \times (1 + 0.5(G))) + 0.67(G1) + 0.33(g)$

K_E Cost of Equity
DY Dividend Yield
G_1 Short-term Growth Estimate
g Stable Growth
G Average Growth Rate

Company	DY Dividend Yield	G1 Short-term Growth Estimate	g Stable Growth	G Average Growth Rate	K_E Cost of Equity
ALLETE Inc.	2.90%	3.50%	3.90%	3.70%	6.59%
Alliant Energy Corp	2.90%	6.50%	3.90%	5.20%	8.62%
Ameren Corp	2.80%	7.50%	3.90%	5.70%	9.19%
American Electric Power Co Inc.	3.50%	4.50%	3.90%	4.20%	7.88%
Black Hills Corp	3.20%	6.50%	3.90%	5.20%	8.93%
CMS Energy Corp	2.90%	7.00%	3.90%	5.45%	8.96%
DTE Energy Co	3.20%	7.50%	3.90%	5.70%	9.60%
Entergy Corp	4.10%	1.00%	3.90%	2.45%	6.11%
MGE Energy Inc.	2.10%	7.50%	3.90%	5.70%	8.47%
NorthWestern Corp	3.80%	2.50%	3.90%	3.20%	6.82%
OGE Energy Corp	3.70%	6.00%	3.90%	4.95%	9.10%
Otter Tail Corp	2.90%	9.00%	3.90%	6.45%	10.31%
WEC Energy Group	3.20%	7.00%	3.90%	5.45%	9.26%
Xcel Energy Inc.	3.20%	5.50%	3.90%	4.70%	8.25%
				Mean	8.43%
				Median	8.77%
				Multi-Stage DGM, Indicated Rate	**8.77%**

We placed more reliance on the median when selecting the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates, Next 5 Years for Earnings provided Value Line

Stable growth rate is the nominal growth rate determined in the Capitalization Rate Study Narrative (indicated long-term growth rate of the U.S. economy of 1.9% plus the expected inflation rate of 2.0%).

Equity Component of the Direct Rate

Company	Value Line P/E Ratio
ALLETE Inc.	23.2
Alliant Energy Corp	21.1
Ameren Corp	22.2
American Electric Power Co Inc.	20.6
Black Hills Corp	19.5
CMS Energy Corp	22.9
DTE Energy Co	19.7
Entergy Corp	18.8
MGE Energy Inc.	25.6
NorthWestern Corp	18.1
OGE Energy Corp	19.7
Otter Tail Corp	21.6
WEC Energy Group	21.9
Xcel Energy Inc.	20.3
Mean	21.09
Median	20.85
Selected Price to Earnings (P/E) Ratio	20.85
Indicated Equity Component of the Direct Rate	**4.80%**

We placed the most reliance on the median price to earnings ratio.

Notes:

The Price/Earnings Ratio was downloaded from Value Line.

Beta Analysis

Company	Beta
ALLETE Inc.	0.65
Alliant Energy Corp	0.60
Ameren Corp	0.55
American Electric Power Co Inc.	0.55
Black Hills Corp	0.75
CMS Energy Corp	0.55
DTE Energy Co	0.55
Entergy Corp	0.60
MGE Energy Inc.	0.60
NorthWestern Corp	0.55
OGE Energy Corp	0.85
Otter Tail Corp	0.75
WEC Energy Group	0.50
Xcel Energy Inc.	0.50
Beta Mean	0.61
Beta Median	0.58
Unlevered and Relevered Mean*	0.62
Indicated Beta	**0.61**

We considered the mean, median, and unlevered/relevered mean. We placed more reliance on the mean when selecting the indicated beta.

Notes:

*See the Unlevering Relevering Beta page for the calculation

DEPARTMENT OF REVENUE

Unlevering/Relevering Betas

Unlevering of Betas					
Company	*Value Line* **Actual Income Tax Rate**	*From Capital Structure Page* **Actual Debt in Capital Structure**	*From Capital Structure Page* **Actual Equity in Capital Structure**	*Value Line* **Levered Beta (Published)**	*Formula* **Unlevered Beta**
ALLETE Inc.	NMF	26.19%	73.81%	0.65	N/A
Alliant Energy Corp	10.00%	31.73%	65.85%	0.60	0.42
Ameren Corp	22.00%	30.62%	68.81%	0.55	0.41
American Electric Power Co Inc.	15.50%	35.05%	64.95%	0.55	0.38
Black Hills Corp	10.00%	43.56%	56.44%	0.75	0.44
CMS Energy Corp	15.00%	37.47%	62.38%	0.55	0.36
DTE Energy Co	11.50%	38.58%	61.42%	0.55	0.35
Entergy Corp	NMF	49.20%	50.18%	0.60	N/A
MGE Energy Inc.	21.00%	18.07%	81.93%	0.60	0.51
NorthWestern Corp	2.50%	39.93%	60.07%	0.55	0.33
OGE Energy Corp	14.50%	26.58%	73.42%	0.85	0.65
Otter Tail Corp	21.00%	23.70%	76.30%	0.75	0.60
WEC Energy Group	11.50%	28.26%	71.65%	0.50	0.37
Xcel Energy Inc.	9.00%	39.07%	60.93%	0.50	0.32
			Average	**0.61**	

Relevering of Betas				
Company	*Formula* **Composite Income Tax Rate**	*From Capital Structure Page* **Industry Debt in Capital Structure**	*From Capital Structure Page* **Industry Equity in Capital Structure**	*Formula* **Levered Beta**
ALLETE Inc.	13.63%	34.00%	66.00%	N/A
Alliant Energy Corp	13.63%	34.00%	66.00%	0.61
Ameren Corp	13.63%	34.00%	66.00%	0.59
American Electric Power Co Inc.	13.63%	34.00%	66.00%	0.55
Black Hills Corp	13.63%	34.00%	66.00%	0.64
CMS Energy Corp	13.63%	34.00%	66.00%	0.52
DTE Energy Co	13.63%	34.00%	66.00%	0.51
Entergy Corp	13.63%	34.00%	66.00%	N/A
MGE Energy Inc.	13.63%	34.00%	66.00%	0.74
NorthWestern Corp	13.63%	34.00%	66.00%	0.48
OGE Energy Corp	13.63%	34.00%	66.00%	0.94
Otter Tail Corp	13.63%	34.00%	66.00%	0.87
WEC Energy Group	13.63%	34.00%	66.00%	0.53
Xcel Energy Inc.	13.63%	34.00%	66.00%	0.46
			Average	**0.62**

Notes:
Uses the Hamada Formula

Unlevered Beta = Levered Beta / [1 + (1 - Tax Rate) x (Debt/Equity))], using company-specific components
Using company-specific components

Relevered Beta = Unlevered Beta [1 + (1 - Tax Rate) x (Debt/Equity)]
Using industry components for Tax Rate, Debt, and Equity

Calculation of Market to Book Ratios for the Electric Market Segment

- December 31, 2018 calendar year information for the January 2, 2019 Assessment
- A market to book ratio over one would be an indication of no obsolescence.
- Market Value estimates for Common Equity are from Value Line. Market Value Estimates for Long-Term Debt are from the company's 10-K.
- Book Value amounts are from the company's 10-K.

Market to Book Ratio for Equity

Company	Market Value of Common Equity from Value Line	Book Value of Common Equity from 10-K	Market to Book Ratio	Source
ALLETE Inc.	4,120,133,744	1,428,500,000	2.88	ALLETE, Inc. 2018 10-K, p. 71
Alliant Energy Corp	10,893,185,758	4,585,000,000	2.38	Alliant Energy Corp. 2018 10-K, p. 105
Ameren Corp	17,110,477,272	7,631,000,000	2.24	Ameren Corp. 2018 10-K, p. 32
American Electric Power Co Inc.	38,669,594,213	19,028,400,000	2.03	American Electric Power Co. 2018 10-K, p. S-6
Black Hills Corp	3,824,581,517	2,181,588,000	1.75	Black Hills Corp. 2018 10-K, p. 70
CMS Energy Corp	14,891,263,497	4,755,000,000	3.13	CMS Energy Corp. 2018 10-K, p. 99
DTE Energy Co	21,680,005,110	10,717,000,000	2.02	DTE Energy Co. 2018 10-K, p. 62
Entergy Corp	16,118,034,291	8,844,305,000	1.82	Entergy Corp. 2018 10-K, p. 51
MGE Energy Inc.	2,242,350,172	816,644,000	2.75	MGE Energy Inc. 2018 10-K, p. 56
NorthWestern Corp	3,067,570,964	1,942,382,000	1.58	NorthWestern Corp. 2018 10-K, p. F-6
OGE Energy Corp	8,003,273,862	4,005,100,000	2.00	OGE Energy Corp. 2018 10-K, p. 39
Otter Tail Corp	1,899,154,646	728,863,000	2.61	Otter Tail Corp. 2018 10-K, p. 68
WEC Energy Group	23,121,749,017	9,788,900,000	2.36	WEC Energy Group. 2018 10-K, p. 78
Xcel Energy Inc.	25,735,694,237	12,222,000,000	2.11	Xcel Energy Inc. 2018 10-K, p. 49
		Average	2.26	

Market to Book Ratio for Debt

Company	Market Value of Long-Term Debt from 10-K	Book Value of Long-Term Debt from 10-K	Market to Book Ratio	Source
ALLETE Inc.	1,534,600,000	1,495,200,000	1.03	ALLETE, Inc. 2018 10-K, p. 101
Alliant Energy Corp	5,860,800,000	5,502,800,000	1.07	Alliant Energy Corp. 2018 10-K, p. 93
Ameren Corp	8,669,000,000	8,439,000,000	1.03	Ameren Corp. 2018 10-K, p. 118
American Electric Power Co Inc.	24,093,900,000	23,346,700,000	1.03	American Elec Power Co. 2018 10-K, p. 286
Black Hills Corp	3,039,108,000	2,956,578,000	1.03	Black Hills Corp. 2018 10-K, p. 129
CMS Energy Corp	11,630,000,000	11,589,000,000	1.00	CMS Energy Corp. 2018 10-K, p. 134
DTE Energy Co	6,713,000,000	6,538,000,000	1.03	DTE Energy Co. 2018 10-K, p. 108
Entergy Corp	15,880,239,000	15,518,303,000	1.02	Entergy Corp. 2018 10-K, p. 127
MGE Energy Inc.	518,811,000	502,431,000	1.03	MGE Energy Inc. 2018 10-K, p.
NorthWestern Corp	2,117,912,000	2,102,345,000	1.01	NorthWestern Corp. 2018 10-K, p. F-23
OGE Energy Corp	3,322,300,000	3,146,900,000	1.06	OGE Energy Corp. 2018 10-K, p. 89
Otter Tail Corp	601,513,000	590,174,000	1.02	Otter Tail Corp. 2018 10-K, p. 111
WEC Energy Group	10,554,900,000	10,335,700,000	1.02	WEC Energy Group. 2018 10-K, p. 114
Xcel Energy Inc.	16,755,000,000	16,209,000,000	1.03	Xcel Energy Inc. 2018 10-K, p. 67
		Average	**1.03**	

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	66.00%	2.26	1.49
Long-term Debt	34.00%	1.03	0.35
			1.84

Appendix B - Gas Distribution

Yield Rate

	Capital Structure	Rate	Composite
Long-Term Debt	27.00%	4.69%	1.27%
Common Equity	73.00%	8.36%	6.10%
Yield Rate			**7.37%**

Gas Distribution Yield Rate	**7.37%**

Capital Structure

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
Atmos Energy Corp	2,617,900,000	None	11,046,670,783	13,664,570,783	19.16%	None	80.84%
Chesapeake Utilities Corp	241,600,000	None	1,381,202,700	1,622,802,700	14.89%	None	85.11%
New Jersey Resources Corp	1,220,200,000	None	4,429,730,376	5,649,930,376	21.60%	None	78.40%
NiSource Inc.	8,754,100,000	None	9,420,030,665	18,174,130,665	48.17%	None	51.83%
Northwest Natural Gas Co	724,700,000	None	2,004,416,952	2,729,116,952	26.55%	None	73.45%
ONE Gas Inc.	893,900,000	None	4,469,992,045	5,363,892,045	16.67%	None	83.33%
South Jersey Industries	1,281,000,000	None	2,759,285,623	4,040,285,623	31.71%	None	68.29%
Southwest Gas Holdings Inc.	2,123,600,000	None	4,159,202,843	6,282,802,843	33.80%	None	66.20%
Spire Inc / Laclede Group Inc.	1,900,100,000	None	4,072,845,551	5,972,945,551	31.81%	None	68.19%
				Mean	27.15%		72.85%
				Median	26.55%		73.45%
				Indicated Industry Capital Structure	**27.00%**	**0%**	**73.00%**

We placed more reliance on the median when selecting the indicated capital structure for the market segment.

Indexed Rate of Debt

Company	Debt Rating	Long-Term Debt Rate	
Atmos Energy Corp	A2	4.37%	
Chesapeake Utilities Corp	B2	7.93%	**
New Jersey Resources Corp	Aa2	4.24%	
NiSource Inc.	Baa2	4.92%	
Northwest Natural Gas Co	A3	4.37%	
ONE Gas Inc.	A2	4.37%	
South Jersey Industries	A2	4.37%	
Southwest Gas Holdings Inc.	Baa1	4.92%	
Spire Inc / Laclede Group Inc.	Baa2	4.92%	

Mean	4.93%
Median	4.37%
Mode	4.37%

Public Utility Bond Yield Averages from Mergent Bond Record, January 2019 Edition

Public Utility Bond Averages, December 2018

Mergent	S&P	Yield Avg.
Aaa	AAA	
Aa1	AA+	
Aa2	AA	
Aa3	AA-	4.24
A1	A+	
A2	A	
A3	A-	4.37
Baa1	BBB+	
Baa2	BBB	
Baa3	BBB-	4.92

** Chesapeake Utilities Corporation is below the debt ratings provided in the Mergent Bond Record Bond Yield Averages. We analyzed the Mergent Bond Record, January 2019 issue, for U.S. Corporate Bonds with the same debt rating. We determined the average B yield to maturity is 7.93%.

Current Actual Cost of Debt

$$p = \sum_{i=1}^{n} d(t_i)c_i + \sum_{j=1}^{m} b_j x_j + e$$

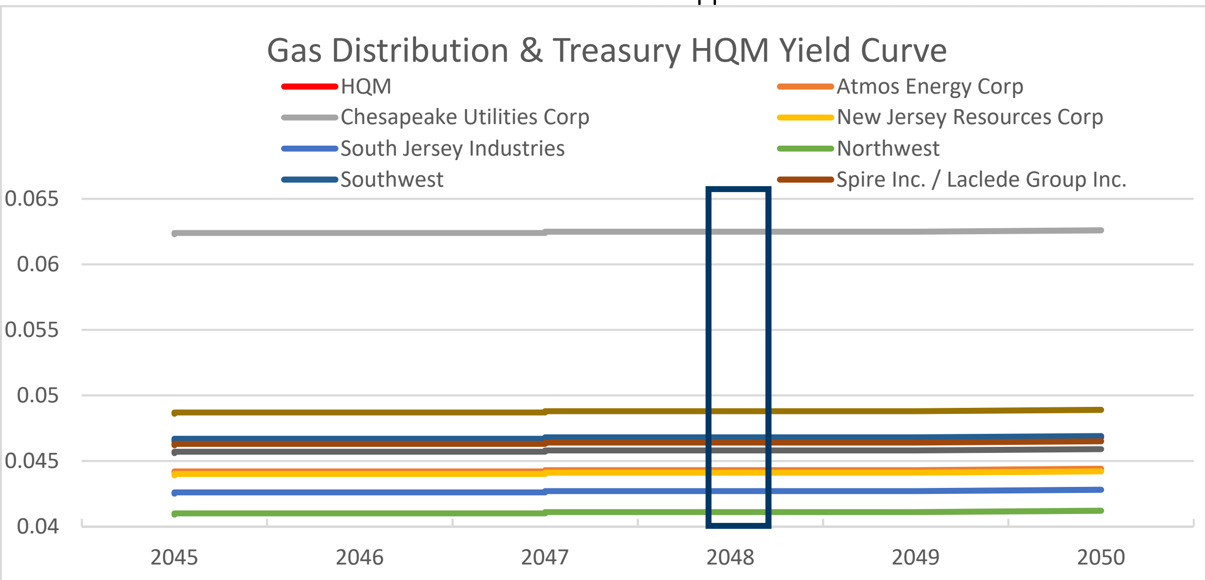
Yield-to-Maturities (YTMs) are based on year-end filings of Form N-Q or 10-K with the SEC.

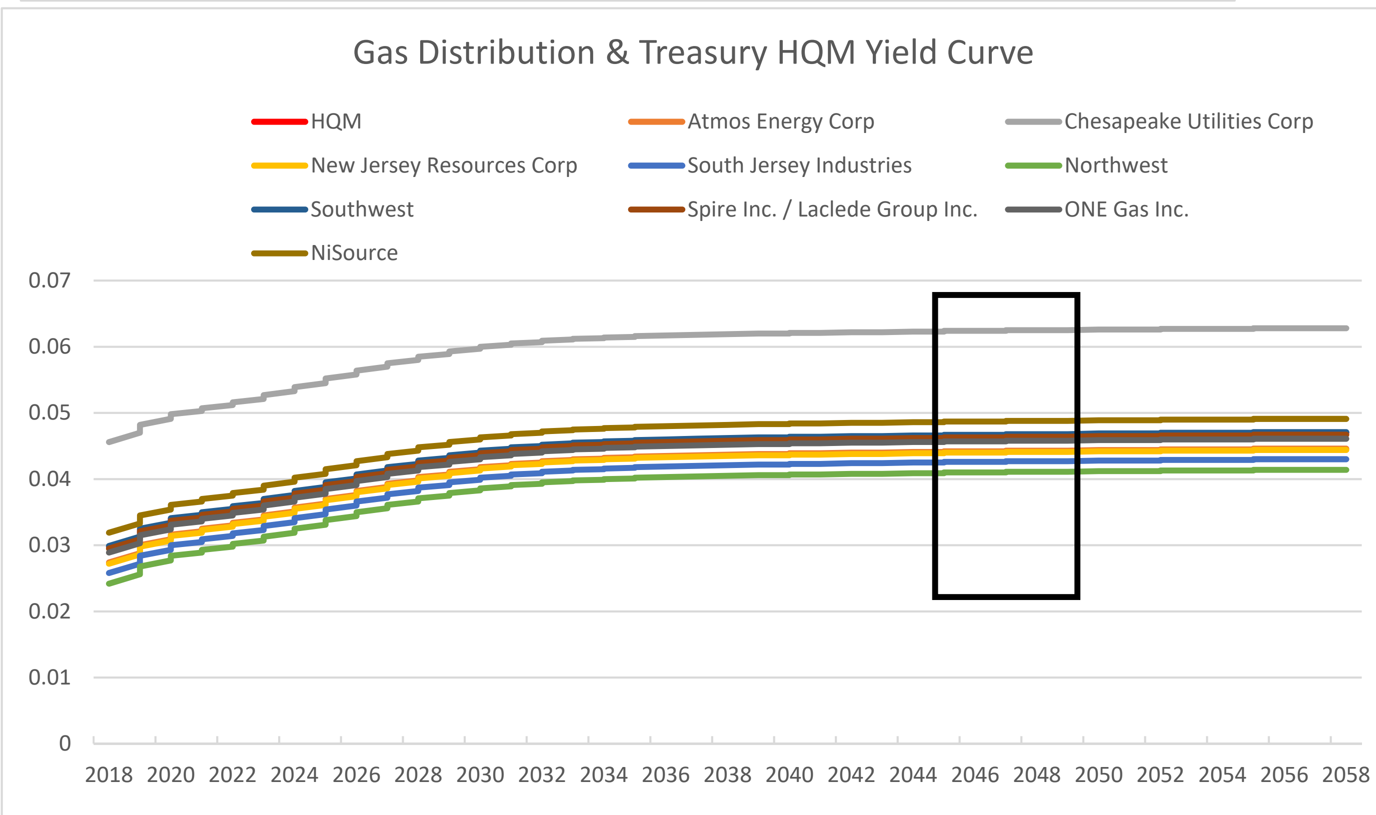
30-year YTMs are based on an observed spread to the Treasury Quality Market Corporate Bond Spot rate curve (equation to the left) and followed out to 30 years.

Indicated Rate of Debt	4.69%

Average YTM at 2048 in below graph.

See Appendix G for more information about debt issuances.





	HQM	Atmos Energy Corp	Chesapeake Utilities Corp	New Jersey Resources Corp	NiSource	Northwest	ONE Gas Inc.	South Jersey Industries	Southwest	Spire Inc. / Laclede Group Inc.
2018.5	2.98%	2.74%	4.56%	2.72%	3.19%	2.42%	2.89%	2.58%	2.99%	2.95%
2019	3.12%	2.88%	4.70%	2.86%	3.33%	2.56%	3.03%	2.72%	3.13%	3.09%
2019.5	3.24%	3.00%	4.82%	2.98%	3.45%	2.68%	3.15%	2.84%	3.25%	3.21%
2020	3.33%	3.09%	4.91%	3.07%	3.54%	2.77%	3.24%	2.93%	3.34%	3.30%
2020.5	3.40%	3.16%	4.98%	3.14%	3.61%	2.84%	3.31%	3.00%	3.41%	3.37%
2021	3.45%	3.21%	5.03%	3.19%	3.66%	2.89%	3.36%	3.05%	3.46%	3.42%
2021.5	3.49%	3.25%	5.07%	3.23%	3.70%	2.93%	3.40%	3.09%	3.50%	3.46%
2022	3.54%	3.30%	5.12%	3.28%	3.75%	2.98%	3.45%	3.14%	3.55%	3.51%
2022.5	3.58%	3.34%	5.16%	3.32%	3.79%	3.02%	3.49%	3.18%	3.59%	3.55%
2023	3.63%	3.39%	5.21%	3.37%	3.84%	3.07%	3.54%	3.23%	3.64%	3.60%
2023.5	3.69%	3.45%	5.27%	3.43%	3.90%	3.13%	3.60%	3.29%	3.70%	3.66%
2024	3.75%	3.51%	5.33%	3.49%	3.96%	3.19%	3.66%	3.35%	3.76%	3.72%
2024.5	3.81%	3.57%	5.39%	3.55%	4.02%	3.25%	3.72%	3.41%	3.82%	3.78%
2025	3.87%	3.63%	5.45%	3.61%	4.08%	3.31%	3.78%	3.47%	3.88%	3.84%
2025.5	3.94%	3.70%	5.52%	3.68%	4.15%	3.38%	3.85%	3.54%	3.95%	3.91%
2026	4.00%	3.76%	5.58%	3.74%	4.21%	3.44%	3.91%	3.60%	4.01%	3.97%
2026.5	4.06%	3.82%	5.64%	3.80%	4.27%	3.50%	3.97%	3.66%	4.07%	4.03%
2027	4.12%	3.88%	5.70%	3.86%	4.33%	3.56%	4.03%	3.72%	4.13%	4.09%
2027.5	4.17%	3.93%	5.75%	3.91%	4.38%	3.61%	4.08%	3.77%	4.18%	4.14%
2028	4.22%	3.98%	5.80%	3.96%	4.43%	3.66%	4.13%	3.82%	4.23%	4.19%
2028.5	4.27%	4.03%	5.85%	4.01%	4.48%	3.71%	4.18%	3.87%	4.28%	4.24%
2029	4.31%	4.07%	5.89%	4.05%	4.52%	3.75%	4.22%	3.91%	4.32%	4.28%
2029.5	4.35%	4.11%	5.93%	4.09%	4.56%	3.79%	4.26%	3.95%	4.36%	4.32%
2030	4.39%	4.15%	5.97%	4.13%	4.60%	3.83%	4.30%	3.99%	4.40%	4.36%
2030.5	4.42%	4.18%	6.00%	4.16%	4.63%	3.86%	4.33%	4.02%	4.43%	4.39%
2031	4.45%	4.21%	6.03%	4.19%	4.66%	3.89%	4.36%	4.05%	4.46%	4.42%
2031.5	4.47%	4.23%	6.05%	4.21%	4.68%	3.91%	4.38%	4.07%	4.48%	4.44%
2032	4.49%	4.25%	6.07%	4.23%	4.70%	3.93%	4.40%	4.09%	4.50%	4.46%
2032.5	4.51%	4.27%	6.09%	4.25%	4.72%	3.95%	4.42%	4.11%	4.52%	4.48%
2033	4.53%	4.29%	6.11%	4.27%	4.74%	3.97%	4.44%	4.13%	4.54%	4.50%
2033.5	4.54%	4.30%	6.12%	4.28%	4.75%	3.98%	4.45%	4.14%	4.55%	4.51%
2034	4.55%	4.31%	6.13%	4.29%	4.76%	3.99%	4.46%	4.15%	4.56%	4.52%
2034.5	4.56%	4.32%	6.14%	4.30%	4.77%	4.00%	4.47%	4.16%	4.57%	4.53%
2035	4.57%	4.33%	6.15%	4.31%	4.78%	4.01%	4.48%	4.17%	4.58%	4.54%
2035.5	4.58%	4.34%	6.16%	4.32%	4.79%	4.02%	4.49%	4.18%	4.59%	4.55%
2036	4.59%	4.35%	6.17%	4.33%	4.80%	4.03%	4.50%	4.19%	4.60%	4.56%
2036.5	4.59%	4.35%	6.17%	4.33%	4.80%	4.03%	4.50%	4.19%	4.60%	4.56%

2037	4.60%	4.36%	6.18%	4.34%	4.81%	4.04%	4.51%	4.20%	4.61%	4.57%
2037.5	4.60%	4.36%	6.18%	4.34%	4.81%	4.04%	4.51%	4.20%	4.61%	4.57%
2038	4.61%	4.37%	6.19%	4.35%	4.82%	4.05%	4.52%	4.21%	4.62%	4.58%
2038.5	4.61%	4.37%	6.19%	4.35%	4.82%	4.05%	4.52%	4.21%	4.62%	4.58%
2039	4.62%	4.38%	6.20%	4.36%	4.83%	4.06%	4.53%	4.22%	4.63%	4.59%
2039.5	4.62%	4.38%	6.20%	4.36%	4.83%	4.06%	4.53%	4.22%	4.63%	4.59%
2040	4.62%	4.38%	6.20%	4.36%	4.83%	4.06%	4.53%	4.22%	4.63%	4.59%
2040.5	4.63%	4.39%	6.21%	4.37%	4.84%	4.07%	4.54%	4.23%	4.64%	4.60%
2041	4.63%	4.39%	6.21%	4.37%	4.84%	4.07%	4.54%	4.23%	4.64%	4.60%
2041.5	4.63%	4.39%	6.21%	4.37%	4.84%	4.07%	4.54%	4.23%	4.64%	4.60%
2042	4.64%	4.40%	6.22%	4.38%	4.85%	4.08%	4.55%	4.24%	4.65%	4.61%
2042.5	4.64%	4.40%	6.22%	4.38%	4.85%	4.08%	4.55%	4.24%	4.65%	4.61%
2043	4.64%	4.40%	6.22%	4.38%	4.85%	4.08%	4.55%	4.24%	4.65%	4.61%
2043.5	4.64%	4.40%	6.22%	4.38%	4.85%	4.08%	4.55%	4.24%	4.65%	4.61%
2044	4.65%	4.41%	6.23%	4.39%	4.86%	4.09%	4.56%	4.25%	4.66%	4.62%
2044.5	4.65%	4.41%	6.23%	4.39%	4.86%	4.09%	4.56%	4.25%	4.66%	4.62%
2045	4.65%	4.41%	6.23%	4.39%	4.86%	4.09%	4.56%	4.25%	4.66%	4.62%
2045.5	4.66%	4.42%	6.24%	4.40%	4.87%	4.10%	4.57%	4.26%	4.67%	4.63%
2046	4.66%	4.42%	6.24%	4.40%	4.87%	4.10%	4.57%	4.26%	4.67%	4.63%
2046.5	4.66%	4.42%	6.24%	4.40%	4.87%	4.10%	4.57%	4.26%	4.67%	4.63%
2047	4.66%	4.42%	6.24%	4.40%	4.87%	4.10%	4.57%	4.26%	4.67%	4.63%
2047.5	4.67%	4.43%	6.25%	4.41%	4.88%	4.11%	4.58%	4.27%	4.68%	4.64%
2048	4.67%	4.43%	6.25%	4.41%	4.88%	4.11%	4.58%	4.27%	4.68%	4.64%
2048.5	4.67%	4.43%	6.25%	4.41%	4.88%	4.11%	4.58%	4.27%	4.68%	4.64%
2049	4.67%	4.43%	6.25%	4.41%	4.88%	4.11%	4.58%	4.27%	4.68%	4.64%
2049.5	4.67%	4.43%	6.25%	4.41%	4.88%	4.11%	4.58%	4.27%	4.68%	4.64%
2050	4.68%	4.44%	6.26%	4.42%	4.89%	4.12%	4.59%	4.28%	4.69%	4.65%
2050.5	4.68%	4.44%	6.26%	4.42%	4.89%	4.12%	4.59%	4.28%	4.69%	4.65%
2051	4.68%	4.44%	6.26%	4.42%	4.89%	4.12%	4.59%	4.28%	4.69%	4.65%
2051.5	4.68%	4.44%	6.26%	4.42%	4.89%	4.12%	4.59%	4.28%	4.69%	4.65%
2052	4.68%	4.44%	6.26%	4.42%	4.89%	4.12%	4.59%	4.28%	4.69%	4.65%
2052.5	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2053	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2053.5	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2054	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2054.5	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2055	4.69%	4.45%	6.27%	4.43%	4.90%	4.13%	4.60%	4.29%	4.70%	4.66%
2055.5	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%
2056	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%
2056.5	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%
2057	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%
2057.5	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%
2058	4.70%	4.46%	6.28%	4.44%	4.91%	4.14%	4.61%	4.30%	4.71%	4.67%

Indicated Rate of Equity

Model	Rate
CAPM - Ex Post	7.46%
CAPM - Supply Side	6.96%
CAPM - Three Stage Ex Ante	6.64%
CAPM - Damodaran	6.84%
CAPM - Duff & Phelps	7.08%
CAPM - Graham and Harvey	5.84%
CAPM - Fernandez, Pershin, and Acin	6.48%
Empirical CAPM - Ex Post	8.07%
Empirical CAPM - Supply Side	7.50%
Empirical CAPM - Three Stage Ex Ante	7.14%
Empirical CAPM - Damodaran	7.37%
Empirical CAPM - Duff & Phelps	7.56%
Empirical CAPM - Graham and Harvey	6.23%
Empirical CAPM - Fernandez, Pershin, and Acin	6.95%
DGM - Dividend Growth	11.80%
DGM - Earnings Growth	9.10%
Multi-Stage DGM	10.03%
Indicated Rate of Equity	**8.36%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance on the Dividend Growth Model - Earnings Growth and secondary reliance on the Capital Asset Pricing Model using the Ex Post equity risk premium.

Direct Rate and Growth

	Capital Structure	Rate	Composite
Debt Component	27.00%	4.69%	1.27%
Equity Component	73.00%	4.26%	3.11%
Direct Rate			**4.38%**

Direct Rate	**4.38%**

Yield Rate	7.37%
Direct Rate	4.38%
Implied Industry Growth Rate	**2.99%**

Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	0.65	4.49%	2.97%	7.46%
Supply Side[3]	6.14%	0.65	3.99%	2.97%	6.96%
Three Stage Ex Ante[4]	5.65%	0.65	3.67%	2.97%	6.64%
Dr. Damodaran ERP[5]	5.96%	0.65	3.87%	2.97%	6.84%
Duff & Phelps[6]	5.50%	0.65	3.58%	3.50%	7.08%
Graham and Harvey[7]	4.42%	0.65	2.87%	2.97%	5.84%
Fernandez, Pershin and Acin[8]	5.40%	0.65	3.51%	2.97%	6.48%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	0.65	3.37%	1.73%	2.97%	**8.07%**
Supply Side[3]	6.14%	0.65	2.99%	1.54%	2.97%	**7.50%**
Three Stage Ex Ante[4]	5.65%	0.65	2.75%	1.41%	2.97%	**7.14%**
Dr. Damodaran ERP[5]	5.96%	0.65	2.91%	1.49%	2.97%	**7.37%**
Duff & Phelps[6]	5.50%	0.65	2.68%	1.38%	3.50%	**7.56%**
Graham and Harvey[7]	4.42%	0.65	2.15%	1.11%	2.97%	**6.23%**
Fernandez, Pershin and Acin[8]	5.40%	0.65	2.63%	1.35%	2.97%	**6.95%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

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8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Dividend Growth Model

Company	Current Dividend Yield (DY)	Projected Short-term EPS Growth Rate (EG)	Projected Short-term Dividend Growth Rate (DG)	Cost of Equity Earnings Growth DY + EG	Cost of Equity Dividend Growth DY + EG
Atmos Energy Corp	2.10%	7.50%	7.00%	9.60%	9.10%
Chesapeake Utilities Corp	1.80%	8.50%	9.00%	10.30%	10.80%
New Jersey Resources Corp	2.30%	9.50%	4.00%	11.80%	6.30%
NiSource Inc.	3.00%	18.00%	9.00%	21.00%	12.00%
Northwest Natural Gas Co	2.70%	30.50%	2.50%	33.20%	5.20%
ONE Gas Inc.	2.40%	10.50%	10.00%	12.90%	12.40%
South Jersey Industries	3.70%	9.50%	4.00%	13.20%	7.70%
Southwest Gas Holdings Inc.	2.60%	9.00%	6.50%	11.60%	9.10%
Spire Inc / Laclede Group Inc.	2.90%	6.50%	3.50%	9.40%	6.40%
Mean	2.61%	12.17%	6.17%	14.78%	8.78%
Median	2.60%	9.50%	6.50%	11.80%	9.10%

DGM - Dividend Growth, Indicated Rate	**11.80%**
DGM - Earnings Growth, Indicated Rate	**9.10%**

We placed more reliance on the median to arrive at the indicated rates for DGM - Earnings Growth and DGM - Dividend Growth.

Notes:

Dividend Yield and growth rates provided by Value Line

Multi-Stage Dividend Growth Model

$K_E = (DY \times (1+ 0.5(G))) + 0.67(G1) + 0.33(g)$

K_E Cost of Equity
DY Dividend Yield
G_1 Short-term Growth Estimate
g Stable Growth
G Average Growth Rate

Company	**DY** Dividend Yield	**G1** Short-term Growth Estimate	**g** Stable Growth	**G** Average Growth Rate	**K_E** Cost of Equity
Atmos Energy Corp	2.10%	7.50%	3.90%	5.70%	8.47%
Chesapeake Utilities Corp	1.80%	8.50%	3.90%	6.20%	8.84%
New Jersey Resources Corp	2.30%	9.50%	3.90%	6.70%	10.03%
NiSource Inc.	3.00%	18.00%	3.90%	10.95%	16.51%
Northwest Natural Gas Co	2.70%	30.50%	3.90%	17.20%	24.65%
ONE Gas Inc.	2.40%	10.50%	3.90%	7.20%	10.81%
South Jersey Industries	3.70%	9.50%	3.90%	6.70%	11.48%
Southwest Gas Holdings Inc.	2.60%	9.00%	3.90%	6.45%	10.00%
Spire Inc / Laclede Group Inc.	2.90%	6.50%	3.90%	5.20%	8.62%
				Mean	12.16%
				Median	10.03%

Multi-Stage DGM, Indicated Rate	**10.03%**

We placed more reliance on the median when selecting the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates, Next 5 Years for Earnings provided Value Line

Stable growth rate is the nominal growth rate determined in the Capitalization Rate Study Narrative (indicated long-term growth rate of the U.S. economy of 1.9% plus the expected inflation rate of 2.0%).

Equity Component of the Direct Rate

Company	Value Line P/E Ratio
Atmos Energy Corp	23.5
Chesapeake Utilities Corp	26.2
New Jersey Resources Corp	32.0
NiSource Inc.	20.4
Northwest Natural Gas Co	29.3
ONE Gas Inc.	24.8
South Jersey Industries	22.4
Southwest Gas Holdings Inc.	20.5
Spire Inc / Laclede Group Inc.	21.2
Mean	24.48
Median	23.50
Selected Price to Earnings (P/E) Ratio	23.50
Indicated Equity Component of the Direct Rate	**4.26%**

We placed the most reliance on the median price to earnings ratio.

Notes:

The Price/Earnings Ratio was downloaded from Value Line.

Beta Analysis

Company	Beta
Atmos Energy Corp	0.60
Chesapeake Utilities Corp	0.65
New Jersey Resources Corp	0.70
NiSource Inc.	0.50
Northwest Natural Gas Co	0.60
ONE Gas Inc.	0.65
South Jersey Industries	0.80
Southwest Gas Holdings Inc.	0.70
Spire Inc / Laclede Group Inc.	0.65
Beta Mean	0.65
Beta Median	0.65
Unlevered and Relevered Mean*	0.65
Indicated Beta	**0.65**

We considered the mean, median, and unlevered/relevered mean. We placed more reliance on the mean when selecting the indicated beta.

Notes:

*See the Unlevering Relevering Beta page for the calculation

Unlevering/Relevering Betas

Unlevering of Betas					
Company	*Value Line* **Actual Income Tax Rate**	*From Capital Structure Page* **Actual Debt in Capital Structure**	*From Capital Structure Page* **Actual Equity in Capital Structure**	*Value Line* **Levered Beta (Published)**	*Formula* **Unlevered Beta**
Atmos Energy Corp	27.00%	19.16%	80.84%	0.60	0.51
Chesapeake Utilities Corp	27.50%	14.89%	85.11%	0.65	0.58
New Jersey Resources Corp	16.50%	21.60%	78.40%	0.70	0.57
NiSource Inc.	21.00%	48.17%	51.83%	0.50	0.29
Northwest Natural Gas Co	21.00%	26.55%	73.45%	0.60	0.47
ONE Gas Inc.	22.50%	16.67%	83.33%	0.65	0.56
South Jersey Industries	21.00%	31.71%	68.29%	0.80	0.59
Southwest Gas Holdings Inc.	21.00%	33.80%	66.20%	0.70	0.50
Spire Inc / Laclede Group Inc.	23.50%	31.81%	68.19%	0.65	0.48
			Average	**0.65**	

Relevering of Betas				
Company	*Formula* **Composite Income Tax Rate**	*From Capital Structure Page* **Industry Debt in Capital Structure**	*From Capital Structure Page* **Industry Equity in Capital Structure**	*Formula* **Levered Beta**
Atmos Energy Corp	22.33%	27.00%	73.00%	0.66
Chesapeake Utilities Corp	22.33%	27.00%	73.00%	0.75
New Jersey Resources Corp	22.33%	27.00%	73.00%	0.73
NiSource Inc.	22.33%	27.00%	73.00%	0.37
Northwest Natural Gas Co	22.33%	27.00%	73.00%	0.61
ONE Gas Inc.	22.33%	27.00%	73.00%	0.72
South Jersey Industries	22.33%	27.00%	73.00%	0.76
Southwest Gas Holdings Inc.	22.33%	27.00%	73.00%	0.64
Spire Inc / Laclede Group Inc.	22.33%	27.00%	73.00%	0.62
			Average	**0.65**

Notes:
Uses the Hamada Formula

Unlevered Beta = Levered Beta / [1 + (1 - Tax Rate) x (Debt/Equity))], using company-specific components
Using company-specific components

Relevered Beta = Unlevered Beta [1 + (1 - Tax Rate) x (Debt/Equity)]
Using industry components for Tax Rate, Debt, and Equity

Calculation of Market to Book Ratios for the Electric Market Segment

- December 31, 2018 calendar year information for the January 2, 2019 Assessment
- A market to book ratio over one would be an indication of no obsolescence.
- Market Value estimates for Common Equity are from Value Line. Market Value Estimates for Long-Term Debt are from the company's 10-K.
- Book Value amounts are from the company's 10-K.

Market to Book Ratio for Equity

Company	Market Value of Common Equity from Value Line	Book Value of Common Equity from 10-K	Market to Book Ratio	Source	Fiscal Year End
Atmos Energy Corp	11,046,670,783	4,769,951,000	2.32	Atmos Energy Corp. 2018 10-K, p. 42	9/30/2018
Chesapeake Utilities Corp	1,381,202,700	518,439,000	2.66	Chesapeake Utilities. 2018 10-K, p. 52	12/31/2018
New Jersey Resources Corp	4,429,730,376	1,418,978,000	3.12	New Jersey Resources. 2018 10-K, p. 27	9/30/2018
NiSource Inc.	9,420,030,665	5,750,900,000	1.64	NiSource Inc. 2018 10-K, p. 51	12/31/2018
Northwest Natural Gas Co	2,004,416,952	762,634,000	2.63	NorthWest Natural Gas. 2018 10-K, p. 69	12/31/2018
ONE Gas Inc.	4,469,992,045	2,042,656,000	2.19	ONE Gas Inc. 2018 10-K, p. 54	12/31/2018
South Jersey Industries	2,759,285,623	1,008,022,000	2.74	South Jersey Industries. 2018 10-K, p. 78	12/31/2018
Southwest Gas Holdings Inc.	4,159,202,843	2,252,042,000	1.85	Southwest Gas Holdings. 2018 10-K, p. 24	12/31/2018
Spire Inc / Laclede Group Inc.	4,072,845,551	2,255,400,000	1.81	Spire Inc. 2018 10-K, p. 58	9/30/2018
		Average	**2.33**		

Market to Book Ratio for Debt

Company	Market Value of Long-Term Debt from 10-K	Book Value of Long-Term Debt from 10-K	Market to Book Ratio	Source
Atmos Energy Corp	3,161,679,000	3,085,000,000	1.02	Atmos Energy Corp. 2018 10-K, p. 86
Chesapeake Utilities Corp	323,800,000	327,200,000	0.99	Chesapeake Utilities. 2018 10-K, p. 73
New Jersey Resources Corp	488,889,000	500,000,000	0.98	New Jersey Resources. 2018 10-K, p. 101
NiSource Inc.	7,228,300,000	7,155,400,000	1.01	NiSource Inc. 2018 10-K, p. 100
Northwest Natural Gas Co	760,222,000	734,123,000	1.04	NorthWest Natural Gas. 2018 10-K, p. 95
ONE Gas Inc.	1,400,000,000	1,300,000,000	1.08	ONE Gas Inc. 2018 10-K, p. 69
South Jersey Industries	2,910,000,000	2,840,000,000	1.02	South Jersey Industries. 2018 10-K, p. 103
Southwest Gas Holdings Inc.	2,203,256,000	2,107,258,000	1.05	Southwest Gas Holdings. 2018 10-K, p. 61
Spire Inc / Laclede Group Inc.	2,074,000,000	2,075,600,000	1.00	Spire Inc. 2018 10-K, p. 88
		Average	**1.02**	

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	73.00%	2.33	1.70
Long-term Debt	27.00%	1.02	0.28
			1.98

Appendix C - Gas Transmission Pipeline

Yield Rate

	Capital Structure	Rate	Composite
Long-Term Debt	33.00%	5.29%	1.75%
Common Equity	67.00%	15.50%	10.39%
Yield Rate			**12.14%**

Gas Transmission Pipeline Yield Rate	**12.14%**

Capital Structure

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
Kinder Morgan Inc.	34,600,000,000	None	38,446,258,560	73,046,258,560	47.37%	0.00%	52.63%
ONEOK Inc.	8,325,700,000	None	25,619,592,788	33,945,292,788	24.53%	0.00%	75.47%
Williams Companies Inc.	21,409,000,000	None	30,663,029,645	52,072,029,645	41.11%	0.00%	58.89%
				Mean	37.67%	0.00%	62.33%
				Median	32.82%	0.00%	67.18%
				Indicated Industry Capital Structure	**33.00%**	**0%**	**67.00%**

We placed more reliance on the median when selecting the indicated capital structure for the industry.

Notes:

We removed TransCanada Corporation as an outlier:

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
TransCanada Corporation	31,661,300,000	3,144,200,000,000	36,916,460,000	3,212,777,760,000	0.99%	97.87%	1.15%

Indexed Rate of Debt

Company	Debt Rating	Long-Term Debt Rate
Kinder Morgan Inc.	Baa2	4.92%
ONEOK Inc.	Baa3	4.92%
TransCanada Corporation	Baa1	4.92%
Williams Companies Inc.	Baa3	4.92%

Mean	4.92%
Median	4.92%
Mode	4.92%

Public Utility Bond Yield Averages from Mergent Bond Record, January 2019 Edition

Public Utility Bond Averages, December 2018

Mergent	S&P	Yield Avg.
Aaa	AAA	
Aa1	AA+	
Aa2	AA	
Aa3	AA-	4.24
A1	A+	
A2	A	
A3	A-	4.37
Baa1	BBB+	
Baa2	BBB	
Baa3	BBB-	4.92

Current Actual Cost of Debt

Yield-to-Maturities (YTMs) are based on year-end filings of Form N-Q or 10-K with the SEC.

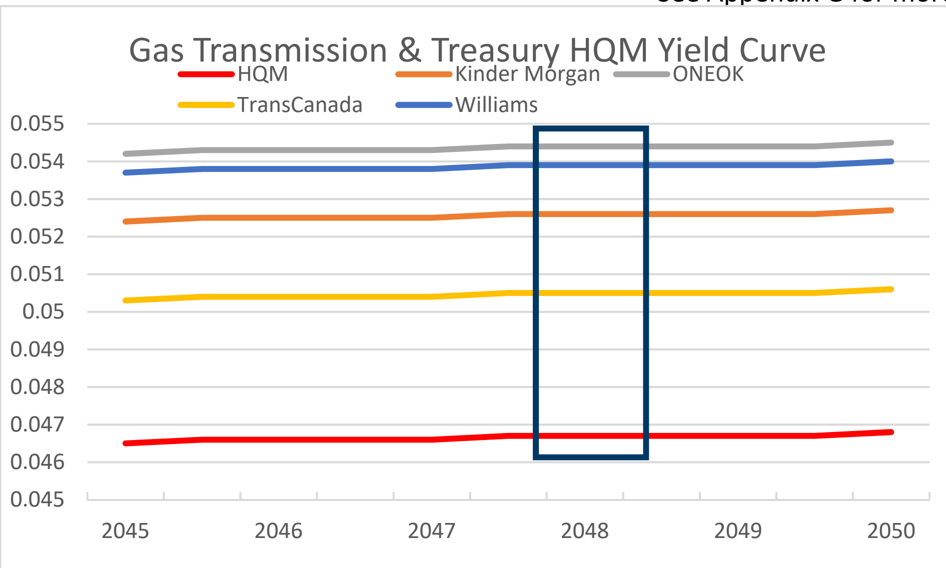
$$p = \sum_{i=1}^{n} d(t_i)c_i + \sum_{j=1}^{m} b_j x_j + e$$

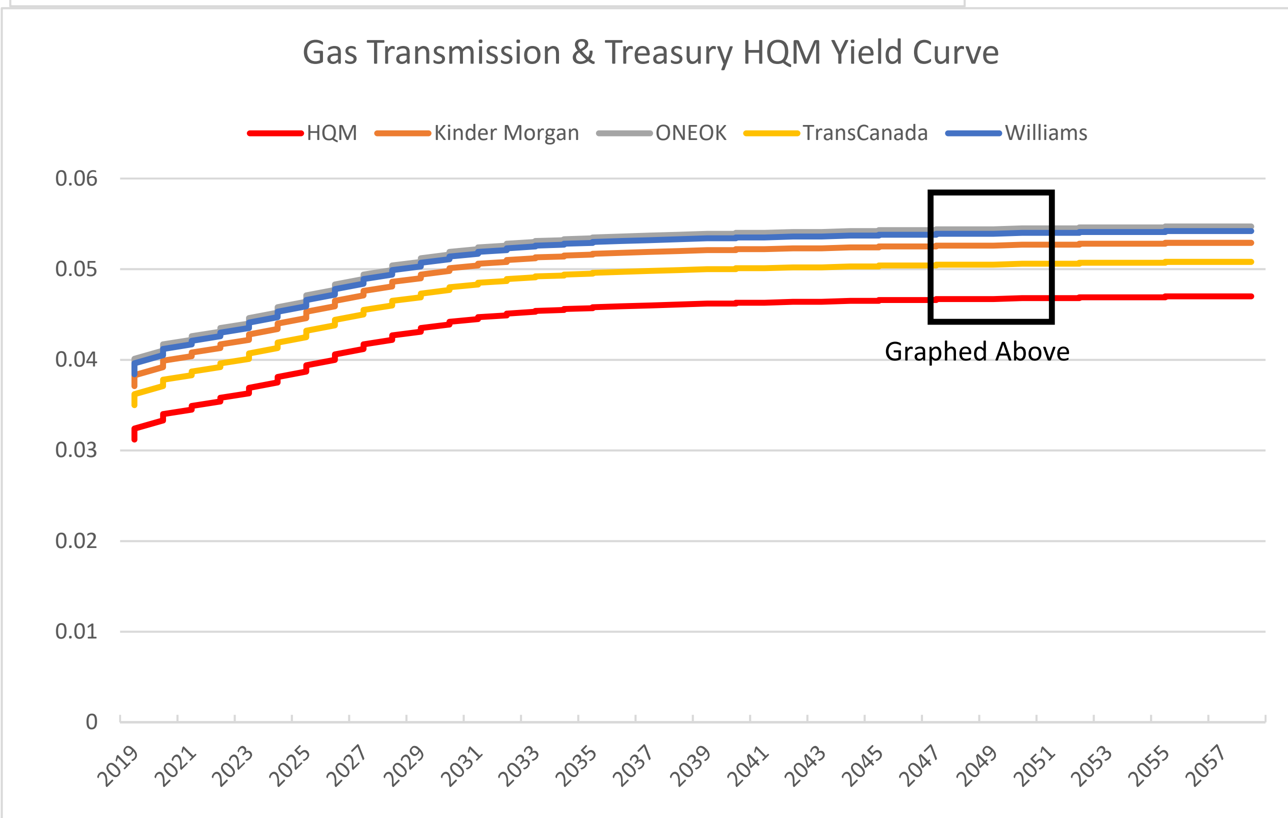
30-year YTMs are based on an observed spread to the Treasury Quality Market Corporate Bond Spot rate curve (equation to the left) and followed out to 30 years.

Indicated Rate of Debt	5.29%

Average YTM at 2048 in below graph.

See Appendix G for more information about debt issuances.





	HQM	Kinder Morgan	ONEOK	TransCanada	Williams
2019	3.12%	3.71%	3.89%	3.50%	3.84%
2019.5	3.24%	3.83%	4.01%	3.62%	3.96%
2020	3.33%	3.92%	4.10%	3.71%	4.05%
2020.5	3.40%	3.99%	4.17%	3.78%	4.12%
2021	3.45%	4.04%	4.22%	3.83%	4.17%
2021.5	3.49%	4.08%	4.26%	3.87%	4.21%
2022	3.54%	4.13%	4.31%	3.92%	4.26%
2022.5	3.58%	4.17%	4.35%	3.96%	4.30%
2023	3.63%	4.22%	4.40%	4.01%	4.35%
2023.5	3.69%	4.28%	4.46%	4.07%	4.41%
2024	3.75%	4.34%	4.52%	4.13%	4.47%
2024.5	3.81%	4.40%	4.58%	4.19%	4.53%
2025	3.87%	4.46%	4.64%	4.25%	4.59%
2025.5	3.94%	4.53%	4.71%	4.32%	4.66%
2026	4.00%	4.59%	4.77%	4.38%	4.72%
2026.5	4.06%	4.65%	4.83%	4.44%	4.78%
2027	4.12%	4.71%	4.89%	4.50%	4.84%
2027.5	4.17%	4.76%	4.94%	4.55%	4.89%
2028	4.22%	4.81%	4.99%	4.60%	4.94%
2028.5	4.27%	4.86%	5.04%	4.65%	4.99%
2029	4.31%	4.90%	5.08%	4.69%	5.03%
2029.5	4.35%	4.94%	5.12%	4.73%	5.07%
2030	4.39%	4.98%	5.16%	4.77%	5.11%
2030.5	4.42%	5.01%	5.19%	4.80%	5.14%
2031	4.45%	5.04%	5.22%	4.83%	5.17%
2031.5	4.47%	5.06%	5.24%	4.85%	5.19%
2032	4.49%	5.08%	5.26%	4.87%	5.21%
2032.5	4.51%	5.10%	5.28%	4.89%	5.23%
2033	4.53%	5.12%	5.30%	4.91%	5.25%
2033.5	4.54%	5.13%	5.31%	4.92%	5.26%
2034	4.55%	5.14%	5.32%	4.93%	5.27%
2034.5	4.56%	5.15%	5.33%	4.94%	5.28%
2035	4.57%	5.16%	5.34%	4.95%	5.29%
2035.5	4.58%	5.17%	5.35%	4.96%	5.30%
2036	4.59%	5.18%	5.36%	4.97%	5.31%
2036.5	4.59%	5.18%	5.36%	4.97%	5.31%
2037	4.60%	5.19%	5.37%	4.98%	5.32%
2037.5	4.60%	5.19%	5.37%	4.98%	5.32%
2038	4.61%	5.20%	5.38%	4.99%	5.33%
2038.5	4.61%	5.20%	5.38%	4.99%	5.33%
2039	4.62%	5.21%	5.39%	5.00%	5.34%
2039.5	4.62%	5.21%	5.39%	5.00%	5.34%

2040	4.62%	5.21%	5.39%	5.00%	5.34%
2040.5	4.63%	5.22%	5.40%	5.01%	5.35%
2041	4.63%	5.22%	5.40%	5.01%	5.35%
2041.5	4.63%	5.22%	5.40%	5.01%	5.35%
2042	4.64%	5.23%	5.41%	5.02%	5.36%
2042.5	4.64%	5.23%	5.41%	5.02%	5.36%
2043	4.64%	5.23%	5.41%	5.02%	5.36%
2043.5	4.64%	5.23%	5.41%	5.02%	5.36%
2044	4.65%	5.24%	5.42%	5.03%	5.37%
2044.5	4.65%	5.24%	5.42%	5.03%	5.37%
2045	4.65%	5.24%	5.42%	5.03%	5.37%
2045.5	4.66%	5.25%	5.43%	5.04%	5.38%
2046	4.66%	5.25%	5.43%	5.04%	5.38%
2046.5	4.66%	5.25%	5.43%	5.04%	5.38%
2047	4.66%	5.25%	5.43%	5.04%	5.38%
2047.5	4.67%	5.26%	5.44%	5.05%	5.39%
2048	**4.67%**	**5.26%**	**5.44%**	**5.05%**	**5.39%**
2048.5	4.67%	5.26%	5.44%	5.05%	5.39%
2049	4.67%	5.26%	5.44%	5.05%	5.39%
2049.5	4.67%	5.26%	5.44%	5.05%	5.39%
2050	4.68%	5.27%	5.45%	5.06%	5.40%
2050.5	4.68%	5.27%	5.45%	5.06%	5.40%
2051	4.68%	5.27%	5.45%	5.06%	5.40%
2051.5	4.68%	5.27%	5.45%	5.06%	5.40%
2052	4.68%	5.27%	5.45%	5.06%	5.40%
2052.5	4.69%	5.28%	5.46%	5.07%	5.41%
2053	4.69%	5.28%	5.46%	5.07%	5.41%
2053.5	4.69%	5.28%	5.46%	5.07%	5.41%
2054	4.69%	5.28%	5.46%	5.07%	5.41%
2054.5	4.69%	5.28%	5.46%	5.07%	5.41%
2055	4.69%	5.28%	5.46%	5.07%	5.41%
2055.5	4.70%	5.29%	5.47%	5.08%	5.42%
2056	4.70%	5.29%	5.47%	5.08%	5.42%
2056.5	4.70%	5.29%	5.47%	5.08%	5.42%
2057	4.70%	5.29%	5.47%	5.08%	5.42%
2057.5	4.70%	5.29%	5.47%	5.08%	5.42%
2058	4.70%	5.29%	5.47%	5.08%	5.42%

Indicated Rate of Equity

Model	Rate
CAPM - Ex Post	13.34%
CAPM - Supply Side	12.18%
CAPM - Three Stage Ex Ante	11.45%
CAPM - Damodaran	11.91%
CAPM - Duff & Phelps	11.75%
CAPM - Graham and Harvey	9.60%
CAPM - Fernandez, Pershin, and Acin	11.07%
Empirical CAPM - Ex Post	12.47%
Empirical CAPM - Supply Side	11.41%
Empirical CAPM - Three Stage Ex Ante	10.74%
Empirical CAPM - Damodaran	11.17%
Empirical CAPM - Duff & Phelps	11.06%
Empirical CAPM - Graham and Harvey	9.05%
Empirical CAPM - Fernandez, Pershin, and Acin	10.40%
DGM - Earnings Growth	17.33%
Multi-Stage DGM	14.75%
Indicated Rate of Equity	**15.50%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance on the Dividend Growth Model - Earnings Growth and secondary reliance on the Capital Asset Pricing Model using the Ex Post equity risk premium.

Direct Rate and Growth

	Capital Structure	Rate	Composite
Debt Component	33.00%	5.29%	1.75%
Equity Component	67.00%	5.15%	3.45%
Direct Rate			**5.20%**

Direct Rate	**5.20%**

Yield Rate	12.14%
Direct Rate	5.20%
Implied Industry Growth Rate	**6.94%**

Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.50	10.37%	2.97%	13.34%
Supply Side[3]	6.14%	1.50	9.21%	2.97%	12.18%
Three Stage Ex Ante[4]	5.65%	1.50	8.48%	2.97%	11.45%
Dr. Damodaran ERP[5]	5.96%	1.50	8.94%	2.97%	11.91%
Duff & Phelps[6]	5.50%	1.50	8.25%	3.50%	11.75%
Graham and Harvey[7]	4.42%	1.50	6.63%	2.97%	9.60%
Fernandez, Pershin and Acin[8]	5.40%	1.50	8.10%	2.97%	11.07%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.50	7.77%	1.73%	2.97%	**12.47%**
Supply Side[3]	6.14%	1.50	6.91%	1.54%	2.97%	**11.41%**
Three Stage Ex Ante[4]	5.65%	1.50	6.36%	1.41%	2.97%	**10.74%**
Dr. Damodaran ERP[5]	5.96%	1.50	6.71%	1.49%	2.97%	**11.17%**
Duff & Phelps[6]	5.50%	1.50	6.19%	1.38%	3.50%	**11.06%**
Graham and Harvey[7]	4.42%	1.50	4.97%	1.11%	2.97%	**9.05%**
Fernandez, Pershin and Acin[8]	5.40%	1.50	6.08%	1.35%	2.97%	**10.40%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Dividend Growth Model

Company	Current Dividend Yield (DY)	Projected Short-term EPS Growth Rate (EG)	Cost of Equity Earnings Growth DY + EG
Kinder Morgan Inc.	4.60%	12.50%	17.10%
ONEOK Inc.	5.60%	27.05%	32.65%
TransCanada Corporation	5.40%	8.42%	13.82%
Williams Companies Inc.	5.40%	12.17%	17.57%
Mean	5.25%	15.03%	20.28%
Median	5.40%	12.33%	17.33%
DGM - Earnings Growth, Indicated Rate			**17.33%**

We placed more reliance on the median to select the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates are an average of the 3-year projected earnings per share (compound annual growth) from S&P Global Stock Report, next 5 years (per annum) from Yahoo! Finance, and expected earnings per share growth (3-5 years) from Zacks Investment Research.

Multi-Stage Dividend Growth Model

K_E = (DY x (1+ 0.5(G))) + 0.67(G1) +0.33(g)

K_E Cost of Equity
DY Dividend Yield
G_1 Short-term Growth Estimate
g Stable Growth
G Average Growth Rate

Company	**DY** Dividend Yield	**G1** Short-term Growth Estimate	**g** Stable Growth	**G** Average Growth Rate	**K_E** Cost of Equity
Kinder Morgan Inc.	4.60%	12.50%	3.90%	8.20%	14.45%
ONEOK Inc.	5.60%	27.05%	3.90%	15.47%	25.44%
TransCanada Corporation	5.40%	8.42%	3.90%	6.16%	12.49%
Williams Companies Inc.	5.40%	12.17%	3.90%	8.03%	15.06%
				Mean	16.86%
				Median	14.75%
				Multi-Stage DGM, Indicated Rate	**14.75%**

We placed more reliance on the median when selecting the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates are an average of the 3-year projected earnings per share (compound annual growth) from S&P Global Stock Report, next 5 years (per annum) from Yahoo! Finance, and expected earnings per share growth (3-5 years) from Zacks Investment Research.

Stable growth rate is the nominal growth rate determined in the Capitalization Rate Study Narrative (indicated long-term growth rate of the U.S. economy of 1.9% plus the expected inflation rate of 2.0%).

Equity Component of the Direct Rate

Company	Value Line P/E Ratio
Kinder Morgan Inc.	17.2
ONEOK Inc.	21.6
TransCanada Corporation	16.4
Williams Companies Inc.	23.9
Mean	19.78
Median	19.40
Selected Price to Earnings (P/E) Ratio	19.40
Indicated Equity Component of the Direct Rate	**5.15%**

We placed the most reliance on the median price to earnings ratio.

Notes:

The Price/Earnings Ratio was downloaded from Value Line.

Beta Analysis

Company	Beta
Kinder Morgan Inc.	1.45
ONEOK Inc.	1.55
TransCanada Corporation	1.10
Williams Companies Inc.	1.95
Beta Mean	1.51
Beta Median	1.50
Unlevered and Relevered Mean*	1.39
Indicated Beta	**1.50**

We considered the mean, median, and unlevered/relevered mean. We placed more reliance on the median when selecting the indicated beta.

Notes:

*See the Unlevering Relevering Beta page for the calculation

Unlevering/Relevering Betas

Unlevering of Betas					
Company	*Value Line* **Actual Income Tax Rate**	*From Capital Structure Page* **Actual Debt in Capital Structure**	*From Capital Structure Page* **Actual Equity in Capital Structure**	*Value Line* **Levered Beta (Published)**	*Formula* **Unlevered Beta**
Kinder Morgan Inc.	14.10%	47.37%	52.63%	1.45	0.82
ONEOK Inc.	21.00%	24.53%	75.47%	1.55	1.23
TransCanada Corporation	25.00%	0.99%	1.15%	1.10	0.67
Williams Companies Inc.	23.00%	41.11%	58.89%	1.95	1.27
			Average	**1.51**	

Relevering of Betas				
Company	*Formula* **Composite Income Tax Rate**	*From Capital Structure Page* **Industry Debt in Capital Structure**	*From Capital Structure Page* **Industry Equity in Capital Structure**	*Formula* **Levered Beta**
Kinder Morgan Inc.	20.78%	33.00%	67.00%	1.14
ONEOK Inc.	20.78%	33.00%	67.00%	1.71
TransCanada Corporation	20.78%	33.00%	67.00%	0.93
Williams Companies Inc.	20.78%	33.00%	67.00%	1.77
			Average	**1.39**

Notes:
Uses the Hamada Formula

Unlevered Beta = Levered Beta / [1 + (1 - Tax Rate) x (Debt/Equity))], using company-specific components
Using company-specific components

Relevered Beta = Unlevered Beta [1 + (1 - Tax Rate) x (Debt/Equity)]
Using industry components for Tax Rate, Debt, and Equity

Calculation of Market to Book Ratios for the Electric Market Segment

- December 31, 2018 calendar year information for the January 2, 2019 Assessment
- A market to book ratio over one would be an indication of no obsolescence.
- Market Value estimates for Common Equity are from Value Line. Market Value Estimates for Long-Term Debt are from the company's 10-K.
- Book Value amounts are from the company's 10-K.

Market to Book Ratio for Equity

Company	Market Value of Common Equity from Value Line	Book Value of Common Equity from 10-K	Market to Book Ratio	Source
Kinder Morgan Inc.	38,446,258,560	34,531,000,000	1.11	Kinder Morgan Inc. 2018 10-K, p. 77
ONEOK Inc.	25,619,592,788	6,579,543,000	3.89	ONEOK Inc. 2018 10-K, p. 65
TransCanada Corporation	36,916,460,000	22,717,869,000	1.62	TransCanada Corp. 2018 40-F, p. 118
Williams Companies Inc.	30,663,029,645	14,660,000,000	2.09	Williams Companies. 2018 10-K, p. 78
		Average	**2.18**	

Market to Book Ratio for Debt

Company	Market Value of Long-Term Debt from 10-K	Book Value of Long-Term Debt from 10-K	Market to Book Ratio	Source
Kinder Morgan Inc.	33,936,000,000	33,205,000,000	1.02	Kinder Morgan Inc. 2018 10-K, p. 104 & 107
ONEOK Inc.	9,600,000,000	9,400,000,000	1.02	ONEOK Inc. 2018 10-K, p. 82
TransCanada Corporation	26,845,067,700	26,592,507,000	1.01	TransCanada Corp. 2018 40-F, p. 155
Williams Companies Inc.	23,330,000,000	22,414,000,000	1.04	Williams Companies. 2018 10-K, p. 134
		Average	**1.02**	

Note: TransCanada Corporation 40-F reported in CAD, used 12/31/2018 conversion rate of 0.7330 from Bank of Canada to convert to USD.

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	67.00%	2.18	1.46
Long-term Debt	33.00%	1.02	0.34
			1.80

Appendix D - Fluid Transportation Pipeline

Yield Rate

	Capital Structure	Rate	Composite
Long-Term Debt	33.00%	5.64%	1.86%
Common Equity	67.00%	15.80%	10.59%
Yield Rate			**12.45%**

Fluid Transportation Pipeline Yield Rate	**12.45%**

Capital Structure

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
Buckeye Partners LP	4,985,000,000	N/A	4,811,221,844	9,796,221,844	50.89%	0.00%	49.11%
Holly Energy Partners LP	1,416,700,000	N/A	3,020,856,000	4,437,556,000	31.93%	0.00%	68.07%
Magellan Midstream Partners LP	3,718,600,000	N/A	14,218,840,420	17,937,440,420	20.73%	0.00%	79.27%
MPLX LP	12,889,000,000	1,000,000,000	26,585,822,137	40,474,822,137	31.84%	2.47%	65.68%
Phillips 66 Partners LP	2,922,000,000	N/A	5,960,271,457	8,882,271,457	32.90%	0.00%	67.10%
Plains All American Pipeline LP	9,140,000,000	N/A	15,767,369,527	24,907,369,527	36.70%	0.00%	63.30%
				Mean	34.16%	0.41%	65.42%
				Median	32.41%	0.00%	66.39%
				Indicated Industry Capital Structure	**33.00%**	**0%**	**67.00%**

We placed more reliance on the median when selecting the indicated capital structure for the industry.

Indexed Rate of Debt

Company	Debt Rating	Long-Term Debt Rate	
Buckeye Partners LP	Baa3	4.93%	
Holly Energy Partners LP	Ba3	8.03%	**
Magellan Midstream Partners LP	Baa1	4.93%	
MPLX LP	Baa3	4.93%	
Phillips 66 Partners LP	Baa3	4.93%	
Plains All American Pipeline LP	Ba1	8.03%	**

Mean	5.96%
Median	4.93%
Mode	4.93%

Public Utility Bond Yield Averages from Mergent Bond Record, January 2019 Edition

Public Utility Bond Averages, December 2018

Mergent	S&P	Yield Avg.
Aaa	AAA	
Aa1	AA+	
Aa2	AA	
Aa3	AA-	4.24
A1	A+	
A2	A	
A3	A-	4.37
Baa1	BBB+	
Baa2	BBB	
Baa3	BBB-	4.92

Notes:

** Holly Energy Partners LP and Plains All American Pipeline are below the debt ratings provided in the Mergent Bond Record Bond Yield Averages. We analyzed the Mergent Bond Record, January 2019 issue, for U.S. Corporate Bonds with the same debt rating. We determined the average Ba yield to maturity is 8.03%.

Current Actual Cost of Debt

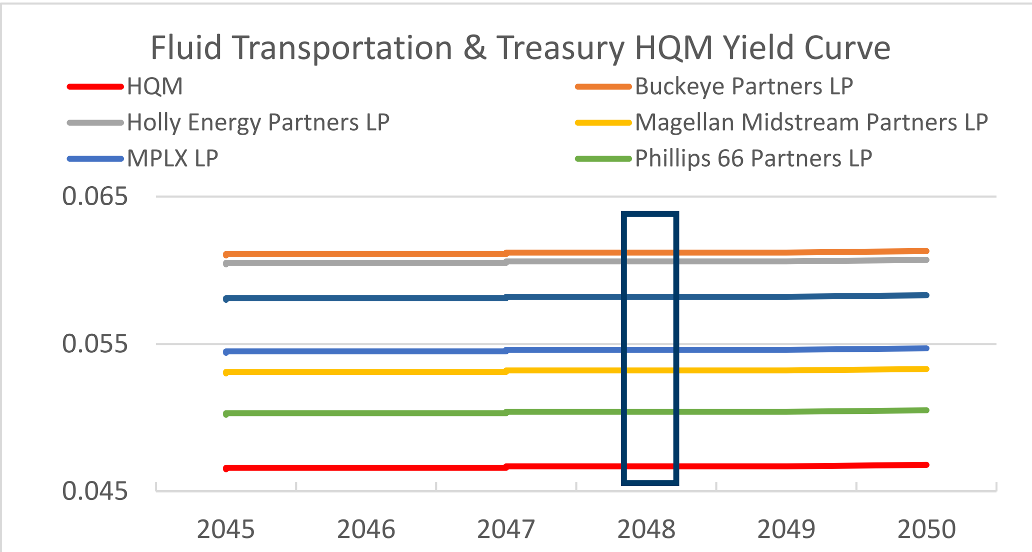
$$p = \sum_{i=1}^{n} d(t_i)c_i + \sum_{j=1}^{m} b_j x_j + e$$

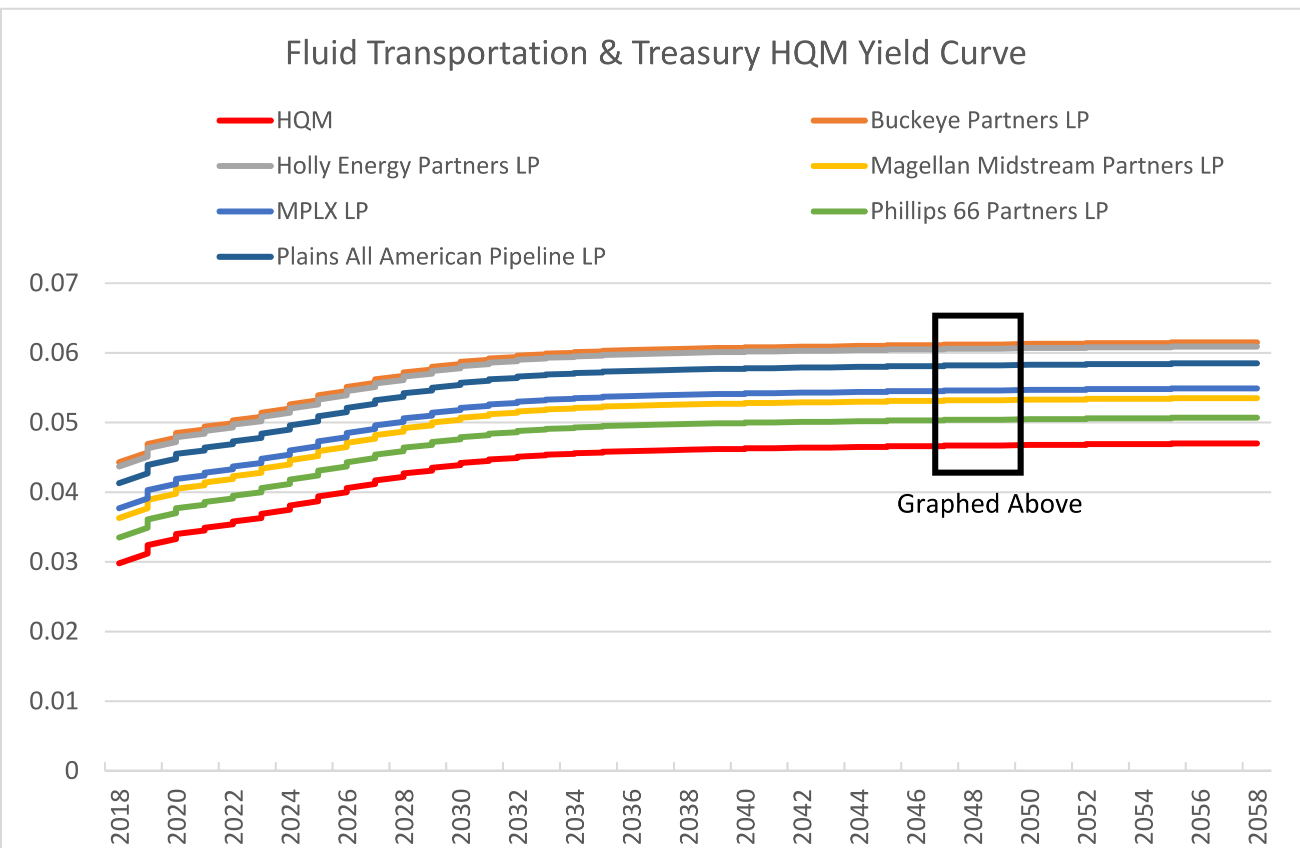
Yield-to-Maturities (YTMs) are based on year-end filings of Form N-Q or 10-K with the SEC.

30-year YTMs are based on an observed spread to the Treasury Quality Market Corporate Bond Spot rate curve (equation below) and followed out to 30 years.

Indicated Rate of Debt	5.64%

Average YTM at 2048 in below graph.
See Appendix G for more information about debt issuances.





	HQM	Buckeye Partners LP	Holly Energy Partners LP	Magellan Midstream Partners LP	MPLX LP	Phillips 66 Partners LP	Plains All American Pipeline LP
2018.5	2.98%	4.43%	4.37%	3.63%	3.77%	3.35%	4.13%
2019	3.12%	4.57%	4.51%	3.77%	3.91%	3.49%	4.27%
2019.5	3.24%	4.69%	4.63%	3.89%	4.03%	3.61%	4.39%
2020	3.33%	4.78%	4.72%	3.98%	4.12%	3.70%	4.48%
2020.5	3.40%	4.85%	4.79%	4.05%	4.19%	3.77%	4.55%
2021	3.45%	4.90%	4.84%	4.10%	4.24%	3.82%	4.60%
2021.5	3.49%	4.94%	4.88%	4.14%	4.28%	3.86%	4.64%
2022	3.54%	4.99%	4.93%	4.19%	4.33%	3.91%	4.69%
2022.5	3.58%	5.03%	4.97%	4.23%	4.37%	3.95%	4.73%
2023	3.63%	5.08%	5.02%	4.28%	4.42%	4.00%	4.78%
2023.5	3.69%	5.14%	5.08%	4.34%	4.48%	4.06%	4.84%
2024	3.75%	5.20%	5.14%	4.40%	4.54%	4.12%	4.90%
2024.5	3.81%	5.26%	5.20%	4.46%	4.60%	4.18%	4.96%
2025	3.87%	5.32%	5.26%	4.52%	4.66%	4.24%	5.02%
2025.5	3.94%	5.39%	5.33%	4.59%	4.73%	4.31%	5.09%
2026	4.00%	5.45%	5.39%	4.65%	4.79%	4.37%	5.15%
2026.5	4.06%	5.51%	5.45%	4.71%	4.85%	4.43%	5.21%
2027	4.12%	5.57%	5.51%	4.77%	4.91%	4.49%	5.27%
2027.5	4.17%	5.62%	5.56%	4.82%	4.96%	4.54%	5.32%
2028	4.22%	5.67%	5.61%	4.87%	5.01%	4.59%	5.37%
2028.5	4.27%	5.72%	5.66%	4.92%	5.06%	4.64%	5.42%
2029	4.31%	5.76%	5.70%	4.96%	5.10%	4.68%	5.46%
2029.5	4.35%	5.80%	5.74%	5.00%	5.14%	4.72%	5.50%
2030	4.39%	5.84%	5.78%	5.04%	5.18%	4.76%	5.54%
2030.5	4.42%	5.87%	5.81%	5.07%	5.21%	4.79%	5.57%
2031	4.45%	5.90%	5.84%	5.10%	5.24%	4.82%	5.60%
2031.5	4.47%	5.92%	5.86%	5.12%	5.26%	4.84%	5.62%
2032	4.49%	5.94%	5.88%	5.14%	5.28%	4.86%	5.64%
2032.5	4.51%	5.96%	5.90%	5.16%	5.30%	4.88%	5.66%
2033	4.53%	5.98%	5.92%	5.18%	5.32%	4.90%	5.68%
2033.5	4.54%	5.99%	5.93%	5.19%	5.33%	4.91%	5.69%
2034	4.55%	6.00%	5.94%	5.20%	5.34%	4.92%	5.70%
2034.5	4.56%	6.01%	5.95%	5.21%	5.35%	4.93%	5.71%
2035	4.57%	6.02%	5.96%	5.22%	5.36%	4.94%	5.72%
2035.5	4.58%	6.03%	5.97%	5.23%	5.37%	4.95%	5.73%
2036	4.59%	6.04%	5.98%	5.24%	5.38%	4.96%	5.74%

2036.5	4.59%	6.04%	5.98%	5.24%	5.38%	4.96%	5.74%
2037	4.60%	6.05%	5.99%	5.25%	5.39%	4.97%	5.75%
2037.5	4.60%	6.05%	5.99%	5.25%	5.39%	4.97%	5.75%
2038	4.61%	6.06%	6.00%	5.26%	5.40%	4.98%	5.76%
2038.5	4.61%	6.06%	6.00%	5.26%	5.40%	4.98%	5.76%
2039	4.62%	6.07%	6.01%	5.27%	5.41%	4.99%	5.77%
2039.5	4.62%	6.07%	6.01%	5.27%	5.41%	4.99%	5.77%
2040	4.62%	6.07%	6.01%	5.27%	5.41%	4.99%	5.77%
2040.5	4.63%	6.08%	6.02%	5.28%	5.42%	5.00%	5.78%
2041	4.63%	6.08%	6.02%	5.28%	5.42%	5.00%	5.78%
2041.5	4.63%	6.08%	6.02%	5.28%	5.42%	5.00%	5.78%
2042	4.64%	6.09%	6.03%	5.29%	5.43%	5.01%	5.79%
2042.5	4.64%	6.09%	6.03%	5.29%	5.43%	5.01%	5.79%
2043	4.64%	6.09%	6.03%	5.29%	5.43%	5.01%	5.79%
2043.5	4.64%	6.09%	6.03%	5.29%	5.43%	5.01%	5.79%
2044	4.65%	6.10%	6.04%	5.30%	5.44%	5.02%	5.80%
2044.5	4.65%	6.10%	6.04%	5.30%	5.44%	5.02%	5.80%
2045	4.65%	6.10%	6.04%	5.30%	5.44%	5.02%	5.80%
2045.5	4.66%	6.11%	6.05%	5.31%	5.45%	5.03%	5.81%
2046	4.66%	6.11%	6.05%	5.31%	5.45%	5.03%	5.81%
2046.5	4.66%	6.11%	6.05%	5.31%	5.45%	5.03%	5.81%
2047	4.66%	6.11%	6.05%	5.31%	5.45%	5.03%	5.81%
2047.5	4.67%	6.12%	6.06%	5.32%	5.46%	5.04%	5.82%
2048	**4.67%**	**6.12%**	**6.06%**	**5.32%**	**5.46%**	**5.04%**	**5.82%**
2048.5	4.67%	6.12%	6.06%	5.32%	5.46%	5.04%	5.82%
2049	4.67%	6.12%	6.06%	5.32%	5.46%	5.04%	5.82%
2049.5	4.67%	6.12%	6.06%	5.32%	5.46%	5.04%	5.82%
2050	4.68%	6.13%	6.07%	5.33%	5.47%	5.05%	5.83%
2050.5	4.68%	6.13%	6.07%	5.33%	5.47%	5.05%	5.83%
2051	4.68%	6.13%	6.07%	5.33%	5.47%	5.05%	5.83%
2051.5	4.68%	6.13%	6.07%	5.33%	5.47%	5.05%	5.83%
2052	4.68%	6.13%	6.07%	5.33%	5.47%	5.05%	5.83%
2052.5	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2053	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2053.5	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2054	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2054.5	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2055	4.69%	6.14%	6.08%	5.34%	5.48%	5.06%	5.84%
2055.5	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%
2056	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%
2056.5	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%
2057	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%
2057.5	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%
2058	4.70%	6.15%	6.09%	5.35%	5.49%	5.07%	5.85%

Indicated Rate of Equity

Model	Rate
CAPM - Ex Post	11.61%
CAPM - Supply Side	10.65%
CAPM - Three Stage Ex Ante	10.03%
CAPM - Damodaran	10.42%
CAPM - Duff & Phelps	10.38%
CAPM - Graham and Harvey	8.50%
CAPM - Fernandez, Pershin, and Acin	9.72%
Empirical CAPM - Ex Post	11.18%
Empirical CAPM - Supply Side	10.26%
Empirical CAPM - Three Stage Ex Ante	9.68%
Empirical CAPM - Damodaran	10.05%
Empirical CAPM - Duff & Phelps	10.03%
Empirical CAPM - Graham and Harvey	8.22%
Empirical CAPM - Fernandez, Pershin, and Acin	9.38%
DGM - Earnings Growth	19.38%
Multi-Stage DGM	17.19%
Indicated Rate of Equity	**15.80%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance on the Dividend Growth Model - Earnings Growth and secondary reliance on the Capital Asset Pricing Model using the Ex Post equity risk premium.

Direct Rate and Growth

	Capital Structure	Rate	Composite
Debt Component	33.00%	5.64%	1.86%
Equity Component	67.00%	8.73%	5.85%
Direct Rate			**7.71%**

Direct Rate	**7.71%**

Yield Rate	12.45%
Direct Rate	7.71%
Implied Industry Growth Rate	**4.74%**

Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.25	8.64%	2.97%	11.61%
Supply Side[3]	6.14%	1.25	7.68%	2.97%	10.65%
Three Stage Ex Ante[4]	5.65%	1.25	7.06%	2.97%	10.03%
Dr. Damodaran ERP[5]	5.96%	1.25	7.45%	2.97%	10.42%
Duff & Phelps[6]	5.50%	1.25	6.88%	3.50%	10.38%
Graham and Harvey[7]	4.42%	1.25	5.53%	2.97%	8.50%
Fernandez, Pershin and Acin[8]	5.40%	1.25	6.75%	2.97%	9.72%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.25	6.48%	1.73%	2.97%	**11.18%**
Supply Side[3]	6.14%	1.25	5.76%	1.54%	2.97%	**10.26%**
Three Stage Ex Ante[4]	5.65%	1.25	5.30%	1.41%	2.97%	**9.68%**
Dr. Damodaran ERP[5]	5.96%	1.25	5.59%	1.49%	2.97%	**10.05%**
Duff & Phelps[6]	5.50%	1.25	5.16%	1.38%	3.50%	**10.03%**
Graham and Harvey[7]	4.42%	1.25	4.14%	1.11%	2.97%	**8.22%**
Fernandez, Pershin and Acin[8]	5.40%	1.25	5.06%	1.35%	2.97%	**9.38%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Dividend Growth Model

Company	Current Dividend Yield (DY)	Projected Short-term EPS Growth Rate (EG)	Cost of Equity Earnings Growth DY + EG
Buckeye Partners LP	9.60%	6.79%	16.39%
Holly Energy Partners LP	9.30%	9.18%	18.48%
Magellan Midstream Partners LP	6.60%	13.67%	20.27%
MPLX LP	7.60%	20.90%	28.50%
Phillips 66 Partners LP	6.60%	11.89%	18.49%
Plains All American Pipeline LP	5.80%	17.99%	23.79%
Mean	7.58%	13.40%	20.99%
Median	7.10%	12.78%	19.38%
DGM - Earnings Growth, Indicated Rate			**19.38%**

We placed more reliance on the median to select the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates are an average of the 3-year projected earnings per share (compound annual growth) from S&P Global Stock Report, next 5 years (per annum) from Yahoo! Finance, and expected earnings per share growth (3-5 years) from Zacks Investment Research.

Multi-Stage Dividend Growth Model

K_E = (DY x (1+ 0.5(G))) + 0.67(G1) +0.33(g)

K_E Cost of Equity
DY Dividend Yield
G_1 Short-term Growth Estimate
g Stable Growth
G Average Growth Rate

Company	**DY** Dividend Yield	**G1** Short-term Growth Estimate	**g** Stable Growth	**G** Average Growth Rate	**K_E** Cost of Equity
Buckeye Partners LP	9.60%	6.79%	3.90%	5.35%	15.69%
Holly Energy Partners LP	9.30%	9.18%	3.90%	6.54%	17.04%
Magellan Midstream Partners LP	6.60%	13.67%	3.90%	8.79%	17.34%
MPLX LP	7.60%	20.90%	3.90%	12.40%	23.36%
Phillips 66 Partners LP	6.60%	11.89%	3.90%	7.89%	16.11%
Plains All American Pipeline LP	5.80%	17.99%	3.90%	10.95%	19.46%
				Mean	18.17%
				Median	17.19%
				Multi-Stage DGM, Indicated Rate	**17.19%**

We placed more reliance on the median to select the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates are an average of the 3-year projected earnings per share (compound annual growth) from S&P Global Stock Report, next 5 years (per annum) from Yahoo! Finance, and expected earnings per share growth (3-5 years) from Zacks Investment Research.

Stable growth rate is the nominal growth rate determined in the Capitalization Rate Study Narrative (indicated long-term growth rate of the U.S. economy of 1.9% plus the expected inflation rate of 2.0%).

Equity Component of the Direct Rate

Company	Value Line P/E Ratio
Buckeye Partners LP	11.3
Holly Energy Partners LP	13.0
Magellan Midstream Partners LP	10.8
MPLX LP	14.0
Phillips 66 Partners LP	11.6
Plains All American Pipeline LP	9.4
Mean	11.68
Median	11.45
Selected Price to Earnings (P/E) Ratio	11.45
Indicated Equity Component of the Direct Rate	**8.73%**

We placed the most reliance on the median price to earnings ratio.

Notes:

The Price/Earnings Ratio was downloaded from Value Line.

Beta Analysis

Company	Beta
Buckeye Partners LP	1.25
Holly Energy Partners LP	1.05
Magellan Midstream Partners LP	1.20
MPLX LP	1.40
Phillips 66 Partners LP	1.10
Plains All American Pipeline LP	1.50
Beta Mean	1.25
Beta Median	1.23
Unlevered and Relevered Mean*	1.33
Indicated Beta	**1.25**

We considered the mean, median, and unlevered/relevered mean. We placed more reliance on the mean when selecting the indicated beta. We placed the least amount of reliance on the unlevered and relevered mean given the minimal tax rate applicable to the guideline companies. The Hamada formula used to unlever and relever betas relies on an income tax component, which these guideline companies do not have.

Notes:

*See the Unlevering Relevering Beta page for the calculation

Unlevering/Relevering Betas

Unlevering of Betas					
Company	*Value Line* **Actual Income Tax Rate**	*From Capital Structure Page* **Actual Debt in Capital Structure**	*From Capital Structure Page* **Actual Equity in Capital Structure**	*Value Line* **Levered Beta (Published)**	*Formula* **Unlevered Beta**
Buckeye Partners LP	---	50.89%	49.11%	1.25	---
Holly Energy Partners LP	0.10%	31.93%	68.07%	1.05	0.72
Magellan Midstream Partners	0.50%	20.73%	79.27%	1.20	0.95
MPLX LP	1.50%	31.84%	65.68%	1.40	0.95
Phillips 66 Partners LP	---	32.90%	67.10%	1.10	---
Plains All American Pipeline LP	3.50%	36.70%	63.30%	1.50	0.96
			Average	**1.25**	

Relevering of Betas				
Company	*Formula* **Composite Income Tax Rate**	*From Capital Structure Page* **Industry Debt in Capital Structure**	*From Capital Structure Page* **Industry Equity in Capital Structure**	*Formula* **Levered Beta**
Buckeye Partners LP	1.40%	33.00%	67.00%	---
Holly Energy Partners LP	1.40%	33.00%	67.00%	1.07
Magellan Midstream Partners	1.40%	33.00%	67.00%	1.41
MPLX LP	1.40%	33.00%	67.00%	1.41
Phillips 66 Partners LP	1.40%	33.00%	67.00%	---
Plains All American Pipeline LP	1.40%	33.00%	67.00%	1.43
			Average	**1.33**

Notes:

Uses the Hamada Formula

Unlevered Beta = Levered Beta / [1 + (1 - Tax Rate) x (Debt/Equity))], using company-specific components
Using company-specific components

Relevered Beta = Unlevered Beta [1 + (1 - Tax Rate) x (Debt/Equity)]
Using industry components for Tax Rate, Debt, and Equity

Calculation of Market to Book Ratios for the Electric Market Segment

- December 31, 2018 calendar year information for the January 2, 2019 Assessment
- A market to book ratio over one would be an indication of no obsolescence.
- Market Value estimates for Common Equity are from Value Line. Market Value Estimates for Long-Term Debt are from the company's 10-K.
- Book Value amounts are from the company's 10-K.

Market to Book Ratio for Equity

Company	Market Value of Common Equity from Value Line	Book Value of Common Equity from 10-K	Market to Book Ratio	Source
Buckeye Partners LP	4,811,221,844	4,131,170,000	1.16	Buckeye Partners. 2018 10-K, p. 63
Holly Energy Partners LP	3,020,856,000	515,561,000	5.86	Holly Energy Partners. 2018 10-K, p. 65
Magellan Midstream Partners LP	14,218,840,420	2,129,653,000	6.68	Magellan Midstream Partners. 2018-10-K, p. 74
MPLX LP	26,585,822,137	6,864,000,000	3.87	MPLX LP. 2018 10-K, p. 103
Phillips 66 Partners LP	5,960,271,457	2,509,000,000	2.38	Phillips 66 Partners. 2018 10-K, p. 67
Plains All American Pipeline LP	15,767,369,527	12,002,000,000	1.31	Plains All American Pipeline. 2018 10-K, p.
		Average	**3.54**	

Market to Book Ratio for Debt

Company	Market Value of Long-Term Debt from 10-K	Book Value of Long-Term Debt from 10-K	Market to Book Ratio	Source
Buckeye Partners LP	4,536,877,000	4,714,442,000	0.96	Buckeye Partners. 2018 10-K, p. 98
Holly Energy Partners LP	488,310,000	495,900,000	0.98	Holly Energy Partners. 2018 10-K, p. 79
Magellan Midstream Partners LP	4,224,373,000	4,270,869,000	0.99	Magellan Midstream Partners. 2018-10-K, p. 116
MPLX LP	13,169,000,000	13,484,000,000	0.98	MPLX LP. 2018 10-K, p. 139
Phillips 66 Partners LP	2,660,000,000	2,998,000,000	0.89	Phillips 66 Partners. 2018 10-K, p. 85
Plains All American Pipeline LP	8,600,000,000	9,143,000,000	0.94	Plains All American Pipeline. 2018 10-K, p. F-31
		Average	**0.95**	

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	67.00%	3.54	2.37
Long-term Debt	33.00%	0.95	0.31
			2.68

Appendix E - Class I Railroads and Other Railroads

Yield Rate

Class I Railroads

	Capital Structure	Rate	Composite
Long-Term Debt	19.00%	4.60%	0.87%
Common Equity	81.00%	12.17%	9.86%
Yield Rate			**10.73%**

Class I Railroads Yield Rate	**10.73%**

Other Railroads

	Capital Structure	Rate	Composite
Long-Term Debt	30.00%	4.78%	1.43%
Common Equity	70.00%	13.34%	9.34%
Yield Rate			**10.77%**

Other Railroads Yield Rate	**10.77%**

Capital Structure

Company	Value of Long-Term Debt	Value of Preferred Equity	Value of Common Equity	Total Market Value	% Long-Term Debt	% Preferred Equity	% Common Equity
Canadian National Railway	7,755,000,000	None	63,073,277,919	70,828,277,919	10.95%	0.00%	89.05%
Canadian Pacific Railway	6,011,000,000	None	29,570,962,000	35,581,962,000	16.89%	0.00%	83.11%
CSX Corporation	13,754,000,000	None	59,345,862,971	73,099,862,971	18.82%	0.00%	81.18%
Genesee & Wyoming Inc.	2,300,600,000	None	4,655,626,499	6,956,226,499	33.07%	0.00%	66.93%
Kansas City Southern	2,680,700,000	6,100,000	9,997,875,425	12,684,675,425	21.13%	0.05%	78.82%
Norfolk Southern Corp	10,635,000,000	None	45,432,916,531	56,067,916,531	18.97%	0.00%	81.03%
Union Pacific Corp	20,943,000,000	None	109,479,643,634	130,422,643,634	16.06%	0.00%	83.94%

	% Long-Term Debt	% Preferred Equity	% Common Equity
Mean Class I*	17.14%	0.01%	82.86%
Median Class I*	18.82%	0.00%	81.18%
Mean Other Railroads^	33.07%	0.00%	66.93%
Median Other Railroads^	33.07%	0.00%	66.93%

Indicated Capital Structure, Class I Railroads	**19.00%**	**0%**	**81.00%**
Indicated Capital Structure, Other Railroads	**30.00%**	**0%**	**70.00%**

We placed more reliance on the median capital structure when selecting the indicated capital structure for Class I Railroads, rounding to 20% debt, 80% equity.
We selected the median and mean capital structure as the indicated capital structure for Other Railroads, rounding to 30% debt, 70% equity.

Notes:
Data downloaded from Value Line.
* Does not include Genesee & Wyoming.
^ Genesee & Wyoming only.

Indexed Rate of Debt

Company	Debt Rating	Long-Term Debt Rate	
Canadian National Railway	A2	4.25%	
Canadian Pacific Railway	Baa1	4.93%	
CSX Corporation	Baa1	4.93%	
Genesee & Wyoming Inc.	Ba2	8.03%	**
Kansas City Southern	Baa2	4.93%	
Norfolk Southern Corp	Baa1	4.93%	
Union Pacific Corp	Baa1	4.93%	

Mean Class I Railroads	4.82%
Median Class I Railroads	4.93%
Mode Class I Railroads	4.93%
Other Railroads^	8.03%

Industrial Bond Yield Averages from Mergent Bond Record, January 2019 Edition

Industrial Bond Averages, December 2018

Mergent	S&P	Yield Avg.
Aaa	AAA	3.93
Aa1	AA+	
Aa2	AA	
Aa3	AA-	4.06
A1	A+	
A2	A	
A3	A-	4.25
Baa1	BBB+	
Baa2	BBB	
Baa3	BBB-	4.93

Notes:

*Does not include Genesee & Wyoming.

^Genesee & Wyoming only.

** Genesee & Wyoming is rated below the Mergent Bond Record Bond Yield Averages. We analyzed the Mergent Bond Record, January 2019 issue, for U.S. Corporate Bonds with the same debt rating. We determined the average Ba yield to maturity is 8.03%.

Current Actual Cost of Debt

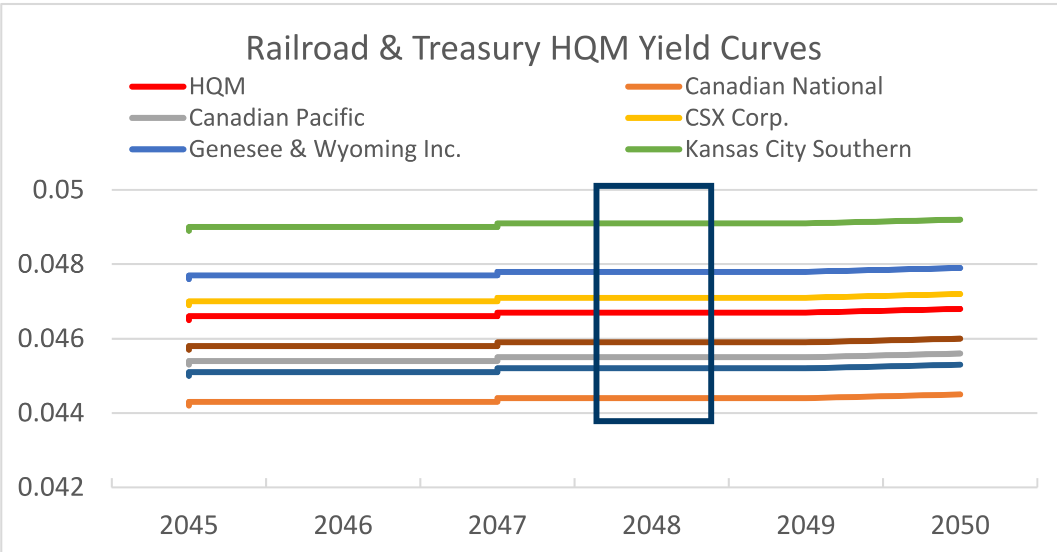
$$p = \sum_{i=1}^{n} d(t_i)c_i + \sum_{j=1}^{m} b_j x_j + e$$

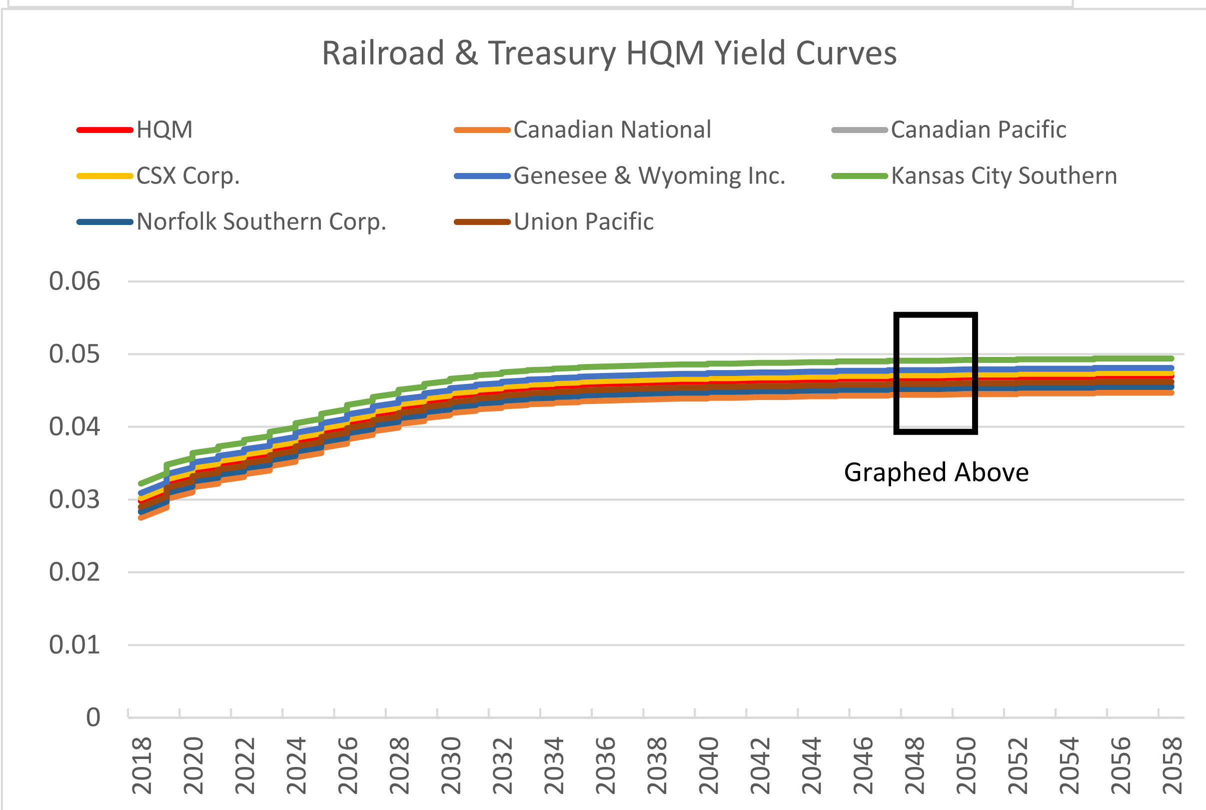
Yield-to-Maturities (YTMs) are based on year-end filings of Form N-Q or 10-K with the SEC.

30-year YTMs are based on an observed spread to the Treasury Quality Market Corporate Bond Spot rate curve (equation to the left) and followed out to 30 years.

Indicated Rate of Debt Class I Railroads	**4.60%**	Average YTM at 2048 in below graph for all Class I Railroads
Indicated Rate of Debt Other Railroads	**4.78%**	Average YTM at 2048 in below graph for Genesee & Wyoming

See Appendix G for more information about debt issuances.





	HQM	Canadian National	Canadian Pacific	CSX Corp.	Genesee & Wyoming Inc	Kansas City Southern	Norfolk Southern Corp.	Union Pacific
2018.5	2.98%	2.67%	2.86%	2.97%	3.09%	3.22%	2.83%	2.90%
2019	3.12%	2.81%	3.00%	3.11%	3.23%	3.36%	2.97%	3.04%
2019.5	3.24%	2.93%	3.12%	3.23%	3.35%	3.48%	3.09%	3.16%
2020	3.33%	3.02%	3.21%	3.32%	3.44%	3.57%	3.18%	3.25%
2020.5	3.40%	3.09%	3.28%	3.39%	3.51%	3.64%	3.25%	3.32%
2021	3.45%	3.14%	3.33%	3.44%	3.56%	3.69%	3.30%	3.37%
2021.5	3.49%	3.18%	3.37%	3.48%	3.60%	3.73%	3.34%	3.41%
2022	3.54%	3.23%	3.42%	3.53%	3.65%	3.78%	3.39%	3.46%
2022.5	3.58%	3.27%	3.46%	3.57%	3.69%	3.82%	3.43%	3.50%
2023	3.63%	3.32%	3.51%	3.62%	3.74%	3.87%	3.48%	3.55%
2023.5	3.69%	3.38%	3.57%	3.68%	3.80%	3.93%	3.54%	3.61%
2024	3.75%	3.44%	3.63%	3.74%	3.86%	3.99%	3.60%	3.67%
2024.5	3.81%	3.50%	3.69%	3.80%	3.92%	4.05%	3.66%	3.73%
2025	3.87%	3.56%	3.75%	3.86%	3.98%	4.11%	3.72%	3.79%
2025.5	3.94%	3.63%	3.82%	3.93%	4.05%	4.18%	3.79%	3.86%
2026	4.00%	3.69%	3.88%	3.99%	4.11%	4.24%	3.85%	3.92%
2026.5	4.06%	3.75%	3.94%	4.05%	4.17%	4.30%	3.91%	3.98%
2027	4.12%	3.81%	4.00%	4.11%	4.23%	4.36%	3.97%	4.04%
2027.5	4.17%	3.86%	4.05%	4.16%	4.28%	4.41%	4.02%	4.09%
2028	4.22%	3.91%	4.10%	4.21%	4.33%	4.46%	4.07%	4.14%
2028.5	4.27%	3.96%	4.15%	4.26%	4.38%	4.51%	4.12%	4.19%
2029	4.31%	4.00%	4.19%	4.30%	4.42%	4.55%	4.16%	4.23%
2029.5	4.35%	4.04%	4.23%	4.34%	4.46%	4.59%	4.20%	4.27%
2030	4.39%	4.08%	4.27%	4.38%	4.50%	4.63%	4.24%	4.31%
2030.5	4.42%	4.11%	4.30%	4.41%	4.53%	4.66%	4.27%	4.34%
2031	4.45%	4.14%	4.33%	4.44%	4.56%	4.69%	4.30%	4.37%
2031.5	4.47%	4.16%	4.35%	4.46%	4.58%	4.71%	4.32%	4.39%
2032	4.49%	4.18%	4.37%	4.48%	4.60%	4.73%	4.34%	4.41%
2032.5	4.51%	4.20%	4.39%	4.50%	4.62%	4.75%	4.36%	4.43%
2033	4.53%	4.22%	4.41%	4.52%	4.64%	4.77%	4.38%	4.45%
2033.5	4.54%	4.23%	4.42%	4.53%	4.65%	4.78%	4.39%	4.46%
2034	4.55%	4.24%	4.43%	4.54%	4.66%	4.79%	4.40%	4.47%
2034.5	4.56%	4.25%	4.44%	4.55%	4.67%	4.80%	4.41%	4.48%
2035	4.57%	4.26%	4.45%	4.56%	4.68%	4.81%	4.42%	4.49%
2035.5	4.58%	4.27%	4.46%	4.57%	4.69%	4.82%	4.43%	4.50%
2036	4.59%	4.28%	4.47%	4.58%	4.70%	4.83%	4.44%	4.51%
2036.5	4.59%	4.28%	4.47%	4.58%	4.70%	4.83%	4.44%	4.51%
2037	4.60%	4.29%	4.48%	4.59%	4.71%	4.84%	4.45%	4.52%
2037.5	4.60%	4.29%	4.48%	4.59%	4.71%	4.84%	4.45%	4.52%

2038	4.61%	4.30%	4.49%	4.60%	4.72%	4.85%	4.46%	4.53%
2038.5	4.61%	4.30%	4.49%	4.60%	4.72%	4.85%	4.46%	4.53%
2039	4.62%	4.31%	4.50%	4.61%	4.73%	4.86%	4.47%	4.54%
2039.5	4.62%	4.31%	4.50%	4.61%	4.73%	4.86%	4.47%	4.54%
2040	4.62%	4.31%	4.50%	4.61%	4.73%	4.86%	4.47%	4.54%
2040.5	4.63%	4.32%	4.51%	4.62%	4.74%	4.87%	4.48%	4.55%
2041	4.63%	4.32%	4.51%	4.62%	4.74%	4.87%	4.48%	4.55%
2041.5	4.63%	4.32%	4.51%	4.62%	4.74%	4.87%	4.48%	4.55%
2042	4.64%	4.33%	4.52%	4.63%	4.75%	4.88%	4.49%	4.56%
2042.5	4.64%	4.33%	4.52%	4.63%	4.75%	4.88%	4.49%	4.56%
2043	4.64%	4.33%	4.52%	4.63%	4.75%	4.88%	4.49%	4.56%
2043.5	4.64%	4.33%	4.52%	4.63%	4.75%	4.88%	4.49%	4.56%
2044	4.65%	4.34%	4.53%	4.64%	4.76%	4.89%	4.50%	4.57%
2044.5	4.65%	4.34%	4.53%	4.64%	4.76%	4.89%	4.50%	4.57%
2045	4.65%	4.34%	4.53%	4.64%	4.76%	4.89%	4.50%	4.57%
2045.5	4.66%	4.35%	4.54%	4.65%	4.77%	4.90%	4.51%	4.58%
2046	4.66%	4.35%	4.54%	4.65%	4.77%	4.90%	4.51%	4.58%
2046.5	4.66%	4.35%	4.54%	4.65%	4.77%	4.90%	4.51%	4.58%
2047	4.66%	4.35%	4.54%	4.65%	4.77%	4.90%	4.51%	4.58%
2047.5	4.67%	4.36%	4.55%	4.66%	4.78%	4.91%	4.52%	4.59%
2048	**4.67%**	**4.36%**	**4.55%**	**4.66%**	**4.78%**	**4.91%**	**4.52%**	**4.59%**
2048.5	4.67%	4.36%	4.55%	4.66%	4.78%	4.91%	4.52%	4.59%
2049	4.67%	4.36%	4.55%	4.66%	4.78%	4.91%	4.52%	4.59%
2049.5	4.67%	4.36%	4.55%	4.66%	4.78%	4.91%	4.52%	4.59%
2050	4.68%	4.37%	4.56%	4.67%	4.79%	4.92%	4.53%	4.60%
2050.5	4.68%	4.37%	4.56%	4.67%	4.79%	4.92%	4.53%	4.60%
2051	4.68%	4.37%	4.56%	4.67%	4.79%	4.92%	4.53%	4.60%
2051.5	4.68%	4.37%	4.56%	4.67%	4.79%	4.92%	4.53%	4.60%
2052	4.68%	4.37%	4.56%	4.67%	4.79%	4.92%	4.53%	4.60%
2052.5	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2053	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2053.5	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2054	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2054.5	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2055	4.69%	4.38%	4.57%	4.68%	4.80%	4.93%	4.54%	4.61%
2055.5	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%
2056	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%
2056.5	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%
2057	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%
2057.5	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%
2058	4.70%	4.39%	4.58%	4.69%	4.81%	4.94%	4.55%	4.62%

Indicated Rate of Equity

Class I Railroads

Model	Rate
CAPM - Ex Post	10.78%
CAPM - Supply Side	9.91%
CAPM - Three Stage Ex Ante	9.35%
CAPM - Damodaran	9.70%
CAPM - Duff & Phelps	9.72%
CAPM - Graham and Harvey	7.96%
CAPM - Fernandez, Pershin, and Acin	9.07%
Empirical CAPM - Ex Post	10.55%
Empirical CAPM - Supply Side	9.71%
Empirical CAPM - Three Stage Ex Ante	9.17%
Empirical CAPM - Damodaran	9.51%
Empirical CAPM - Duff & Phelps	9.54%
Empirical CAPM - Graham and Harvey	7.82%
Empirical CAPM - Fernandez, Pershin, and Acin	8.90%
DGM - Dividend Growth	11.50%
DGM - Earnings Growth	13.30%
Multi-Stage DGM	10.95%
Indicated Rate of Equity	**12.17%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance on the Dividend Growth Model - Earnings Growth and secondary reliance on the Capital Asset Pricing Model using the Ex Post equity risk premium.

Indicated Rate of Equity

Other Railroads

Model	Rate
CAPM - Ex Post	13.34%
CAPM - Supply Side	12.18%
CAPM - Three Stage Ex Ante	11.45%
CAPM - Damodaran	11.91%
CAPM - Duff & Phelps	11.75%
CAPM - Graham and Harvey	9.60%
CAPM - Fernandez, Pershin, and Acin	11.07%
Empirical CAPM - Ex Post	12.47%
Empirical CAPM - Supply Side	11.41%
Empirical CAPM - Three Stage Ex Ante	10.74%
Empirical CAPM - Damodaran	11.17%
Empirical CAPM - Duff & Phelps	11.06%
Empirical CAPM - Graham and Harvey	9.05%
Empirical CAPM - Fernandez, Pershin, and Acin	10.40%
DGM - Dividend Growth	11.50%
DGM - Earnings Growth	13.30%
Multi-Stage DGM	10.95%
Indicated Rate of Equity	**13.34%**

We established a range of acceptability for the cost of equity with all available models. We considered all of the data and placed the most reliance the Capital Asset Pricing Model using the Ex Post equity risk premium.

Direct Rate and Growth

Class I Railroads

	Capital Structure	Rate	Composite
Debt Component	19.00%	4.60%	0.87%
Equity Component	81.00%	5.71%	4.63%
Direct Rate			**5.50%**

Direct Rate	**5.50%**

Yield Rate	10.73%
Direct Rate	5.50%
Implied Industry Growth Rate	**5.23%**

Other Railroads

	Capital Structure	Rate	Composite
Debt Component	30.00%	4.78%	1.43%
Equity Component	70.00%	5.56%	3.89%
Direct Rate			**5.33%**

Direct Rate	**5.33%**

Yield Rate	10.77%
Direct Rate	5.33%
Implied Industry Growth Rate	**5.44%**

Class I Railroads
Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.13	7.81%	2.97%	10.78%
Supply Side[3]	6.14%	1.13	6.94%	2.97%	9.91%
Three Stage Ex Ante[4]	5.65%	1.13	6.38%	2.97%	9.35%
Dr. Damodaran ERP[5]	5.96%	1.13	6.73%	2.97%	9.70%
Duff & Phelps[6]	5.50%	1.13	6.22%	3.50%	9.72%
Graham and Harvey[7]	4.42%	1.13	4.99%	2.97%	7.96%
Fernandez, Pershin and Acin[8]	5.40%	1.13	6.10%	2.97%	9.07%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Other Railroads
Capital Asset Pricing Model (CAPM)

(ERP x β) + RFR = Indicated Equity Rate

	Equity Risk Premium (ERP)	x Industry Beta (β)	= Industry Risk Premium	+ Risk-Free Rate[1] (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.50	10.37%	2.97%	13.34%
Supply Side[3]	6.14%	1.50	9.21%	2.97%	12.18%
Three Stage Ex Ante[4]	5.65%	1.50	8.48%	2.97%	11.45%
Dr. Damodaran ERP[5]	5.96%	1.50	8.94%	2.97%	11.91%
Duff & Phelps[6]	5.50%	1.50	8.25%	3.50%	11.75%
Graham and Harvey[7]	4.42%	1.50	6.63%	2.97%	9.60%
Fernandez, Pershin and Acin[8]	5.40%	1.50	8.10%	2.97%	11.07%

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

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7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Class I Railroads
Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.13	5.86%	1.73%	2.97%	**10.55%**
Supply Side[3]	6.14%	1.13	5.20%	1.54%	2.97%	**9.71%**
Three Stage Ex Ante[4]	5.65%	1.13	4.79%	1.41%	2.97%	**9.17%**
Dr. Damodaran ERP[5]	5.96%	1.13	5.05%	1.49%	2.97%	**9.51%**
Duff & Phelps[6]	5.50%	1.13	4.66%	1.38%	3.50%	**9.54%**
Graham and Harvey[7]	4.42%	1.13	3.75%	1.11%	2.97%	**7.82%**
Fernandez, Pershin and Acin[8]	5.40%	1.13	4.58%	1.35%	2.97%	**8.90%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

6 Duff & Phelps recommended equity risk premium (conditional) Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Other Railroads
Empirical Capital Asset Pricing Model (ECAPM)

(ERP x β x .75) + (ERP x .25) + RFR = Indicated Equity Rate

Model	Equity Risk Premium (ERP)	Industry Beta (β)	Weighted Industry Risk Premium (weighted at 75%)	Weighted Equity Risk Premium (weighted at 25%)	Risk-Free Rate (RFR)	Indicated Equity Rate
Ex Post[2]	6.91%	1.50	7.77%	1.73%	2.97%	**12.47%**
Supply Side[3]	6.14%	1.50	6.91%	1.54%	2.97%	**11.41%**
Three Stage Ex Ante[4]	5.65%	1.50	6.36%	1.41%	2.97%	**10.74%**
Dr. Damodaran ERP[5]	5.96%	1.50	6.71%	1.49%	2.97%	**11.17%**
Duff & Phelps[6]	5.50%	1.50	6.19%	1.38%	3.50%	**11.06%**
Graham and Harvey[7]	4.42%	1.50	4.97%	1.11%	2.97%	**9.05%**
Fernandez, Pershin and Acin[8]	5.40%	1.50	6.08%	1.35%	2.97%	**10.40%**

Notes:

1 U.S. Treasury on January 2, 2019 - 30-year Coupon Bond Yield, Daily Observations, Retrieved from www.federalreserve.gov

2 Historical Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

3 Supply Side Long-Term (1926 - Present) Equity Risk Premium. Duff & Phelps. (2019, February). Cost of Capital Navigator. Retrieved February 6, 2019, from https://costofcapital.duffandphelps.com/

4 Three Stage Dividend Growth Model, S&P 500. See Appendix F, Three Stage Ex Ante Calculation

5 Implied Equity Risk Premium on January 1, 2019 as determined by Dr. Aswath Damodaran; http://pages.stern.nyu.edu/~adamodar/

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7 Graham, J. R., & Harvey, C. R. (2018). The Equity Risk Premium in 2018. SSRN Electronic Journal. doi:10.2139/ssrn.3151162

8 Fernandez, P., Pershin, V., & Acin, I. F. (2018). Market Risk Premium and Risk-Free Rate used for 59 Countries in 2018: A Survey. SSRN Electronic Journal. doi:10.2139/ssrn.3155709

Dividend Growth Model

Company	Current Dividend Yield (DY)	Projected Short-term EPS Growth Rate (EG)	Projected Short-term Dividend Growth Rate (DG)	Cost of Equity Earnings Growth DY + EG	Cost of Equity Dividend Growth DY + EG
Canadian National Railway	2.10%	10.00%	11.00%	12.10%	13.10%
Canadian Pacific Railway	1.30%	11.50%	11.50%	12.80%	12.80%
CSX Corporation	1.30%	13.50%	11.00%	14.80%	12.30%
Kansas City Southern	1.50%	12.50%	8.50%	14.00%	10.00%
Norfolk Southern Corp	1.90%	11.50%	6.00%	13.40%	7.90%
Union Pacific Corp	2.20%	11.00%	8.50%	13.20%	10.70%
Mean	1.72%	11.67%	9.42%	13.38%	11.13%
Median	1.70%	11.50%	9.75%	13.30%	11.50%

DGM - Dividend Growth, Indicated Rate	**11.50%**
DGM - Earnings Growth, Indicated Rate	**13.30%**

We placed more reliance on the median to arrive at the indicated rates for DGM - Earnings Growth and DGM - Dividend Growth.

Notes:

Dividend Yield and growth rates provided by Value Line

We removed Genesee & Wyoming because they do not pay dividends.

Multi-Stage Dividend Growth Model

K_E = (DY x (1+ 0.5(G))) + 0.67(G1) +0.33(g)

K_E Cost of Equity
DY Dividend Yield
G_1 Short-term Growth Estimate
g Stable Growth
G Average Growth Rate

Company	**DY** Dividend Yield	**G1** Short-term Growth Estimate	**g** Stable Growth	**G** Average Growth Rate	**K_E** Cost of Equity
Canadian National Railway	2.10%	10.00%	3.90%	6.95%	10.16%
Canadian Pacific Railway	1.30%	11.50%	3.90%	7.70%	10.34%
CSX Corporation	1.30%	13.50%	3.90%	8.70%	11.69%
Kansas City Southern	1.50%	12.50%	3.90%	8.20%	11.22%
Norfolk Southern Corp	1.90%	11.50%	3.90%	7.70%	10.97%
Union Pacific Corp	2.20%	11.00%	3.90%	7.45%	10.94%

Mean	10.89%
Median	10.95%
Multi-Stage DGM, Indicated Rate	**10.95%**

We placed more reliance on the median to select the indicated rate.

Notes:

Dividend Yield provided by Value Line

Growth Estimates, Next 5 Years for Earnings provided Value Line

Stable growth rate is the nominal growth rate determined in the Capitalization Rate Study Narrative (indicated long-term growth rate of the U.S. economy of 1.9% plus the expected inflation rate of 2.0%).

We removed Genesee & Wyoming because they do not pay dividends.

Equity Component of the Direct Rate

Company	Value Line P/E Ratio
Canadian National Railway	18.5
Canadian Pacific Railway	17.5
CSX Corporation	17.5
Genesee & Wyoming Inc.	18.0
Kansas City Southern	14.8
Norfolk Southern Corp	17.1
Union Pacific Corp	17.9
Class I Railroads*	
Mean	17.22
Median	17.50
Selected Price to Earnings (P/E) Ratio	17.50
Indicated Equity Component of the Direct Rate	**5.71%**

Other Railroads^	
Mean	18.00
Median	18.00
Selected Price to Earnings (P/E) Ratio	18.00
Indicated Equity Component of the Direct Rate	**5.56%**

We placed the most reliance on the median price to earnings ratio.

Notes:

The Price/Earnings Ratio was downloaded from Value Line.

*Does not include Genesee & Wyoming

^Genesee & Wyoming only.

Beta Analysis

Company	Beta
Canadian National Railway	1.05
Canadian Pacific Railway	1.20
CSX Corporation	1.20
Genesee & Wyoming Inc.	1.50
Kansas City Southern	1.10
Norfolk Southern Corp	1.15
Union Pacific Corp	1.10

Class I Railroads*	Beta
Beta mean	1.13
Beta Median	1.13
Unlevered Relevered Beta Mean^	1.15
Indicated Class I Beta	**1.13**

Other Railroads^^	Beta
Beta mean	1.50
Beta Median	1.50
Indicated Other Railroads Beta	**1.50**

We considered the mean, median, and unlevered/relevered mean for the Class I Railroads. We placed equal reliance on the mean and median when selecting the indicated beta.

Notes:

*Does not include Genesee & Wyoming

^See the Unlevering Relevering Beta page for the calculation

^^Genesee & Wyoming only.
We did not unlever and relever the beta for Other Railroads because it is only Genesee & Wyoming.

Unlevering/Relevering Betas for Class I Railroads

Unlevering of Betas					
Company	*Value Line* **Actual Income Tax Rate**	*From Capital Structure Page* **Actual Debt in Capital Structure**	*From Capital Structure Page* **Actual Equity in Capital Structure**	*Value Line* **Levered Beta (Published)**	*Formula* **Unlevered Beta**
Canadian National Railway	25.00%	10.95%	89.05%	1.05	0.96
Canadian Pacific Railway	25.00%	16.89%	83.11%	1.2	1.04
CSX Corporation	25.00%	18.82%	81.18%	1.2	1.02
Kansas City Southern	29.00%	21.13%	78.82%	1.1	0.92
Norfolk Southern Corp	24.00%	18.97%	81.03%	1.15	0.98
Union Pacific Corp	24.00%	16.06%	83.94%	1.1	0.96
			Average	**1.13**	

Relevering of Betas				
Company	*Formula* **Composite Income Tax Rate**	*From Capital Structure Page* **Industry Debt in Capital Structure**	*From Capital Structure Page* **Industry Equity in Capital Structure**	*Formula* **Levered Beta**
Canadian National Railway	25.33%	19.00%	81.00%	1.13
Canadian Pacific Railway	25.33%	19.00%	81.00%	1.22
CSX Corporation	25.33%	19.00%	81.00%	1.20
Kansas City Southern	25.33%	19.00%	81.00%	1.08
Norfolk Southern Corp	25.33%	19.00%	81.00%	1.15
Union Pacific Corp	25.33%	19.00%	81.00%	1.13
			Average	**1.15**

Notes:
Uses the Hamada Formula

Unlevered Beta = Levered Beta / [1 + (1 - Tax Rate) x (Debt/Equity))], using company-specific components
Using company-specific components

Relevered Beta = Unlevered Beta [1 + (1 - Tax Rate) x (Debt/Equity)]
Using industry components for Tax Rate, Debt, and Equity

Calculation of Market to Book Ratios for the Railroad Market Segment

- December 31, 2018 calendar year information for the January 2, 2019 Assessment
- A market to book ratio over one would be an indication of no obsolescence.
- Market Value estimates for Common Equity are from Value Line. Market Value Estimates for Long-Term Debt are from the company's 10-K.
- Book Value amounts are from the company's 10-K.

Market to Book Ratio for Equity

Company	Market Value of Common Equity from Value Line	Book Value of Common Equity from 10-K	Market to Book Ratio	Source
Canadian National Railway	63,073,277,919	12,930,853,000	4.88	Canadian National. 2018 Annual Report, p. 99
Canadian Pacific Railway	29,570,962,000	6,636,000,000	4.46	Canadian Pacific. 2018 10-K, p. 70
CSX Corporation	59,345,862,971	12,580,000,000	4.72	CSX Corp. 2018 10-K, p. 56
Genesee & Wyoming Inc.	4,655,626,499	3,421,706,000	1.36	Genesee & Wyoming Inc. 2018 10-K, p. F-4
Kansas City Southern	9,997,875,425	4,813,000,000	2.08	Kansas City Southern. 2018 10-K, p. 55
Norfolk Southern Corp	45,432,916,531	15,362,000,000	2.96	Norfolk Southern. 2018 10-K, p. K 38
Union Pacific Corp	109,479,643,634	20,423,000,000	5.36	Union Pacific. 2018 10-K, p. 47
		Class I Average	**3.69**	
		Other Railroads Average	**1.36**	

Market to Book Ratio for Debt

Company	Market Value of Long-Term Debt from 10-K	Book Value of Long-Term Debt from 10-K	Market to Book Ratio	Source
Canadian National Railway	9,791,254,800	9,213,077,000	1.06	Canadian National. 2018 Annual Report, p. 99
Canadian Pacific Railway	7,065,387,000	6,374,168,000	1.11	Canadian Pacific. 2018 10-K, p. 90
CSX Corporation	14,914,000,000	14,757,000,000	1.01	CSX Corp. 2018 10-K, p. 102
Genesee & Wyoming Inc.	2,406,601,000	2,391,633,000	1.01	Genesee & Wyoming Inc. 2018 10-K, p. F-40
Kansas City Southern	2,661,300,000	2,689,400,000	0.99	Kansas City Southern. 2018 10-K, p. 46
Norfolk Southern Corp	12,203,000,000	11,145,000,000	1.09	Norfolk Southern. 2018 10-K, p. K 48
Union Pacific Corp	21,900,000,000	21,400,000,000	1.02	Union Pacific. 2018 10-K, p. 72
		Class I Average	**1.04**	
		Other Railroads Average	**1.01**	

Class I Railroads

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	81.00%	3.69	2.99
Long-term Debt	19.00%	1.04	0.20
			3.19

Other Railroads

Application of Capital Structure as determined in the Capitalization Rate Study

	Capital Structure	Market to Book	Composite
Common Equity	30.00%	1.36	0.41
Long-term Debt	70.00%	1.01	0.71
			1.12

Note: Converted the following companies' long-term debt figures and book value of shareholder equity from CAD to USD using the 12/31/2018 conversion rate of 0.7330 from Bank of Canada:

Canadian National
Canadian Pacific

Appendix F - Three Stage Ex Ante Calculation

Three Stage Ex Ante Equity Risk Premium Calculation

Implied Market Rate Range =	**7.67%**	**to**	**8.62%**

Mean	8.15%
Median	8.15%
Market Rate Used	**8.62%**
(Less) Risk-Free Rate	2.97%
Equals Equity Risk Premium	**5.65%**

Assumptions:

Stages	**Years**		**Growth**	**Model 1**					**Model 2**			
1st Stage	1-5 years		Constant @:	13.09%			*		12.67%			*
												Linear
2nd Stage	6-15 years		Linear from:	12.31%	to	4.51%		OR	12.31%	to	3.20%	*from*
				Real Growth**					Inflation^			*1st*
3rd Stage	15 years -perpetuity	GDP Growth:	Real and Inflation	1.50%		2.75%		+	1.70%	to	1.76%	*Stage*
												to 3rd
		GDP Growth^^:	Real + Inflation	4.51%				TO	3.20%			*Stage*

	Model 1	Model 2
Implied Market Return	8.62%	7.67%

Year	**Model 1**				**Model 2**			
	Starting Industry			S & P 500	Starting Industry			S & P 500
2017	Start Price†		$	(2,510.03)	Start Price†		$	(2,510.03)
2018	Expected Dividends††		$	57.20	Expected Dividends††		$	57.20
2019	1st Stage Growth Rates	13.09%	$	64.69	1st Stage Growth Rates	12.67%	$	64.45
2020		13.09%	$	73.16		12.67%	$	72.61
2021		13.09%	$	82.73		12.67%	$	81.81
2022		13.09%	$	93.56		12.67%	$	92.18
2023	2nd Stage Growth Rates	12.31%	$	105.08	2nd Stage Growth Rates	12.31%	$	103.53
2024		11.53%	$	117.19		11.40%	$	115.33
2025		10.75%	$	129.79		10.49%	$	127.42
2026		9.97%	$	142.73		9.58%	$	139.63
2027		9.19%	$	155.85		8.67%	$	151.72
2028		8.41%	$	168.96		7.76%	$	163.49
2029		7.63%	$	181.85		6.84%	$	174.68
2030		6.85%	$	194.30		5.93%	$	185.04
2031		6.07%	$	206.10		5.02%	$	194.34
2032		5.29%	$	217.00		4.11%	$	202.33
2033		4.51%	$	226.79		3.20%	$	208.80
2034		4.51%	$	237.02		3.20%	$	215.48
2035		4.51%	$	247.70		3.20%	$	222.38
2036		4.51%	$	258.88		3.20%	$	229.49
2037		4.51%	$	270.55		3.20%	$	236.84
2038		4.51%	$	282.75		3.20%	$	244.42
2039		4.51%	$	295.51		3.20%	$	252.24
2040		4.51%	$	308.83		3.20%	$	260.31
2041		4.51%	$	322.76		3.20%	$	268.64
2042		4.51%	$	337.32		3.20%	$	277.24
2043		4.51%	$	352.53		3.20%	$	286.11
2044		4.51%	$	368.43		3.20%	$	295.26
2045		4.51%	$	385.05		3.20%	$	304.71
2046		4.51%	$	402.41		3.20%	$	314.46
2047		4.51%	$	420.56		3.20%	$	324.53
2048		4.51%	$	439.53		3.20%	$	334.91
2049		4.51%	$	459.35		3.20%	$	345.63
2050		4.51%	$	480.07		3.20%	$	356.69
2051		4.51%	$	501.72		3.20%	$	368.10
2052		4.51%	$	524.35		3.20%	$	379.88
2053		4.51%	$	547.99		3.20%	$	392.04
2054		4.51%	$	572.71		3.20%	$	404.58
2055		4.51%	$	598.54		3.20%	$	417.53
2056		4.51%	$	625.53		3.20%	$	430.89
2057		4.51%	$	653.74		3.20%	$	444.68
2058		4.51%	$	683.23		3.20%	$	458.91
2059		4.51%	$	714.04		3.20%	$	473.59
2060		4.51%	$	746.24		3.20%	$	488.75
2061		4.51%	$	779.90		3.20%	$	504.39
2062		4.51%	$	815.07		3.20%	$	520.53
2063		4.51%	$	851.83		3.20%	$	537.18
2064		4.51%	$	890.25		3.20%	$	554.37
2065		4.51%	$	930.40		3.20%	$	572.11
2066		4.51%	$	972.36		3.20%	$	590.42
2067		4.51%	$	1,016.21		3.20%	$	609.32
2068		4.51%	$	1,062.05		3.20%	$	628.81

2069		4.51%	$	1,109.94		3.20%	$	648.94
2070		4.51%	$	1,160.00		3.20%	$	669.70
2071		4.51%	$	1,212.32		3.20%	$	691.13
2072		4.51%	$	1,266.99		3.20%	$	713.25
2073		4.51%	$	1,324.14		3.20%	$	736.07
2074		4.51%	$	1,383.85		3.20%	$	759.63
2075		4.51%	$	1,446.27		3.20%	$	783.93
2076		4.51%	$	1,511.49		3.20%	$	809.02
2077		4.51%	$	1,579.66		3.20%	$	834.91
2078		4.51%	$	1,650.90		3.20%	$	861.63
2079		4.51%	$	1,725.36		3.20%	$	889.20
2080		4.51%	$	1,803.17		3.20%	$	917.65
2081		4.51%	$	1,884.50		3.20%	$	947.02
2082	3rd Stage Growth Rates	4.51%	$	1,969.49	3rd Stage Growth Rates	3.20%	$	977.32
2083		4.51%	$	2,058.31		3.20%	$	1,008.60
2084		4.51%	$	2,151.14		3.20%	$	1,040.87
2085		4.51%	$	2,248.16		3.20%	$	1,074.18
2086		4.51%	$	2,349.55		3.20%	$	1,108.55
2087		4.51%	$	2,455.51		3.20%	$	1,144.03
2088		4.51%	$	2,566.26		3.20%	$	1,180.64
2089		4.51%	$	2,682.00		3.20%	$	1,218.42
2090		4.51%	$	2,802.95		3.20%	$	1,257.41
2091		4.51%	$	2,929.37		3.20%	$	1,297.64
2092		4.51%	$	3,061.48		3.20%	$	1,339.17
2093		4.51%	$	3,199.55		3.20%	$	1,382.02
2094		4.51%	$	3,343.85		3.20%	$	1,426.24
2095		4.51%	$	3,494.66		3.20%	$	1,471.88
2096		4.51%	$	3,652.27		3.20%	$	1,518.99
2097		4.51%	$	3,816.99		3.20%	$	1,567.59
2098		4.51%	$	3,989.13		3.20%	$	1,617.76
2099		4.51%	$	4,169.04		3.20%	$	1,669.52
2100		4.51%	$	4,357.07		3.20%	$	1,722.95
2101		4.51%	$	4,553.57		3.20%	$	1,778.08
2102		4.51%	$	4,758.94		3.20%	$	1,834.98
2103		4.51%	$	4,973.57		3.20%	$	1,893.70
2104		4.51%	$	5,197.87		3.20%	$	1,954.30
2105		4.51%	$	5,432.30		3.20%	$	2,016.84
2106		4.51%	$	5,677.29		3.20%	$	2,081.38
2107		4.51%	$	5,933.34		3.20%	$	2,147.98
2108		4.51%	$	6,200.93		3.20%	$	2,216.72
2109		4.51%	$	6,480.60		3.20%	$	2,287.65
2110		4.51%	$	6,772.87		3.20%	$	2,360.85
2111		4.51%	$	7,078.33		3.20%	$	2,436.40
2112		4.51%	$	7,397.56		3.20%	$	2,514.37
2113		4.51%	$	7,731.19		3.20%	$	2,594.83
2114		4.51%	$	8,079.87		3.20%	$	2,677.86
2115		4.51%	$	8,444.27		3.20%	$	2,763.55
2116		4.51%	$	8,825.11		3.20%	$	2,851.99
2117		4.51%	$	9,223.12		3.20%	$	2,943.25
2118		4.51%	$	9,639.08		3.20%	$	3,037.43
2119		4.51%	$	10,073.80		3.20%	$	3,134.63
2120		4.51%	$	10,528.13		3.20%	$	3,234.94
2121		4.51%	$	11,002.95		3.20%	$	3,338.46
2122		4.51%	$	11,499.18		3.20%	$	3,445.29
2123		4.51%	$	12,017.80		3.20%	$	3,555.54
2124		4.51%	$	12,559.80		3.20%	$	3,669.32
2125		4.51%	$	13,126.25		3.20%	$	3,786.73
2126		4.51%	$	13,718.24		3.20%	$	3,907.91
2127		4.51%	$	14,336.93		3.20%	$	4,032.96
2128		4.51%	$	14,983.53		3.20%	$	4,162.02
2129		4.51%	$	15,659.29		3.20%	$	4,295.20
2130		4.51%	$	16,365.52		3.20%	$	4,432.65
2131		4.51%	$	17,103.60		3.20%	$	4,574.49
2132		4.51%	$	17,874.98		3.20%	$	4,720.88
2133		Reversion``	$	17.89		Reversion``	$	15.56
	Implied Market Return			**8.62%**	**Implied Market Return**			**7.67%**

*S&P 500 Earnings and Estimate Report dated 1/17/2018, http://us.spindices.com/indices/equity/sp-500
**First Quarter 2019 Survey of Professional Forecasters - Philadelphia Federal Reserve Release Date 3/22/2019
^Inflation Range = Federal Reserve, Treasuries Inflation - Indexed
^^GDP Growth = Real growth + Inflation
† Start Price is the S&P 500 Index adjusted close on 1/2/2019, downloaded from Yahoo! Finance
††Expected Dividends downloaded from http://www.cmegroup.com/trading/equity-index/us-index/sp-500-quarterly-dividend-index.html, 1/22/2019

``Reversion Calculation:

A.	Last period's expected dividends, growth applied	18,681.14	4,871.94
B.	Implied Market Risk Premium Less Long-Term Growth	6.04%	5.09%
C.	A / B	309,253.3	95,651.7
D.	C / ((1 + Implied Market Risk Premium) ^ Last Period +1)	17.89	15.56

Appendix G - Debt Rate Analysis Data

Electric

Issued Debt by Company

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
ALLETE Inc. 1	**4.07%**	**4/16/2048**	**1,000**	**1,000**	**$100.00**	**4.07%**
Alliant Energy Finance LLC	3.75%	6/15/2023	377	380	$100.71	3.58%
Alliant Energy Finance LLC	**4.25%**	**6/15/2028**	**377**	**375**	**$99.52**	**4.31%**
Ameren Corp.	2.70%	11/15/2020	4,852	4,744	$97.77	3.95%
Ameren Illinois Co.	2.70%	9/1/2022	6,835	6,632	$97.03	3.57%
Ameren Illinois Co.	3.25%	3/1/2025	4,247	4,117	$96.94	3.81%
Ameren Illinois Co.	**3.80%**	**5/15/2028**	**7,164**	**7,149**	**$99.79**	**3.83%**
Ameren Illinois Co.	4.15%	3/15/2046	1,061	1,006	$94.82	4.48%
Ameren Illinois Co.	3.70%	12/1/2047	1,425	1,262	$88.56	4.40%
Ameren Illinois Co.	4.50%	3/15/2049	1,000	1,009	$100.90	4.45%
American Electric Power Co. Inc.	2.15%	11/13/2020	6,990	6,799	$97.27	3.68%
American Electric Power Co. Inc.	3.65%	12/1/2021	4,000	3,992	$99.80	3.72%
American Electric Power Co. Inc.	2.95%	12/15/2022	7,151	6,922	$96.80	3.83%
American Electric Power Co. Inc.	3.20%	11/13/2027	4,100	3,795	$92.56	4.21%
American Electric Power Co. Inc.	**4.30%**	**12/1/2028**	**1,500**	**1,496**	**$99.73**	**4.33%**
American Electric Power Co. Inc.	4.30%	12/1/2028	7,500	7,478	$99.71	4.34%
Black Hills Corp.	4.25%	11/30/2023	3,454	3,452	$99.94	4.26%
Black Hills Corp.	3.95%	1/15/2026	7,470	7,286	$97.54	4.36%
Black Hills Corp.	**3.15%**	**1/15/2027**	**5,350**	**4,920**	**$91.96**	**4.35%**
Black Hills Corp.	4.35%	5/1/2033	850	834	$98.12	4.53%
Black Hills Corp.	4.20%	9/15/2046	589	528	$89.64	4.89%
CMS Energy Corp.	5.05%	3/15/2022	4,290	4,442	$103.54	3.86%
CMS Energy Corp.	3.00%	5/15/2026	4,664	4,282	$91.81	4.31%
CMS Energy Corp.	**3.45%**	**8/15/2027**	**4,975**	**4,686**	**$94.19**	**4.26%**
CMS Energy Corp.	4.88%	3/1/2044	589	594	$100.85	4.82%
DTE Electric Co.	3.65%	3/15/2024	5,359	5,350	$99.83	3.68%
DTE Electric Co.	3.38%	3/1/2025	4,361	4,243	$97.29	3.87%
DTE Electric Co.	4.00%	4/1/2043	975	929	$95.28	4.32%
DTE Electric Co.	4.30%	7/1/2044	201	195	$97.01	4.50%
DTE Electric Co.	3.70%	3/15/2045	1,138	1,025	$90.07	4.34%
DTE Electric Co.	3.70%	6/1/2046	1,103	970	$87.94	4.47%
DTE Electric Co.	3.75%	8/15/2047	913	811	$88.83	4.44%
DTE Electric Co.	4.05%	5/15/2048	1,275	1,205	$94.51	4.38%
DTE Electric Co.	3.45%	10/1/2020	5,365	5,373	$100.15	3.36%
DTE Energy Co.	3.85%	12/1/2023	4,525	4,498	$99.40	3.98%
DTE Energy Co.	3.50%	6/1/2024	7,050	6,869	$97.43	4.03%
DTE Energy Co.	2.85%	10/1/2026	9,667	8,740	$90.41	4.32%
DTE Energy Co.	**3.80%**	**3/15/2027**	**5,750**	**5,502**	**$95.69**	**4.43%**
DTE Energy Co.	6.38%	4/15/2033	845	978	$115.74	4.84%
DTE Energy Co.	2.40%	12/1/2019	7,920	7,854	$99.17	3.34%
DTE Energy Co.	3.30%	6/15/2022	4,470	4,405	$98.55	3.75%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
DTE Energy Co.	3.70%	8/1/2023	8,600	8,573	$99.69	3.77%
Entergy Arkansas Inc.	3.70%	6/1/2024	3,475	3,464	$99.68	3.76%
Entergy Arkansas Inc.	3.50%	4/1/2026	11,434	11,126	$97.31	3.93%
Entergy Arkansas Inc.	3.75%	2/15/2021	4,567	4,591	$100.53	3.49%
Entergy Corp.	**2.95%**	**9/1/2026**	**9,310**	**8,417**	**$90.41**	**4.44%**
Entergy Corp.	5.13%	9/15/2020	3,825	3,892	$101.75	4.04%
Entergy Corp.	4.00%	7/15/2022	6,324	6,327	$100.05	3.99%
Entergy Gulf States Louisiana LLC	5.59%	10/1/2024	4,349	4,701	$108.09	4.00%
Entergy Louisiana LLC	5.40%	11/1/2024	4,595	5,000	$108.81	3.70%
Entergy Louisiana LLC	2.40%	10/1/2026	10,819	9,716	$89.80	3.94%
Entergy Louisiana LLC	3.12%	9/1/2027	9,920	9,242	$93.17	4.06%
Entergy Louisiana LLC	3.25%	4/1/2028	3,348	3,175	$94.83	3.92%
Entergy Louisiana LLC	3.05%	6/1/2031	803	719	$89.54	4.14%
Entergy Louisiana LLC	4.00%	3/15/2033	1,850	1,805	$97.57	4.23%
Entergy Louisiana LLC	4.95%	1/15/2045	828	834	$100.72	4.90%
Entergy Louisiana LLC	4.20%	9/1/2048	1,600	1,523	$95.19	4.50%
Entergy Louisiana LLC	4.05%	9/1/2023	7,850	7,950	$101.27	3.75%
Entergy Mississippi Inc.	2.85%	6/1/2028	1,738	1,568	$90.22	4.11%
MGE 2	4.24%	7/1/2053	1,000	1,000	$100.00	4.24%
MGE 2	4.34%	7/1/2058	1,000	1,000	$100.00	4.34%
MGE 2	**4.19%**	**9/1/2048**	**1,000**	**1,000**	**$100.00**	**4.19%**
Northern States Power Co.	6.20%	7/1/2037	971	1,185	$122.04	4.44%
Northern States Power Co.	5.35%	11/1/2039	700	782	$111.71	4.48%
Northern States Power Co.	3.40%	8/15/2042	905	782	$86.41	4.32%
Northern States Power Co.	4.13%	5/15/2044	588	555	$94.39	4.50%
Northern States Power Co.	4.00%	8/15/2045	650	610	$93.85	4.39%
Northern States Power Co.	3.60%	5/15/2046	870	766	$88.05	4.35%
Northern States Power Co.	3.60%	9/15/2047	1,113	973	$87.42	4.37%
Northern States Power Co.	2.20%	8/15/2020	3,200	3,145	$98.28	3.30%
Northern States Power Co.	2.20%	8/15/2020	3,200	3,145	$98.28	3.30%
Northern States Power Co.	2.15%	8/15/2022	2,875	2,739	$95.27	3.56%
Northern States Power Co.	2.15%	8/15/2022	2,875	2,739	$95.27	3.56%
Northern States Power Co.	2.60%	5/15/2023	6,440	6,176	$95.90	3.62%
Northern States Power Co.	2.60%	5/15/2023	6,440	6,176	$95.90	3.62%
NorthWestern Corp.	**4.18%**	**11/15/2044**	**939**	**910**	**$96.91**	**4.38%**
Oklahoma Gas & Electric Co.	**3.80%**	**8/15/2028**	**5,450**	**5,339**	**$97.96**	**4.06%**
Oklahoma Gas & Electric Co.	4.15%	4/1/2047	600	566	$94.33	4.51%
Oklahoma Gas & Electric Co.	3.85%	8/15/2047	600	534	$89.00	4.54%
Otter Tail Power3	**4.07%**	**2/1/2048**	**1,000**	**1,000**	**$100.00**	**4.07%**
WEC Energy Group Inc.	3.55%	6/15/2025	5,942	5,751	$96.79	4.12%
WEC Energy Group Inc.	2.45%	6/15/2020	4,613	4,548	$98.59	3.46%
WEC Energy Group Inc.	3.38%	6/15/2021	9,882	9,797	$99.14	3.75%
Wisconsin Electric Power Co.	5.63%	5/15/2033	535	603	$112.71	4.42%
Wisconsin Electric Power Co.	5.70%	12/1/2036	250	290	$116.00	4.40%
Wisconsin Electric Power Co.	**4.30%**	**10/15/2048**	**650**	**636**	**$97.85**	**4.43%**

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Wisconsin Electric Power Co.	2.95%	9/15/2021	2,870	2,835	$98.78	3.43%
Xcel Energy Inc.	3.30%	6/1/2025	9,196	8,762	$95.28	4.15%
Xcel Energy Inc.	3.35%	12/1/2026	6,305	5,954	$94.43	4.18%
Xcel Energy Inc.	**4.00%**	**6/15/2028**	**8,585**	**8,421**	**$98.09**	**4.25%**
Xcel Energy Inc.	6.50%	7/1/2036	889	1,112	$125.08	4.42%
Xcel Energy Inc.	4.70%	5/15/2020	4,640	4,693	$101.14	3.83%
Xcel Energy Inc.	2.40%	3/15/2021	9,995	9,735	$97.40	3.64%
Xcel Energy Inc.	2.60%	3/15/2022	3,900	3,764	$96.51	3.77%

[1] On April 16, 2018, ALLETE issued and sold $60.0 million of its First Mortgage Bonds (the Bonds) that bear interest at 4.07 percent. The Bonds will mature in April 2048 and pay interest semi-annually in April and October of each year, commencing on October 16, 2018. ALLETE has the option to prepay all or a portion of the Bonds at its discretion, subject to a make-whole provision. The Bonds are subject to additional terms and conditions which are customary for these types of transactions. ALLETE intends to use the proceeds from the sale of the Bonds to fund utility capital investment and for general corporate purposes. The Bonds were sold in reliance on an exemption from registration under Section 4(a)(2) of the Securities Act of 1933, as amended, to institutional accredited investors.

[2] In July 2018, MGE issued $20 million of new long-term unsecured debt carrying an interest rate of 4.24% per annum over its 35-year term and $20 million of new long-term unsecured debt carrying an interest rate of 4.34% per annum over its 40-year term. In September 2018, MGE issued $60 million of new long-term unsecured debt carrying an interest rate of 4.19% per annum over its 30-year term. MGE used the net proceeds from these debt financings to assist with financing capital expenditures, such as the Saratoga Wind Farm, and to refinance $20 million of long-term debt which matured in September 2018. The covenants of the new long-term unsecured debt are substantially consistent with MGE's existing unsecured long-term debt.

[3] On November 14, 2017, OTP entered into a Note Purchase Agreement (the 2018 Note Purchase Agreement) with the purchasers named therein, pursuant to which OTP agreed to issue to the purchasers, in a private placement transaction, $100 million aggregate principal amount of OTP’s 4.07% Series 2018A Senior Unsecured Notes due February 7, 2048 (the 2018 Notes). The 2018 Notes were issued on February 7, 2018. Proceeds from the 2018 Notes were used to repay outstanding borrowings under the OTP Credit Agreement.

Gas Distribution

Issued Debt by Company

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Atmos Energy Corp.	**3.00%**	**6/15/2027**	**7,288**	**6,803**	**$93.35**	**3.93%**
Atmos Energy Corp.	5.50%	6/15/2041	1,000	1,114	$111.40	4.67%
Atmos Energy Corp.	4.15%	1/15/2043	812	762	$93.84	4.57%
Atmos Energy Corp.	4.13%	10/15/2044	1,758	1,649	$93.80	4.53%
Chesapeake Energy Corp	5.75%	3/15/2023	4,179,000	4,069,301	$97.37	6.47%
Chesapeake Energy Corp	7.00%	10/1/2024	6,635,000	6,635,000	$100.00	7.00%
Chesapeake Energy Corp	**5.50%**	**9/15/2026**	**3,699,000**	**3,653,676**	**$98.77**	**5.70%**
New Jersey Resources Corp1	**3.96%**	**6/8/2028**	**1,000**	**1,000**	**$100.00**	**3.96%**
NiSource Finance Corp.	2.65%	11/17/2022	100	96	$95.82	3.82%
NiSource Finance Corp.	3.49%	5/15/2027	13,678	12,857	$94.00	4.35%
NiSource Finance Corp.	5.95%	6/15/2041	916	1,030	$112.45	5.02%
NiSource Finance Corp.	5.25%	2/15/2043	1,340	1,388	$103.58	4.99%
NiSource Finance Corp.	4.80%	2/15/2044	961	933	$97.09	5.00%
NiSource Finance Corp.	5.65%	2/1/2045	1,525	1,608	$105.44	5.26%
NiSource Finance Corp.	4.38%	5/15/2047	2,260	2,045	$90.49	5.01%
NiSource Finance Corp.	**3.95%**	**3/30/2048**	**1,065**	**911**	**$85.54**	**4.88%**
NiSource Inc.	3.65%	6/15/2023	6,000	5,866	$97.77	4.21%
Northwest Natural Gas4	**4.11%**	**9/15/2048**	**1,000**	**1,000**	**$100.00**	**4.11%**
ONE Gas Inc.	3.61%	2/1/2024	2,314	2,283	$98.66	3.90%
ONE Gas Inc.	4.66%	2/1/2044	1,271	1,275	$100.31	4.64%
ONE Gas Inc.	**4.50%**	**11/1/2048**	**825**	**814**	**$98.67**	**4.58%**
South Jersey Industries 2	3.18%	4/15/2021	1,000	1,000	$100.00	3.18%
South Jersey Industries 2	**3.82%**	**4/15/2028**	**1,000**	**1,000**	**$100.00**	**3.82%**
South Jersey Industries 2	3.92%	4/15/2030	1,000	1,000	$100.00	3.92%
Southwest Gas Corp.	**3.70%**	**4/1/2028**	**4,000**	**3,839**	**$95.98**	**4.23%**
Southwest Gas Corp.	3.80%	9/29/2046	370	319	$86.22	4.69%
Spire Inc. 3	**4.64%**	**1/15/2049**	**1,000**	**1,000**	**$100.00**	**4.64%**

[1] On June 8, 2018, NJR entered into a note purchase agreement, under which we issued $100 million of 3.96 percent senior notes due June 8, 2028. The notes are not secured by assets, but are instead guaranteed by certain unregulated subsidiaries of NJR. The proceeds of the notes will be used for general corporate purposes, including, but not limited to, funding capital expenditures.

[2] In April 2018, SJI entered into a Note Purchase Agreement (NPA) that provides for the issuance by the Company of an aggregate of $250.0 million of senior unsecured notes. During the second quarter of 2018, the Company issued these senior unsecured notes as follows: (a) $90.0 million aggregate principal amount of 3.18% Senior Notes, Series 2018A, due April 2021; (b) $80.0 million aggregate principal amount of 3.82% 2 Senior Notes, Series 2018B, due 2028; and (c) $80.0 million aggregate principal amount of 3.92% Senior Notes, Series 2018C, due 2030.

[3] On January 15, 2019, Spire Alabama entered into the Second Supplement to Master Note Purchase Agreement with certain institutional investors. Pursuant to the terms of that supplement, Spire Alabama closed a $90.0 private placement of 4.64% Series 2019A Senior Notes due January 15, 2049, to those institutional investors. The notes bear interest from the date of issuance, payable semi-annually on the 15th day of July and January of each year, commencing on July 15, 2019. The notes are senior unsecured obligations of Spire Alabama, rank equal in right to payment with all its other senior unsecured indebtedness, and have make-whole and par call options. Spire Alabama used the proceeds to repay short-term debt and for general corporate purposes.

[4] September 30, 2018, NW Natural had long-term debt of $809.6 million, which included $5.9 million of unamortized debt issuance costs. Utility long-term debt consists of first mortgage bonds (FMBs) with maturity dates ranging from 2018 through 2048, interest rates ranging from 1.545% to 9.05%, and a weighted average coupon rate of 4.690%. In March 2018, NW Natural retired $22.0 million of FMBs with a coupon rate of 6.60%, and in September 2018, NW Natural issued $50.0 million of FMBs with a coupon rate of 4.110%, due in 2048.
https://www.sec.gov/Archives/edgar/data/73020/000007302018000040/form10-qq32018.htm

Gas Transmission Pipeline
Issued Debt by Company

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Kinder Morgan Energy Partners LP	4.15%	2/1/2024	8,973	8,844	$98.56	4.47%
Kinder Morgan Energy Partners LP	4.30%	5/1/2024	11,223	11,114	$99.03	4.51%
Kinder Morgan Energy Partners LP	4.25%	9/1/2024	6,857	6,790	$99.02	4.45%
Kinder Morgan Energy Partners LP	7.40%	3/15/2031	326	374	$114.72	5.71%
Kinder Morgan Energy Partners LP	7.75%	3/15/2032	1,492	1,779	$119.24	5.66%
Kinder Morgan Energy Partners LP	7.30%	8/15/2033	1,025	1,176	$114.73	5.79%
Kinder Morgan Energy Partners LP	5.80%	3/15/2035	1,238	1,240	$100.16	5.78%
Kinder Morgan Energy Partners LP	6.50%	2/1/2037	1,248	1,306	$104.65	6.07%
Kinder Morgan Energy Partners LP	6.95%	1/15/2038	2,975	3,278	$110.18	6.04%
Kinder Morgan Energy Partners LP	6.50%	9/1/2039	266	278	$104.51	6.11%
Kinder Morgan Energy Partners LP	6.55%	9/15/2040	825	864	$104.73	6.15%
Kinder Morgan Energy Partners LP	7.50%	11/15/2040	763	871	$114.15	6.30%
Kinder Morgan Energy Partners LP	6.38%	3/1/2041	938	966	$102.99	6.13%
Kinder Morgan Energy Partners LP	5.63%	9/1/2041	1,003	956	$95.31	6.01%
Kinder Morgan Energy Partners LP	5.00%	8/15/2042	1,037	923	$89.01	5.87%
Kinder Morgan Energy Partners LP	4.70%	11/1/2042	1,142	976	$85.46	5.84%
Kinder Morgan Energy Partners LP	5.00%	3/1/2043	709	625	$88.15	5.93%
Kinder Morgan Energy Partners LP	5.50%	3/1/2044	1,648	1,559	$94.60	5.91%
Kinder Morgan Energy Partners LP	5.40%	9/1/2044	1,125	1,048	$93.16	5.92%
Kinder Morgan Energy Partners LP	6.85%	2/15/2020	7,449	7,710	$103.50	3.61%
Kinder Morgan Energy Partners LP	6.50%	4/1/2020	8,270	8,498	$102.76	4.19%
Kinder Morgan Energy Partners LP	5.30%	9/15/2020	5,855	5,973	$102.02	4.06%
Kinder Morgan Energy Partners LP	3.50%	3/1/2021	13,986	13,833	$98.91	4.03%
Kinder Morgan Energy Partners LP	5.80%	3/1/2021	6,150	6,383	$103.79	3.95%
Kinder Morgan Energy Partners LP	5.00%	10/1/2021	13,337	13,623	$102.14	4.16%
Kinder Morgan Energy Partners LP	4.15%	3/1/2022	3,400	3,388	$99.65	4.27%
Kinder Morgan Energy Partners LP	3.95%	9/1/2022	12,500	12,378	$99.02	4.24%
Kinder Morgan Energy Partners LP	3.45%	2/15/2023	5,869	5,665	$96.52	4.38%
Kinder Morgan Energy Partners LP	3.50%	9/1/2023	6,275	6,026	$96.03	4.45%
Kinder Morgan Inc.	3.05%	12/1/2019	17,937	17,799	$99.23	3.92%
Kinder Morgan Inc.	4.30%	6/1/2025	20,297	19,829	$97.69	4.72%
Kinder Morgan Inc.	**4.30%**	**3/1/2028**	**21,085**	**20,295**	**$96.25**	**4.81%**
Kinder Morgan Inc.	7.80%	8/1/2031	625	744	$119.04	5.66%
Kinder Morgan Inc.	7.75%	1/15/2032	2,130	2,521	$118.36	5.73%
Kinder Morgan Inc.	5.30%	12/1/2034	2,380	2,297	$96.51	5.63%
Kinder Morgan Inc.	5.55%	6/1/2045	3,545	3,461	$97.63	5.72%
Kinder Morgan Inc.	5.05%	2/15/2046	1,380	1,245	$90.22	5.77%
Kinder Morgan Inc.	5.20%	3/1/2048	1,700	1,583	$93.12	5.69%
Kinder Morgan Inc.	6.50%	9/15/2020	3,978	4,123	$103.65	4.25%
Kinder Morgan Inc.	3.15%	1/15/2023	11,535	11,067	$95.94	4.26%
ONEOK Inc.	4.00%	7/13/2027	7,701	7,216	$93.70	4.91%
ONEOK Inc.	**4.55%**	**7/15/2028**	**6,275**	**6,068**	**$96.70**	**4.99%**
ONEOK Inc.	6.00%	6/15/2035	665	674	$101.35	5.87%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
ONEOK Inc.	4.95%	7/13/2047	1,613	1,436	$89.03	5.74%
ONEOK Inc.	5.20%	7/15/2048	950	884	$93.05	5.69%
ONEOK Inc.	4.25%	2/1/2022	10,983	10,971	$99.89	4.29%
ONEOK Inc.	7.50%	9/1/2023	9,700	10,879	$112.15	4.57%
ONEOK Partners LP	4.90%	3/15/2025	6,634	6,704	$101.06	4.70%
ONEOK Partners LP	6.65%	10/1/2036	1,255	1,350	$107.57	5.95%
ONEOK Partners LP	6.85%	10/15/2037	1,900	2,057	$108.26	6.10%
ONEOK Partners LP	6.13%	2/1/2041	1,061	1,075	$101.32	6.02%
ONEOK Partners LP	6.20%	9/15/2043	427	436	$102.11	6.03%
ONEOK Partners LP	3.38%	10/1/2022	6,865	6,637	$96.68	4.34%
ONEOK Partners LP	5.00%	9/15/2023	4,955	5,061	$102.14	4.49%
TransCanada PipeLines Ltd.	4.88%	1/15/2026	10,794	10,988	$101.80	4.57%
TransCanada PipeLines Ltd.	**4.25%**	**5/15/2028**	**12,945**	**12,601**	**$97.34**	**4.60%**
TransCanada PipeLines Ltd.	4.63%	3/1/2034	1,890	1,772	$93.76	5.23%
TransCanada PipeLines Ltd.	5.60%	3/31/2034	548	561	$102.37	5.37%
TransCanada PipeLines Ltd.	5.85%	3/15/2036	585	613	$104.79	5.42%
TransCanada PipeLines Ltd.	6.20%	10/15/2037	1,905	2,066	$108.45	5.47%
TransCanada PipeLines Ltd.	4.75%	5/15/2038	1,250	1,178	$94.24	5.23%
TransCanada PipeLines Ltd.	7.25%	8/15/2038	2,002	2,384	$119.08	5.63%
TransCanada PipeLines Ltd.	7.63%	1/15/2039	2,670	3,308	$123.90	5.62%
TransCanada PipeLines Ltd.	6.10%	6/1/2040	1,893	2,027	$107.08	5.53%
TransCanada PipeLines Ltd.	5.00%	10/16/2043	1,336	1,261	$94.39	5.41%
TransCanada PipeLines Ltd.	4.88%	5/15/2048	1,900	1,812	$95.37	5.18%
TransCanada PipeLines Ltd.	5.10%	3/15/2049	2,250	2,181	$96.93	5.30%
TransCanada PipeLines Ltd.	3.80%	10/1/2020	16,805	16,870	$100.39	3.57%
TransCanada PipeLines Ltd.	2.50%	8/1/2022	25,170	24,016	$95.42	3.89%
TransCanada PipeLines Ltd.	3.75%	10/16/2023	4,475	4,421	$98.79	4.03%
Williams Cos. Inc.	4.30%	3/4/2024	13,037	12,865	$98.68	4.59%
Williams Cos. Inc.	4.55%	6/24/2024	15,692	15,711	$100.12	4.52%
Williams Cos. Inc.	3.90%	1/15/2025	13,914	13,345	$95.91	4.69%
Williams Cos. Inc.	4.00%	9/15/2025	17,651	16,914	$95.82	4.73%
Williams Cos. Inc.	**3.75%**	**6/15/2027**	**18,570**	**17,125**	**$92.22**	**4.89%**
Williams Cos. Inc.	7.50%	1/15/2031	718	836	$116.43	5.60%
Williams Cos. Inc.	6.30%	4/15/2040	2,640	2,730	$103.41	6.01%
Williams Cos. Inc.	5.80%	11/15/2043	1,171	1,161	$99.15	5.87%
Williams Cos. Inc.	5.40%	3/4/2044	399	372	$93.23	5.92%
Williams Cos. Inc.	5.75%	6/24/2044	1,900	1,867	$98.26	5.88%
Williams Cos. Inc.	4.90%	1/15/2045	1,076	953	$88.57	5.75%
Williams Cos. Inc.	5.10%	9/15/2045	2,969	2,705	$91.11	5.76%
Williams Cos. Inc.	4.85%	3/1/2048	1,375	1,212	$88.15	5.69%
Williams Cos. Inc.	5.25%	3/15/2020	25,371	25,852	$101.90	3.61%
Williams Cos. Inc.	4.13%	11/15/2020	7,212	7,229	$100.24	3.99%
Williams Cos. Inc.	4.00%	11/15/2021	6,757	6,721	$99.47	4.20%
Williams Cos. Inc.	3.60%	3/15/2022	13,031	12,784	$98.10	4.24%
Williams Cos. Inc.	3.35%	8/15/2022	16,135	15,613	$96.76	4.33%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Williams Cos. Inc.	3.70%	1/15/2023	6,850	6,660	$97.23	4.46%

Fluid Transportation Pipeline

Issued Debt by Company

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Buckeye Partners LP	4.35%	10/15/2024	782	764	$97.70	4.81%
Buckeye Partners LP	3.95%	12/1/2026	17,928	16,047	$89.51	5.61%
Buckeye Partners LP	**4.13%**	**12/1/2027**	**1,700**	**1,518**	**$89.29**	**5.67%**
Buckeye Partners LP	5.85%	11/15/2043	958	895	$93.42	6.38%
Buckeye Partners LP	5.60%	10/15/2044	479	419	$87.47	6.62%
Buckeye Partners LP	4.88%	2/1/2021	9,804	9,904	$101.02	4.35%
Buckeye Partners LP	4.15%	7/1/2023	6,175	5,937	$96.15	5.12%
HollyFrontier Corp.	**5.88%**	**4/1/2026**	**13,151**	**13,479**	**$102.49**	**5.45%**
Magellan Midstream Partners LP	**5.15%**	**10/15/2043**	**1,165**	**1,142**	**$98.03**	**5.29%**
Magellan Midstream Partners LP	4.25%	9/15/2046	1,048	921	$87.88	5.07%
Magellan Midstream Partners LP	4.20%	10/3/2047	1,220	1,054	$86.39	5.11%
Magellan Midstream Partners LP	4.25%	2/1/2021	4,156	4,183	$100.65	3.92%
MPLX LP	4.88%	12/1/2024	24,782	25,093	$101.25	4.63%
MPLX LP	4.00%	2/15/2025	9,830	9,414	$95.77	4.81%
MPLX LP	4.88%	6/1/2025	13,820	13,857	$100.27	4.83%
MPLX LP	4.13%	3/1/2027	12,306	11,517	$93.59	5.09%
MPLX LP	**4.00%**	**3/15/2028**	**11,300**	**10,464**	**$92.60**	**5.01%**
MPLX LP	4.80%	2/15/2029	1,575	1,542	$97.90	5.07%
MPLX LP	4.50%	4/15/2038	3,695	3,177	$85.98	5.71%
MPLX LP	5.20%	3/1/2047	1,860	1,668	$89.68	5.96%
MPLX LP	4.70%	4/15/2048	3,170	2,699	$85.14	5.75%
MPLX LP	5.50%	2/15/2049	3,150	3,006	$95.43	5.82%
MPLX LP	4.90%	4/15/2058	1,200	985	$82.08	6.11%
MPLX LP	5.50%	2/15/2023	938	952	$101.49	5.09%
MPLX LP	3.38%	3/15/2023	5,203	5,000	$96.10	4.40%
MPLX LP	4.50%	7/15/2023	21,006	21,036	$100.14	4.46%
Phillips 66	**3.90%**	**3/15/2028**	**9,496**	**9,008**	**$94.86**	**4.59%**
Phillips 66	4.65%	11/15/2034	2,155	2,060	$95.59	5.06%
Phillips 66	5.88%	5/1/2042	3,241	3,469	$107.03	5.34%
Phillips 66	4.88%	11/15/2044	3,229	3,057	$94.67	5.25%
Phillips 66	4.30%	4/1/2022	28,535	28,972	$101.53	3.79%
Phillips 66 Partners LP	3.61%	2/15/2025	7,045	6,643	$94.29	4.69%
Phillips 66 Partners LP	3.55%	10/1/2026	6,400	5,864	$91.63	4.86%
Phillips 66 Partners LP	3.75%	3/1/2028	6,675	6,135	$91.91	4.85%
Phillips 66 Partners LP	4.68%	2/15/2045	775	669	$86.32	5.69%
Phillips 66 Partners LP	4.90%	10/1/2046	1,475	1,340	$90.85	5.55%
Phillips 66 Partners LP	2.65%	2/15/2020	4,075	4,039	$99.12	3.46%
Plains All American Pipeline LP / PAA F	3.60%	11/1/2024	7,969	7,472	$93.76	4.84%
Plains All American Pipeline LP / PAA F	4.65%	10/15/2025	13,636	13,172	$96.60	5.25%
Plains All American Pipeline LP / PAA	**4.50%**	**12/15/2026**	**12,098**	**11,543**	**$95.41**	**5.21%**
Plains All American Pipeline LP / PAA F	5.15%	6/1/2042	1,075	929	$86.42	6.26%
Plains All American Pipeline LP / PAA F	4.30%	1/31/2043	455	352	$77.36	6.11%
Plains All American Pipeline LP / PAA F	4.70%	6/15/2044	1,830	1,500	$81.97	6.10%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Plains All American Pipeline LP / PAA F	4.90%	2/15/2045	1,660	1,402	$84.46	6.10%
Plains All American Pipeline LP / PAA F	6.65%	1/15/2047	835	868	$103.95	6.35%
Plains All American Pipeline LP / PAA F	2.60%	12/15/2019	6,085	6,045	$99.34	3.31%
Plains All American Pipeline LP / PAA F	5.75%	1/15/2020	9,652	9,881	$102.37	3.39%
Plains All American Pipeline LP / PAA F	5.00%	2/1/2021	8,434	8,531	$101.15	4.41%
Plains All American Pipeline LP / PAA F	3.65%	6/1/2022	6,591	6,402	$97.13	4.57%
Plains All American Pipeline LP / PAA F	2.85%	1/31/2023	5,275	4,907	$93.02	4.75%
Plains All American Pipeline LP / PAA F	3.85%	10/15/2023	9,978	9,568	$95.89	4.82%

Railroad (Class I and Other)

Issued Debt by Company

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Canadian National Railway Co.	2.40%	2/3/2020	4,075	4,040	$99.14	3.21%
Canadian National Railway Co.	2.85%	12/15/2021	5,125	5,055	$98.63	3.34%
Canadian National Railway Co.	**2.75%**	**3/1/2026**	**6,743**	**6,324**	**$93.79**	**3.75%**
Canadian National Railway Co.	6.90%	7/15/2028	4,271	5,249	$122.90	3.99%
Canadian National Railway Co.	6.25%	8/1/2034	1,063	1,287	$121.07	4.37%
Canadian National Railway Co.	6.20%	6/1/2036	680	823	$121.03	4.45%
Canadian National Railway Co.	6.38%	11/15/2037	710	883	$124.37	4.45%
Canadian National Railway Co.	4.50%	11/7/2043	200	201	$100.50	4.47%
Canadian National Railway Co.	3.20%	8/2/2046	1,310	1,077	$82.21	4.31%
Canadian National Railway Co.	3.65%	2/3/2048	1,170	1,045	$89.32	4.30%
Canadian National Railway Co.	4.45%	1/20/2049	1,200	1,221	$101.75	4.35%
Canadian Pacific Railway Co.	2.90%	2/1/2025	7,433	7,019	$94.43	3.94%
Canadian Pacific Railway Co.	**4.00%**	**6/1/2028**	**8,950**	**8,882**	**$99.24**	**4.10%**
Canadian Pacific Railway Co.	7.13%	10/15/2031	694	871	$125.50	4.48%
Canadian Pacific Railway Co.	5.75%	3/15/2033	170	186	$109.41	4.83%
Canadian Pacific Railway Co.	4.80%	9/15/2035	418	427	$102.15	4.61%
Canadian Pacific Railway Co.	5.95%	5/15/2037	935	1,075	$114.97	4.72%
Canadian Pacific Railway Co.	4.80%	8/1/2045	995	1,023	$102.81	4.61%
Canadian Pacific Railway Co.	6.13%	9/15/2115	2,030	2,299	$113.25	5.40%
CSX Corp.	3.70%	10/30/2020	5,203	5,245	$100.81	3.24%
CSX Corp.	4.25%	6/1/2021	6,115	6,192	$101.26	3.70%
CSX Corp.	3.70%	11/1/2023	4,075	4,096	$100.52	3.58%
CSX Corp.	3.40%	8/1/2024	7,388	7,252	$98.16	3.77%
CSX Corp.	3.35%	11/1/2025	7,960	7,633	$95.89	4.04%
CSX Corp.	2.60%	11/1/2026	11,372	10,158	$89.32	4.22%
CSX Corp.	**3.25%**	**6/1/2027**	**12,294**	**11,504**	**$93.57**	**4.16%**
CSX Corp.	3.80%	3/1/2028	11,175	10,789	$96.55	4.26%
CSX Corp.	4.25%	3/15/2029	500	502	$100.40	4.20%
CSX Corp.	6.00%	10/1/2036	488	553	$113.32	4.87%
CSX Corp.	6.15%	5/1/2037	1,438	1,680	$116.83	4.76%
CSX Corp.	6.22%	4/30/2040	855	992	$116.02	4.99%
CSX Corp.	5.50%	4/15/2041	1,091	1,169	$107.15	4.97%
CSX Corp.	4.75%	5/30/2042	1,240	1,218	$98.23	4.88%
CSX Corp.	4.40%	3/1/2043	600	564	$94.00	4.82%
CSX Corp.	4.10%	3/15/2044	2,099	1,895	$90.28	4.77%
CSX Corp.	3.80%	11/1/2046	1,576	1,349	$85.60	4.74%
CSX Corp.	4.30%	3/1/2048	1,755	1,620	$92.31	4.79%
CSX Corp.	4.75%	11/15/2048	1,250	1,235	$98.80	4.83%
CSX Corp.	3.95%	5/1/2050	1,150	988	$85.91	4.83%
CSX Corp.	4.50%	8/1/2054	1,376	1,265	$91.93	4.99%
CSX Corp.	4.25%	11/1/2066	1,909	1,606	$84.13	5.15%
CSX Corp.	4.65%	3/1/2068	845	754	$89.23	5.26%
CSX Transportation Inc.	6.25%	1/15/2023	26	28	$107.69	4.16%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Genesee & Wyoming1	**3.74%**	**6/5/2023**	**1,000**	**1,000**	**$100.00**	**3.74%**
Kansas City Southern	4.30%	5/15/2043	920	838	$91.09	4.93%
Kansas City Southern	4.95%	8/15/2045	808	805	$99.63	4.97%
Kansas City Southern	**4.70%**	**5/1/2048**	**1,175**	**1,136**	**$96.68**	**4.91%**
Norfolk Southern Corp.	9.75%	6/15/2020	1,980	2,169	$109.55	2.96%
Norfolk Southern Corp.	3.25%	12/1/2021	10,634	10,573	$99.43	3.46%
Norfolk Southern Corp.	3.00%	4/1/2022	6,375	6,273	$98.40	3.53%
Norfolk Southern Corp.	2.90%	2/15/2023	10,113	9,811	$97.01	3.69%
Norfolk Southern Corp.	3.85%	1/15/2024	3,250	3,263	$100.40	3.76%
Norfolk Southern Corp.	5.59%	5/17/2025	1,770	1,929	$108.98	3.98%
Norfolk Southern Corp.	3.65%	8/1/2025	360	357	$99.17	3.79%
Norfolk Southern Corp.	2.90%	6/15/2026	8,775	8,177	$93.19	3.97%
Norfolk Southern Corp.	7.80%	5/15/2027	3,692	4,594	$124.43	4.29%
Norfolk Southern Corp.	3.15%	6/1/2027	9,638	9,029	$93.68	4.04%
Norfolk Southern Corp.	**3.80%**	**8/1/2028**	**8,150**	**7,978**	**$97.89**	**4.07%**
Norfolk Southern Corp.	7.05%	5/1/2037	255	323	$126.67	4.84%
Norfolk Southern Corp.	4.84%	10/1/2041	2,095	2,134	$101.86	4.70%
Norfolk Southern Corp.	3.95%	10/1/2042	1,225	1,095	$89.39	4.70%
Norfolk Southern Corp.	4.45%	6/15/2045	1,798	1,721	$95.72	4.74%
Norfolk Southern Corp.	4.65%	1/15/2046	675	665	$98.52	4.75%
Norfolk Southern Corp.	3.94%	11/1/2047	100	88	$88.00	4.71%
Norfolk Southern Corp.	4.15%	2/28/2048	1,265	1,158	$91.54	4.68%
Norfolk Southern Corp.	4.05%	8/15/2052	1,575	1,387	$88.06	4.77%
Norfolk Southern Railway Co.	5.10%	8/1/2118	1,439	1,355	$94.16	5.42%
Union Pacific Corp.	2.25%	6/19/2020	3,700	3,651	$98.68	3.19%
Union Pacific Corp.	4.00%	2/1/2021	4,054	4,091	$100.91	3.54%
Union Pacific Corp.	3.20%	6/8/2021	10,675	10,613	$99.42	3.45%
Union Pacific Corp.	4.16%	7/15/2022	5,525	5,602	$101.39	3.74%
Union Pacific Corp.	2.95%	1/15/2023	6,437	6,260	$97.25	3.69%
Union Pacific Corp.	2.75%	4/15/2023	2,125	2,061	$96.99	3.51%
Union Pacific Corp.	3.50%	6/8/2023	10,842	10,779	$99.42	3.64%
Union Pacific Corp.	3.65%	2/15/2024	8,369	8,252	$98.60	3.95%
Union Pacific Corp.	3.75%	3/15/2024	6,955	6,940	$99.78	3.80%
Union Pacific Corp.	3.25%	1/15/2025	5,307	5,130	$96.66	3.88%
Union Pacific Corp.	3.75%	7/15/2025	4,200	4,175	$99.40	3.85%
Union Pacific Corp.	3.25%	8/15/2025	6,352	6,076	$95.65	4.00%
Union Pacific Corp.	2.75%	3/1/2026	15,390	14,185	$92.17	4.02%
Union Pacific Corp.	**3.00%**	**4/15/2027**	**3,597**	**3,335**	**$92.72**	**4.04%**
Union Pacific Corp.	3.95%	9/10/2028	14,850	14,552	$97.99	4.20%
Union Pacific Corp.	3.38%	2/1/2035	996	858	$86.14	4.60%
Union Pacific Corp.	3.60%	9/15/2037	1,872	1,640	$87.61	4.59%
Union Pacific Corp.	4.38%	9/10/2038	1,975	1,905	$96.46	4.65%
Union Pacific Corp.	4.75%	9/15/2041	265	262	$98.87	4.83%
Union Pacific Corp.	4.30%	6/15/2042	925	862	$93.19	4.79%
Union Pacific Corp.	4.25%	4/15/2043	1,072	990	$92.35	4.79%

Company	Coupon	Maturity	Face Amount	Market Value	Market Price	YTM
Union Pacific Corp.	4.82%	2/1/2044	625	627	$100.32	4.80%
Union Pacific Corp.	4.15%	1/15/2045	325	294	$90.46	4.80%
Union Pacific Corp.	4.05%	11/15/2045	1,101	982	$89.19	4.77%
Union Pacific Corp.	4.05%	3/1/2046	2,100	1,872	$89.14	4.77%
Union Pacific Corp.	3.35%	8/15/2046	682	541	$79.33	4.69%
Union Pacific Corp.	4.00%	4/15/2047	1,101	979	$88.92	4.71%
Union Pacific Corp.	4.50%	9/10/2048	3,350	3,221	$96.15	4.74%
Union Pacific Corp.	3.80%	10/1/2051	716	590	$82.40	4.88%
Union Pacific Corp.	3.88%	2/1/2055	1,003	823	$82.05	4.95%
Union Pacific Corp.	4.80%	9/10/2058	1,050	1,015	$96.67	4.99%
Union Pacific Corp.	4.38%	11/15/2065	1,280	1,108	$86.56	5.14%
Union Pacific Corp.	4.10%	9/15/2067	1,065	872	$81.88	5.11%

On June 5, 2018, the Company entered into Amendment No. 3 (the Amendment) to the Credit Agreement, the Third Amended and Restated Senior Secured Syndicated Credit Facility Agreement (the Amended Credit Agreement). At closing, the credit facilities under the Amended Credit Agreement were comprised of a $1,423.0 million United States term loan, a £272.9 million (or $365.2 million at the exchange rate on June 5, 2018) U.K. term loan and a $625.0 million revolving credit facility. The revolving credit facility includes borrowing capacity for letters of credit and swingline loans. The Amendment also extended the maturity date of the Company's credit facilities to June 5, 2023.

In connection with entering into the Amendment, the Company wrote-off $2.2 million of unamortized deferred financing fees and capitalized an additional $5.3 million of new fees. Deferred financing costs are amortized as additional interest expense over the terms of the related debt using the effective-interest method for the term loan debt and the straight-line method for the revolving credit facility.

At the Company's election, at the time of entering into a specific borrowing, interest on that borrowing is calculated under a "LIBOR" or "Base Rate." LIBOR is the London Interbank Offered Rate. The applicable borrowing spread for the LIBOR Rate loans ranges from 1.00% to 2.00% depending on the Company's total leverage ratio. The applicable spread for the Base Rate loans ranges from 0.00% to 1.00% depending on the Company's total leverage ratio.

In addition to paying interest on any outstanding borrowing under the Amended Credit Agreement, the Company is required to pay a commitment fee related to the unutilized portion of the commitments under the revolving credit facility. The commitment fee ranges from 0.20% to 0.30% depending on the Company's total leverage ratio as defined in the Amended Credit Agreement.

Since entering into the Amendment, the Company has made prepayments of $120.0 million on its United States term loan and £25.0 million (or $32.8 million at the exchange rate at the time the payments were made) on its U.K. term loan, which were applied towards its future quarterly installments. As of September 30, 2018, the Company had the following amounts of term loans outstanding under the Amended Credit Agreement (amounts in thousands, except percentages) 3.74% 6/15/2023

https://www.sec.gov/Archives/edgar/data/1012620/000101262018000027/gwr0930201810-q.htm

Appendix H – Guideline Company Selection

Section Contents

Note: The information below is verbatim from Value Line and the company's website.

Market Segment: Electric

Companies Included in the Electric Market Segment

ALLETE, Inc.

Company Summary from Value Line:

ALLETE, Inc. is the parent of Minnesota Power, which supplies electricity to 146,000 customers in northeastern MN, & Superior Water, Light & Power in northwestern WI. Electric rev. breakdown: taconite mining/processing, 26%; paper/wood products, 9%; other industrial, 8%; residential, 12%; commercial, 13%; wholesale, 16% other, 16%. ALLETE Clean Energy owns renewable energy projects. Acq'd U.S. Water Services 2/15. Has real estate operation in FL. Generating sources: coal & lignite, 41%; wind, 12%; other, 6%; purchased, 41%. Fuel costs: 28% of revs. '17 depreciation. rate: 3.2%. Has 2,000 employees.

Additional Company Information from Website:

ALLETE (NYSE: ALE) is well-positioned as a reliable provider of competitively-priced energy in the upper Midwest, and invests in transmission infrastructure and other energy-centric businesses. ALLETE's Minnesota Power electric utility serves 145,000 residents, 16 municipalities and some of the nation's largest industrial customers. Other businesses include BNI Energy in North Dakota; ALLETE Clean Energy, a developer of energy projects with limited environmental impact; Superior Water, Light and Power in Superior, Wisconsin; U.S. Water Services, an integrated water management company in St. Michael, Minnesota; ALLETE Renewable Resources, which operates and maintains wind generation facilities in North Dakota; and ALLETE Properties, which owns real estate in Florida.[1]

Why was the company included?

This company is similar (and is one of) to the Electric Companies that the State Assessed Section is responsible for valuing. The company engages in providing energy in the upper Midwest.

Alliant Energy Corp.

Company Summary from Value Line:

Alliant Energy Corp., formerly named Interstate Energy, is a holding company formed through the merger of WPL Holdings, IES Industries, and Interstate Power. Supplies electricity, gas, and other services in Wisconsin, Iowa, and Minnesota. Elect. revs. by state: WI, 38%; IA, 61%; MN, 1%. Elect. rev.: residential, 36%; commercial, 24%; industrial, 30%; wholesale, 8%; other, 2%. Fuel sources, 2017: coal, 40%; gas, 17%; other, 43%. Fuel costs: 45% of revs. 2017 depreciation rate: 5.5%. Estimated plant age: 15 years. Has approximately 3,989 employees.

Additional Company Information from Website:

We are proud to be a Midwest energy company that provides electric and natural gas services to our customers and communities throughout Iowa and Wisconsin. Our mission - To deliver the energy solutions and exceptional service that our customers and communities count on – safely, efficiently and responsibly.

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[1] http://www.allete.com/OurBusinesses/, accessed 1/30/2019

Operations at a Glance:

Number of electric customers	962,121
Number of natural gas customers	413,054
Number of employees	3,989
Operating revenues (year-end 2017)	$3.4 billion
Total assets (year-end 2017)	$14.2 billion
Headquarters	Madison, Wisconsin
Service area	54,369 square miles in Iowa and Wisconsin
Miles of electric lines	42,300
Miles of natural gas main	9,600
Electric generation	31 million megawatt-hours per year
Maximum summer peak hour demand	5,375 megawatts
Utility natural gas sold and transported	126,166 (thousands of dekatherms)mi

All numbers are approximations[2]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company engages in providing energy in the upper Midwest.

Ameren Corporation
Company Summary from Value Line:
Ameren Corporation is a holding company formed through the merger of Union Electric and CIPSCO. Acq'd CILCORP 1/03; Illinois Power 10/04. Has 1.2 mill. electric and 127,000 gas customers in Missouri; 1.2 mill. electric and 813,000 gas customers in Illinois. Discontinued nonregulated power-generation operation in '13. Electric rev. breakdown: residential, 46%; commercial, 35%; industrial, 8%; other, 11%. Generating sources: coal, 71%; nuclear, 19%; hydro & other, 4%; purchased, 6%. Fuel costs: 27% of revs. '17 reported deprec. rates: 3%-4%. Has 8,600 employees.

Additional Company Information from Website:
Ameren Corporation is a Fortune 500 company that trades on the New York Stock Exchange under the symbol AEE. It is the parent company of Ameren Illinois, based in Collinsville, Ill., and Ameren Missouri in St. Louis. Ameren Transmission Company, also based in St. Louis, designs and builds regional transmission projects. View our businesses. Ameren was created by the combination of three Illinois utilities (CIPSCO Incorporated, CILCO Inc. and Illinois Power Company) and Union Electric Company of St. Louis. The name comes from combining the words American and Energy. Employing more than 8,500 personnel, Ameren powers the quality of life for 2.4 million electric customers and more than 900,000 natural gas customers across a 64,000-square-mile area. Ameren Missouri ranks as

[2] https://www.alliantenergy.com/AboutAlliantEnergy/OperationsValuesandCompliance, accessed 2/19/2019

the largest electric power provider in Missouri, and Ameren Illinois ranks as Illinois' third largest natural gas distribution operation in total number of customers. Ameren companies generate a net capacity of nearly 10,200 megawatts of electricity and own more than 7,500 circuit miles of transmission lines. Ameren's rates are some of the lowest in the nation.[3]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company engages in providing energy in the Midwest.

American Electric Power Company, Inc.
Company Summary from Value Line:
American Electric Power Company, Inc. (AEP), through 10 operating utilities, serves 5.4 mill. customers in Arkansas, Kentucky, Indiana, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, & West Virginia. Electric revenue breakdown: residential, 40%; commercial, 23%; industrial, 19%; wholesale, 15%; other, 3%. Sold SEEBOARD (British utility) '02; Houston Pipeline '05; commercial barge operation in '15. Generating sources not available. Fuel costs: 35% of revenues. '16 reported depreciation rates (utility): 1.5%-8.6%. Has 17,600 employees.

Additional Company Information from Website:
As one of the largest electric energy companies in the U.S., we power millions of homes and businesses. We're working together with our customers and communities to create the future of energy. We're listening, going beyond customers' expectations and developing innovative solutions to build a future that is boundless for us all. We're continually energized by our team members, their passions, and their drive to make a difference in the communities we serve. Our Mission: Together, with our customers, we are redefining the future of energy and developing innovative solutions that power communities and improve lives. Our Vision: Powering a new and brighter future for our customers and communities. Our Network: Our electricity transmission network stretches more than 40,000 miles – the largest in the nation. Our Capacity: We own or operate approximately 60 generation stations, with a combined capacity of approximately 26,000 megawatts – enough energy to power approximately 26 million customers. Our operating companies: One of the largest investor-owned utilities, we serve nearly 5.4 million customers in 11 states.[4]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company engages in providing energy in the Midwest.

Black Hills Corporation
Company Summary from Value Line:
Black Hills Corporation is a holding company for Black Hills Energy, which serves 209,000 electric customers in CO, SD, WY and MT, and 1 million gas customers in NE, IA, KS, CO, WY, and AR. Has coal mining sub. Acq'd Cheyenne Light 1/05; utility ops. from Aquila 7/08; SourceGas 2/16. Discount. telecom in '05; oil marketing in '06; gas marketing in '11; gas & oil E&P in '17. Electric rev. breakdown: res'l, 30%; comm'l, 37%; ind'l, 17%; other, 16%. Generating sources: coal, 32%; other, 8%; purch., 60%. Fuel costs: 34% of revs. '17 deprec. rate: 3.5%. Has 2,800 employees.

[3] https://www.ameren.com/about/facts, accessed 2/8/2019
[4] https://www.aep.com/about/, accessed 2/19/2019

Additional Company Information from Website:
Black Hills Corporation is a customer focused, growth-oriented utility company with a tradition of exemplary service and a vision to be the energy partner of choice. Based in Rapid City, South Dakota, the company serves over 1.25 million electric and natural gas utility customers in more than 800 communities in Arkansas, Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota and Wyoming. Employees partner to produce results that improve life with energy. [5]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company engages in providing energy in the Midwest.

CMS Energy Corporation
Company Summary from Value Line:
CMS Energy Corporation is a holding company for Consumers Energy, which supplies electricity and gas to lower Michigan (excluding Detroit). Has 1.8 million electric, 1.8 million gas customers. Has 1,034 megawatts of nonregulated generating capacity. Sold Palisades nuclear plant in '07. Electric revenue breakdown: residential, 43%; commercial, 34%; industrial, 17%; other, 6%. Generating sources: coal, 28%; gas, 15%; other, 2%; purchased, 55%. Fuel costs: 43% of revenues. '17 reported deprec. rates: 3.9% electric, 2.9% gas, 10.0% other. Has 7,900 employees.

Additional Company Information from Website:
CMS Energy Corporation's business strategy is focused primarily on its principal subsidiary, Consumers Energy Company, Michigan's largest electric and natural gas utility, serving 6.7 million of the state's 10 million residents. With our subsidiary, CMS Enterprises Company, we are also engaged in independent power generation in several states. Our business also includes EnerBank® USA, which specializes in providing unsecured home improvement payment option programs for homeowners through nationwide dealer networks. [6]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

DTE Energy Company
Company Summary from Value Line:
DTE Energy Company is a holding company for DTE Electric (formerly Detroit Edison), which supplies electricity in Detroit and a 7,600-square-mile area in southeastern Michigan, and DTE Gas (formerly Michigan Consolidated Gas). Customers: 2.2 mill. electric, 1.3 mill. gas. Has various nonutility operations. Electric revenue breakdown: residential, 46%; commercial, 35%; industrial, 13%; other, 6%. Generating sources: coal, 67%; nuclear, 17%; gas, 1%; purchased, 15%. Fuel costs: 57% of revenues. '17 reported deprec. rates: 3.6% electric, 2.7% gas. Has 10,200 employees.

Additional Company Information from Website:
DTE Energy (NYSE: DTE) is a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. Its operating units include an

[5] https://www.blackhillscorp.com/about, accessed on 2/19/2019
[6] http://www.cmsenergy.com/about-cms-energy/default.aspx, accessed 2/19/2019

electric utility serving 2.2 million customers in Southeastern Michigan and a natural gas utility serving 1.3 million customers in Michigan. The DTE Energy portfolio includes non-utility energy businesses focused on power and industrial projects, natural gas pipelines, gathering and storage, and energy marketing and trading. As one of Michigan's leading corporate citizens, DTE Energy is a force for growth and prosperity in the 450 Michigan communities it serves in a variety of ways, including philanthropy, volunteerism and economic progress. DTE Energy has more than 10,000 employees in utility and non-utility subsidiaries involved in a wide range of energy-related businesses. The company's growing non-utility businesses are built around the strengths, skills and assets of DTE Energy's electric and gas utilities.[7]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

Entergy Corporation
Company Summary from Value Line:
Entergy Corporation supplies electricity to 2.9 million customers through subsidiaries in Arkansas, Louisiana, Mississippi, Texas, and New Orleans (regulated separately from Louisiana). Distributes gas to 199,000 customers in Louisiana. Has a nonutility subsidiary that owns six nuclear units (two no longer operating). Electric revenue breakdown: residential, 36%; commercial, 27%; industrial, 28%; other, 9%. Generating sources: gas, 36%; nuclear, 27%; coal, 8%; purchased, 29%. Fuel costs: 31% of revenues. '17 reported depreciation rate: 3.0%. Has 13,500 employees.

Additional Company Information from Website:
Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately 30,000 megawatts of electric generating capacity, including nearly 9,000 megawatts of nuclear power.

Entergy delivers electricity to 2.9 million utility customers in Arkansas, Louisiana, Mississippi and Texas. Entergy has annual revenues of approximately $11 billion and more than 13,000 employees.[8]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in Arkansas, Louisiana, Mississippi, New Orleans, and Texas.

MGE Energy, Inc.
Company Summary from Value Line:
MGE Energy, Inc. is a holding company for Madison Gas and Electric. It provides electric service to about 151,000 customers in Dane County and gas service to 158,000 customers in seven counties in Wisconsin. Electric revenue breakdown, '17: residential, 34%; commercial, 53%; industrial, 4%; public authorities, 9%. Generating sources, '17: coal, 53%; purchased power, 24%; natural gas and other, 23%. Fuel costs: 20% of rev. '17 depr. rate: 4.0%. Has 712 employees.

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[7] https://newlook.dteenergy.com/wps/wcm/connect/dte-web/home/about-dte/common/about-dte/about-dte, accessed 2/19/2019

[8] http://entergy.com/about_entergy/, accessed 2/19/2019

Additional Company Information from Website:
MGE Energy, a public utility holding company, is headquartered in the state capital Madison, Wis. MGE Energy trades on NASDAQ with the stock ticker MGEE. MGE Energy is dedicated to long-term value for its shareholders. We have increased our dividend for more than 40 consecutive years and have paid dividends for more than 100 years. MGE Energy is the parent company of the following:

- Madison Gas and Electric Company (MGE) provides natural gas and electric service in south-central and western Wisconsin.
- MGE Transco Investment holds an ownership interest in ATC LLC, which invests in transmission assets, primarily within Wisconsin.
- MGEE Transco LLC holds an ownership interest in ATC Holdco, which invests in transmission assets outside ATC LLC service territory.
- MGE Power owns assets in the West Campus Cogeneration Facility in Madison, Wis. and the Elm Road Generating Station in Oak Creek, Wis.
- MAGAEL, LLC holds title to properties acquired for future utility plant expansion.
- Central Wisconsin Development Corporation promotes business growth in MGE's service area.
- MGE Services, LLC provides construction and other services.[9]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

NorthWestern Corporation
Company Summary from Value Line:
Northwestern Corporation (doing business as Northwestern Energy) supplies electricity & gas in the Upper Midwest and Northwest, serving 433,000 electric customers in Montana and South Dakota and 286,000 gas customers in Montana (87% of gross margin), South Dakota (12%), and Nebraska (1%). Electric revenue breakdown: residential, 40%; commercial, 51%; industrial, 5%; other, 4%. Generating sources: hydro, 36%; coal, 29%; wind, 6%; other, 4%; purchased, 25%. Fuel costs: 31% of revenues. '17 reported deprec. rate: 3.0%. Has 1,600 employees.

Additional Company Information from Website:
For more than 100 years, NorthWestern Energy has delivered the energy and exceptional service that our customers and communities count on – safely, efficiently and responsibly. We own and operate natural gas production, transmission and distribution systems serving 282,600 customers. We own and operate a diverse generation fleet of wind, water, natural gas and coal-fired resources* and the high-voltage transmission system and distribution system that reliably delivers responsibly-produced electricity to more than 427,000 customers daily.[10]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. This company operates in the Midwest.

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[9] https://www.mgeenergy.com/about-us/about.htm, accessed 3/11/2019
[10] http://www.northwesternenergy.com/our-company/about-us, accessed 2/19/2019

OGE Energy Corporation

Company Summary from Value Line:

OGE Energy Corp. is a holding company for Oklahoma Gas and Electric Company (OG&E), which supplies electricity to 847,000 customers in Oklahoma (84% of electric revenues) and western Arkansas (8%); wholesale is (8%). Owns 25.6% of Enable Midstream Partners. Electric revenue breakdown: residential, 40%; commercial, 26%; industrial, 9%; oilfield, 7%; other, 18%. Generating sources: coal, 34%; gas, 25%; wind, 4%; purchased, 37%. Fuel costs: 40% of revenues. '17 reported depreciation rate (utility): 2.5%. Has 2,400 employees.

Additional Company Information from Website:

OGE Energy Corp. is headquartered in Oklahoma City, Oklahoma and is publicly traded on the New York Stock Exchange under the symbol OGE. It is the parent company of Oklahoma Gas and Electric (OG&E), a regulated utility, and holds a 25.6 percent limited partner interest and a 50 percent general partner interest in Enable Midstream Partners, LP, also headquartered in Oklahoma City.

Formed in 1902, OG&E is Oklahoma's oldest and largest investor-owned electric utility. We serve more than 843,000 customers in 276 towns and cities in a 30,000 square mile area of Oklahoma and western Arkansas. The largest city on our system, Oklahoma City, has a metro area population of approximately 1.5 million people. But we also serve towns like Enid, Ardmore, Muskogee, Norman, Durant, Ft. Smith Ark., as well as many other smaller communities throughout our service territory. We have approximately 2,500 employees who live and work in the very communities we serve.[11]

Why was the company included?

This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in Oklahoma and Arkansas.

Otter Tail Corporation

Company Summary from Value Line:

Otter Tail Corporation is the parent of Otter Tail Power Company, which supplies electricity to over 130,000 customers in Minnesota (53% of retail elec. revs.), North Dakota (38%), and South Dakota (9%). Electric rev. breakdown, '17: residential, 31%; commercial & farms, 35%; industrial, 32%; other, 2%. Fuel costs: 14.7% of revenues. Also has operations in manufacturing and plastics. 2017 depr. rate: 3.1%. Has 2,097 employees.

Additional Company Information from Website:

Our strategy is to continue to grow our largest business, the regulated electric utility, which will lower our overall risk, create a more predictable earnings stream, improve our credit quality, and preserve our ability to fund the dividend. Over time, we expect the electric utility business will provide approximately 75-85% of our overall earnings. We expect our manufacturing and plastic pipe businesses will provide 15-25% of our earnings and will continue to be a fundamental part of our strategy. Reliable utility performance along with rate base investment opportunities over the next five years will provide us with a strong base of revenues, earnings, and cash flows.[12]

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[11] https://www.oge.com/wps/portal/oge/about-us/companyOverview/!ut/p/z1/jZDdCoJAEIWfpRdwxlVLL1c3fwn1QrS9CQ3bBHXDJF8_QbqJsuZqBr4zh3OAQwG8Lx-NKMdG9mU730e-PZmph36kqwcPLRepRtQ4dhPN2xHIF4Cgg4FOQi8ie6QRY6mRMDWwdeD_6PHLUPxPvwLw9fc58MXilQDDeaWOyaLUsjX0jXfgQ8RfJiFw0cpq6ZP2lWYK4EN9qYd6UK7yPkIxTZMipBRtrZxlB7cuywpski6nmyeQ5dVa/dz/d5/L2dJQSEvUUt3QS80TmxFL1o2XzhRRzBISzQxTUcwOUYwQTMyMU9PRlAzRzcy/, accessed 2/19/2019

[12] http://www.ottertail.com/corporate-profile, accessed 2/19/2019

Why was the company included?
This company is similar to (and is one of) the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

WEC Energy Group
Company Summary from Value Line:
WEC Energy Group, Inc. (formerly Wisconsin Energy) is a holding company for utilities that provide electric, gas & steam service in WI & gas service in IL, MN, & MI. Customers: 1.6 mill. elec., 2.9 mill. gas. Acq'd Integrys Energy 6/15. Sold Point Beach nuclear plant in '07. Electric revenue breakdown: residential, 35%; small commercial & industrial, 31%; large commercial & industrial, 21%; other, 13%. Generating sources: coal, 49%; gas, 18%; renewables, 4%; purchased, 29%. Fuel costs: 37% of revenues. '17 reported deprec. rates (utility): 2.3%-3.3%. Has 8,100 employees.

Additional Company Information from Website:
We are one of the nation's largest electric generation and distribution and natural gas delivery holding companies, with the operational expertise and financial resources to serve the Midwest's energy needs safely, reliably and responsibly. Our subsidiaries focus on reliable service, customer satisfaction and shareholder value. Together, we provide energy services to 4.5 million customers in Wisconsin, Illinois, Michigan and Minnesota. Our combined assets allow operating efficiencies across 69,600 miles of electric distribution lines, 49,000 miles of natural gas distribution and transmission lines, and 8,700 megawatts of reliable power plant capacity. Our family of companies is committed to delivering world-class reliability and the very best customer care anywhere. Customers are the heart of our business, and we work every day to help grow and support communities where we provide vital energy services. As a Fortune 500 company, we value and develop our employees who are making a difference in a mission that matters.[13]

Why was the company included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

Xcel Energy
Company Summary from Value Line:
Xcel Energy Inc. is the parent of Northern States Power, which supplies electricity to Minnesota, Wisconsin, North Dakota, South Dakota & Michigan & gas to Minnesota, Wisconsin, North Dakota & Michigan; Public Service of Colorado, which supplies electricity & gas to Colorado; & Southwestern Public Service, which supplies electricity to Texas & New Mexico. Customers: 3.6 mill. electric, 1.9 mill. gas. Elec. rev. breakdown: residential, 31%; sm. comm'l & ind'l, 36%; lg. comm'l & ind'l, 18%; other, 15%. Generating sources not available. Fuel costs: 40% of revs. '17 reported depr. rate: 3.1%. Has 11,500 employees.

Additional Company Information from Website:
Every day we power millions of homes and businesses across eight Western and Midwestern States, including Colorado, Michigan, Minnesota, New Mexico, North Dakota, South Dakota, Texas, and Wisconsin. Our commitment starts with the basics — customers can count on us 24/7 to be there with

[13] https://www.wecenergygroup.com/about/aboutus.htm, accessed 2/19/2019

safe, reliable and affordable energy. But, what we provide goes much deeper than that. Based in Minneapolis, we are a recognized industry leader in delivering renewable energy and in reducing carbon and other emissions, efforts that have put us on a path to a more sustainable energy future. Through a growing range of innovative solutions, we continue to empower our customers with industry-leading options and energy alternatives to support their goals and objectives. In a rapidly changing industry, we are taking a smart and thoughtful approach to how we produce and deliver energy, looking for better ways to serve our customers and ensure we are *Leading the Energy Future*. [14]

Why was the company included?
This company is similar to (and is one of) the Electric Companies that the State Assessed Section is responsible for valuing. The company serves an electric service territory in the Midwest.

Companies Not Included in the Electric Market Segment

AVANGRID, Inc.
Company Summary from Value Line:
AVANGRID, Inc. (formerly Iberdrola USA, Inc.), is a diversified energy and utility company that serves 2.2 million electric customers in New York, Connecticut, and Maine and 1 million gas customers in New York, Connecticut, Massachusetts and Maine. Has a nonregulated generating subsidiary focused on wind power, with 7.1 gigawatts of capacity. Revenue breakdown by customer class not available. Generating sources not available. Fuel costs: 22% of revenues. '17 depreciation rate: 2.9%. Iberdrola owns 81.5% of stock. Has 6,500 employees.

Additional Company Information from Website:
AVANGRID, Inc. (NYSE: AGR) is a leading, sustainable energy company with $32 billion in assets and operations in 24 U.S. states. AVANGRID has two primary lines of business: Avangrid Networks and Avangrid Renewables. Avangrid Networks owns eight electric and natural gas utilities, serving 3.2 million customers in New York and New England. Avangrid Renewables owns and operates 7.1 gigawatts of electricity capacity, primarily through wind power, with a presence in 22 states across the United States. AVANGRID employs approximately 6,500 people. AVANGRID supports the U.N.'s Sustainable Development Goals and was awarded Compliance Leader Verification by Ethisphere, a prestigious third party verification of its ethics and compliance program.[15]

AVANGRID has two head of business companies: Avangrid Networks combines the resources and expertise of eight electric and natural gas utilities with a rate base of $9.1 billion serving approximately 3.2 million customers in New York and New England. Avangrid Renewables owns and operates approximately 7.1 GW of generation capacity, primarily through wind and solar, in 22 states. It is one of the nation's largest producers of wind energy.[16]

[14] https://www.xcelenergy.com/company/corporate_responsibility_report/who_we_are, accessed 3/11/2019
[15] https://www.avangrid.com/wps/portal/avangrid/aboutus, accessed on 2/20/2019
[16] https://www.avangrid.com/wps/portal/avangrid/aboutus/companyprofile/ourcompanies html, accessed 2/20/2019

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Avista Corporation
Company Summary from Value Line:
Avista Corporation (formerly The Washington Water Power Company) supplies electricity & gas in eastern Washington & northern Idaho. Supplies electricity to part of Alaska & gas to part of Oregon. Customers: 402,000 electric, 350,000 gas. Acq'd Alaska Electric Light and Power 7/14. Sold Ecova energy-management sub. 6/14. Electric rev. breakdown: residential, 39%; commercial, 32%; industrial, 11%; wholesale, 8%; other, 10%. Generating sources: hydro, 33%; gas & coal, 28%; purch., 39%. Fuel costs: 36% of revs. '17 reported depr. rate (Avista Utilities): 3.1%. Has 2,000 employees.

Additional Company Information from Website:
We are an energy company involved in the production, transmission, and distribution of energy as well as other energy-related businesses. Avista Utilities is our operating division that provides electric service to more than 600,000 electric and natural gas customers across 30,000 square miles in eastern Washington, northern Idaho and parts of southern and eastern Oregon. Alaska Energy and Resources Company, an Avista subsidiary, provides retail electric service in the city and borough of Juneau through its subsidiary Alaska Electric Light and Power Company. Avista's legacy of innovation is rooted in the renewable energy we've generated since our founding in 1889.[17]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

CenterPoint Energy, Inc.
Company Summary from Value Line:
CenterPoint Energy, Inc. is a holding company for Houston Electric, which serves 2.4 million customers in Houston and environs, and gas utilities with 3.4 million customers in Texas, Minnesota, Arkansas, Louisiana, and Oklahoma. Owns 54.1% of Enable Midstream Partners. Discontinued Texas Genco Holdings in '04. Electric revenue breakdown: residential, 52%; commercial, 31%; industrial, 15%; other, 2%. Does not own generating assets. Gas costs: 51% of revenues. '17 depreciation rate: 5.6%. Has 8,000 employees.

Additional Company Information from Website:
Our vision to lead the nation in delivering energy, service and value drives our strategy and performance. We have an unwavering commitment to safely and reliably deliver electricity and natural gas to millions of people. Natural Gas: We sell and deliver natural gas to more than 4.5 million homes and businesses in eight states: Arkansas, Indiana, Louisiana, Minnesota (including Minneapolis), Mississippi, Ohio, Oklahoma and Texas (including greater Houston area). We are investing in modernizing our natural gas infrastructure and are committed to eliminating cast-iron pipe in all our territories. Electric Transmission and Distribution and Power Generation: We maintain the wires, poles

[17] https://www.myavista.com/about-us/our-company, accessed 2/20/2019

and electric infrastructure serving more than 2.5 million metered customers in the greater Houston area and in southwestern Indiana. We also own and operate nearly 1,300 megawatts of electric generation capacity in Indiana. We are committed to the reliable delivery of electricity generated from power plants and renewable energy resources to homes and businesses. Competitive Energy Businesses: Our competitive energy businesses include three areas: natural gas marketing and energy-related services; energy efficiency, sustainability and infrastructure modernization solutions; and construction and repair services for pipeline systems, primarily natural gas. Our competitive energy businesses' footprint spans nearly 40 states. CenterPoint Energy Home Service Plus®: For over 80 years, HSP has provided heating and cooling solutions for Minnesota homeowners. We proudly offer expert repair, along with service and maintenance plans, and professional sales for both gas and electric equipment. CenterPoint Energy and HomeServe: We are partnering with HomeServe, a trusted nationwide provider of emergency home repair programs, in our natural gas markets in Texas and in Houston to offer our customers service repair plans that reduce the stress and expense from the unexpected.[18]

CenterPoint Energy, Inc. and Vectren Corporation announced on February 1, 2019 the successful completion of their merger.[19]

Why was the company not included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. However, CenterPoint Energy, Inc. and Vectren Corporation recently completed a merger.

Consolidated Edison, Inc.
Company Summary from Value Line:
Consolidated Edison, Inc. is a holding company for Consolidated Edison Company of New York, Inc. (CECONY), which sells electricity, gas, and steam in most of New York City and Westchester County. Also owns Orange and Rockland Utilities (O&R), which operates in New York and New Jersey. Has 3.7 million electric, 1.2 million gas customers. Pursues competitive energy opportunities through three wholly owned subsidiaries. Entered into midstream gas joint venture 6/16. Purchases most of its power. Fuel costs: 22% of revenues. '17 reported depreciation rates: 2.9%-3.1%. Has 15,000 employees.

Additional Company Information from Website:
We operate one of the world's largest energy delivery systems. Founded in 1823 as the New York Gas Light company, our electric, gas, and steam service now provides energy for the 10 million people who live in New York City and Westchester County. We're constantly looking toward the future and exploring ways to innovate and take advantage of developing technology. But, more than anything, we're listening to you and working hard to give you cleaner, more efficient energy choices, and more control over when and how you use your power.[20]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

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[18] https://www.centerpointenergy.com/en-us/corporate/about-us/company-overview, accessed on 2/20/2019
[19] http://investors.centerpointenergy.com/news-releases/news-release-details/centerpoint-energy-and-vectren-complete-merger, accessed 2/20/2019
[20] https://www.coned.com/en/about-us/company-information, accessed 2/20/2019

Dominion Energy, Inc.

Company Summary from Value Line:

Dominion Energy, Inc. (formerly Dominion Resources) is a holding company for Virginia Power & North Carolina Power, which serve 2.6 mill. customers in VA & northeastern NC. Serves 2.3 mill. gas customers in OH, WV, & UT. Other ops. incl. independent power production. Owns 50.6% of Dominion Midstream Partners. Acq'd Questar 9/16. Elec. rev. breakdown: residential, 46%; commercial, 32%; industrial, 7%; other, 15%. Generating sources: nuclear, 32%; gas, 32%; coal, 17%; other, 5%; purch., 14%. Fuel costs: 24% of revs. '17 reported depr. rates: 2.2%-4.9%. Has 16,200 empls.

Additional Company Information from Website:

Headquartered in Richmond, VA, Dominion Energy [NYSE: D] is one of the nation's largest producers and transporters of energy, with a portfolio of approximately 31,000 megawatts of electric generation; 106,400 miles of natural gas gathering, storage, transmission and distribution pipeline; and 93,600 miles of electric transmission and distribution lines. We operate one of the largest natural gas storage systems in the U.S. with more than a trillion cubic feet of capacity, and serve nearly 7.5 million utility and retail energy customers. Our company is built on a proud legacy of public service, innovation and community involvement. In addition to our core businesses, Dominion Energy and our 21,000 employees invest in the communities where we live and work and by practicing responsible environmental stewardship wherever we operate.[21]

Dominion Energy, Inc. and SCANA Corporation announced on January 2, 2019 that they have completed their proposed merger.[22]

Why was the company not included?

This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota. Also, the company recently involved in a merger.

Duke Energy Corporation

Company Summary from Value Line:

Duke Energy Corporation is a holding company for utilities with 7.4 mill. elec. customers in NC, FL, IN, SC, Oh, & KY, and 1.5 mill. gas customers in OH, KY, NC, SC, and TN. Owns independent power plants & has 25% stake in National Methanol in Saudi Arabia. ~~Acq'd Progress Energy 7/12; Piedmont Natural Gas 10/16; discontinued most int'l ops. in '16. Elec. rev. breakdown: residential, 41%; commercial, 29%; industrial, 14%; other, 16%. Generating sources: coal, 27%; nuclear, 27%; gas, 23%; other, 1%; purchased, 22%. Fuel costs: 30% of revs. '17 reported deprec. rate: 2.8%. Has 29,100 employees.

Additional Company Information from Website:

We are one of the largest electric power holding companies in the United States, providing electricity to 7.6 million retail customers in six states. We have approximately 49,500 megawatts of electric generating capacity in the Carolinas, the Midwest and Florida – and natural gas distribution services serving more than 1.6 million customers in Ohio, Kentucky, Tennessee and the Carolinas. Our

[21] https://www.dominionenergy.com/about-us/who-we-are, accessed 2/20/2019

[22] https://dominionenergy.mediaroom.com/2019-01-02-Dominion-Energy-Combines-With-SCANA-Corporation, accessed 2/20/2019

commercial business owns and operates diverse power generation assets in North America, including a portfolio of renewable energy assets. We are transforming our customers' experience, modernizing our energy grid, generating cleaner energy and expanding our natural gas infrastructure to create a smarter energy future for our customers.[23]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Edison International (formerly SCECorp)
Company Summary from Value Line:
Edison International (formerly SCECorp) is a holding company for Southern California Edison Company (SCE), which supplies electricity to 5.1 mill. customers in a 50,000-sq.-mi. area in central, coastal, & southern CA (excl. Los Angeles & San Diego). Edison Energy is an energy svcs. co. Disc. Edison Mission Energy (independent power producer) in '12. Elec. rev. breakdown: residential, 37%; commercial, 44%; industrial, 6%; other, 13%. Generating sources: gas, 6%; nuclear, 6%; hydro, 5%; purchased, 83%. Fuel costs: 38% of revs. '17 reported depr. rate: 3.8%. Has 12,500 empls.

Additional Company Information from Website:
At Edison International, our vision is to lead the transformation of the electric power industry toward a clean energy future. Through our subsidiaries, we generate and distribute electric power, as well as provide energy services and technologies, including renewable energy. With 130+ years of innovation in our history, our company is well-positioned and prepared for the work that lies ahead as we focus on opportunities in clean energy, efficient electrification, the grid of the future, and customer choice to strengthen and grow our business. Our subsidiary, Southern California Edison, is one of the largest electric utilities in the United States and a longtime leader in renewable energy and energy efficiency. With headquarters in Rosemead, Calif., SCE serves approximately 15 million people in a 50,000 square-mile area of central, coastal and Southern California. SCE has provided electric service in the region for more than 130 years. Edison Energy is an independent advisory and services company with the capabilities to develop and integrate an array of energy solutions for the largest energy users nationwide. Based in Irvine, Calif., Edison Energy focuses on helping the nation's largest energy users simultaneously reduce their energy costs, improve the environmental performance of their operations, ensure energy resiliency, and manage exposure to energy price risk. Edison Energy has the heritage, resources, experience, technology and entrepreneurial business model to improve the way commercial, industrial and institutional organizations procure, use, and manage energy.[24]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

[23] https://www.duke-energy.com/our-company/about-us, accessed 2/20/2019

[24] https://www.edison.com/home/about-us/our-companies.html, accessed 2/20/2019

El Paso Electric Company

Company Summary from Value Line:

El Paso Electric Company (EPE) provides electric service to 424,000 customers in an area of approximately 10,000 square miles in the Rio Grande valley in western Texas (68% of revenues) and southern New Mexico (19% of revenues), including El Paso, Texas and Las Cruces, New Mexico. Wholesale is 13% of revenues. Electric revenue breakdown by customer class not available. Generating sources: nuclear, 49%; gas, 36%; purchased, 15%. Fuel costs: 27% of revenues. '17 reported depreciation rate: 2.3%. Has about 1,100 employees.

Additional Company Information from Website:

El Paso Electric (EPE) first began serving its customers on August 30, 1901. It was then known as the El Paso Electric Railway Company. Initially its primary business consisted of providing transportation via mule-drawn streetcars, which were replaced in 1902 with electric streetcars. Today, El Paso Electric is a regional electric utility providing generation, transmission and distribution service to approximately 417,000 retail and wholesale customers in a 10,000 square mile area of the Rio Grande valley in west Texas and southern New Mexico. Its service territory extends from Hatch, New Mexico to Van Horn, Texas.[25]

Why was the company not included?

This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Evergy Inc.

Company Summary from Value Line:

Evergy, Inc. was formed through the merger of Great Plains Energy and Westar Energy in June of 2018. Through its subsidiaries, Kansas City Power & Light Company and Westar Energy, provides electric service to 1.6 million customers in Kansas and Missouri. Electric revenue breakdown: residential, 35%; commercial, 28%; industrial, 14%; wholesale, 12%; other, 11%. Generating sources: coal, 71%; nuclear, 19%; hydro & other, 4%; purchased, 6%. Fuel costs: 24% of revenues. ’17 reported deprec. rates: 3%-4%. Has 4,800 employees.

Additional Company Information from Website:

Evergy is committed to delivering clean, safe, reliable sources of energy today and well into the future. So we’re embracing alternative energy sources to generate more power with less impact to our environment, and adopting new technologies that let our customers manage their energy use in ways that work for them. Whether it’s new ways to connect with us, electric vehicle charging stations, or the next innovation around the corner, we’re dedicated to empowering a better future. Evergy, Inc. (NYSE: EVRG), through its operating subsidiaries, Kansas City Power & Light Company (KCP&L) and Westar Energy, Inc., provides clean, safe and reliable energy to 1.6 million customers in Kansas and Missouri. By combining KCP&L and Westar Energy, Inc., in 2018, a leading energy company was created that provides value to shareholders and a stronger company for customers.[26]

[25] https://www.epelectric.com/, accessed 2/20/2019

[26] http://www.evergyinc.com/homepage, accessed 2/20/2019

Great Plains Energy Incorporated, which serves customers as KCP&L, and Westar Energy, Inc. announced on May 24, 2018 that they received final regulatory approval from the Kansas Corporation Commission and Missouri Public Service Commission to combine. The stock-for-stock merger of equals creates a holding company of approximately $15 billion equity value, which will be named Every, Inc. Its principal business will be conducted by the operating companies today known as Westar and KCP&L.[27]

Why was the company not included?
This company is located in the Electric Utility (Central) Value Line Industry However, the company was recently created through the merger of Great Plains Energy Incorporated and Westar Energy, Inc. The department will consider this company as a guideline company in the future.

Eversource Energy
Company Summary from Value Line:
Eversource Energy (formerly Northeast Utilities) is the parent of utilities that have 3.1 mill. electric, 504,000 gas, 230,000 water customers. Supplies power to most of Connecticut and gas to part of Connecticut; supplies power to 3/4 of New Hampshire's population; supplies power to western Massachusetts and parts of eastern Massachusetts & gas to central & eastern Massachusetts; supplies water to CT, MA, & NH. Acq'd NSTAR 4/12; Aquarion 12/17. Electric rev. breakdown: residential, 51%; commercial, 36%; industrial, 5%; other, 8%. Fuel costs: 33% of revs. '17 reported deprec. rate: 3.0%. Has 8,100 empls.

Additional Company Information from Website:
The approximately 8,300 men and women of Eversource bring a strong commitment to providing safe, reliable and sustainable electric, gas and water service. Serving the neighborhoods where we live and work. Coming together in good weather and bad. Taking care of problems before they're problems. Heading out in the storm when others head home. Connecting you to solutions for savings. Working together for a better tomorrow. In 2012, Northeast Utilities and its operating companies Connecticut Light & Power, Public Service of New Hampshire, Western Massachusetts Electric and Yankee Gas merged with NSTAR Electric & Gas to better serve New England. On December 4, 2017, Eversource closed the deal on an acquisition of Aquarion Water Company, making Eversource the only electric company in the U.S. that also owns a water utility. Aquarion serves 230,000 water customers in Connecticut, Massachusetts and New Hampshire. Combined, we power the possible for New England.[28]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

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[27] http://www.evergyinc.com/news-releases/news-release-details/merger-great-plains-energy-and-westar-energy-approved-paving-way, accessed 2/20/2019

[28] https://www.eversource.com/content/general/about/about-us/about-us/welcome-to-eversource, accessed 2/20/2019

Exelon Corporation

Company Summary from Value Line:

Exelon Corporation is a holding company for Commonwealth Edison, PECO Energy, Baltimore Gas and Electric, Pepco, Delmarva Power, & Atlantic City Electric. Has 8.8 mill. elec., 1.3 mill. gas customers. Has nonregulated generating & energy-marketing ops. Acq'd Constellation Energy 3/12; Pepco Holdings 3/16. Elec. rev. breakdown: res'l, 53%; small comm'l & ind'l, 17%; large comm'l & ind'l, 15%; other, 15%. Generating sources: nuclear, 69%; other, 12%; purch., 19%. Fuel costs: 42% of revs. '17 depr. rates: 2.8%-7.0% elec., 2.1% gas. Has 34,600 empls.

Additional Company Information from Website:

We are a FORTUNE 100 company that works in every stage of the energy business: power generation, competitive energy sales, transmission and delivery. As the nation's leading competitive energy provider, Exelon does business in 48 states, D.C., and Canada and had 2017 revenues of $33.5 billion. We employ approximately 34,000 people nationwide. Exelon's family of companies represents every stage of the energy value chain. Exelon’s six utilities deliver electricity and natural gas to approximately 10 million customers in Delaware, the District of Columbia, Illinois, Maryland, New Jersey and Pennsylvania through its Atlantic City Electric, BGE, ComEd, Delmarva Power, PECO and Pepco subsidiaries. Exelon is one of the largest competitive U.S. power generators, with more than 32,700 megawatts of nuclear, gas, wind, solar and hydroelectric generating capacity comprising one of the nation’s cleanest and lowest-cost power generation fleets. The company’s Constellation business unit provides energy products and services to approximately 2 million residential, public sector and business customers, including more than two-thirds of the Fortune 100.[29]

Why was the company not included?

This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

FirstEnergy Corporation

Company Summary from Value Line:

FirstEnergy Corp. is a holding company for Ohio Edison, Pennsylvania Power, Cleveland Electric, Toledo Edison, Metropolitan Edison, Penelec, Jersey Central Power & Light, West Penn Power, Potomac Edison, & Mon Power. Provides electric service to 6.1 million customers in OH, PA, NJ, WV, MD, & NY. Acq'd Allegheny Energy 2/11. Electric revenue breakdown by customer class not available. Generating sources: coal, 44%; nuclear, 26%; purchased, 30%. Fuel costs: 33% of revenues. '17 reported deprec. rate: 2.4%. Has 15,200 employees.

Additional Company Information from Website:

We are a forward-thinking electric utility powered by a diverse team of employees committed to making customers’ lives brighter, the environment better and our communities stronger. FirstEnergy (NYSE: FE) is dedicated to safety, reliability and operational excellence. Headquartered in Akron, Ohio, FirstEnergy includes one of the nation's largest investor-owned electric systems, more than 24,000 miles of transmission lines that connect the Midwest and Mid-Atlantic regions, and a generating fleet with a total capacity of more than 5,000 megawatts. Our company has invested $10 billion in environmental

[29] http://www.exeloncorp.com/company/about-exelon, accessed 2/20/2019

efforts since 1970, and we have a continuing commitment to cleaner energy resources, smarter technology and a more sustainable planet.[30]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Fortis, Inc.
Company Summary from Value Line:
Fortis Inc.'s main focus is electricity, hydroelectric, and gas utility operations (both regulated and nonregulated) in the United States, Canada, and the Caribbean. Has 2 mill. electric, 1.3 mill. gas customers. Owns UNS Energy (Arizona), Central Hudson (New York), FortisBC Energy (British Columbia), FortisAlberta (Central Alberta), and Eastern Canada (Newfoundland). Sold commercial real estate and hotel property assets in 2015. Acquired ITC Holdings 10/16. Fuel costs: 28% of revenues. '17 reported deprec. rate: 2.6%. Has 8,500 employees.

Additional Company Information from Website:
Fortis Inc. has its origin in the formation of St. John's Electric Light Company in 1885 in the province now known as Newfoundland and Labrador. That company eventually became Newfoundland Light & Power Co. Limited which became the first wholly owned subsidiary of Fortis Inc. Fortis was created as a holding company in 1987 with the mission to expand and diversify. Today, Fortis is a leader in the North American utility industry with assets of $53 billion and 2018 revenue of $8.4 billion. Our more than 8,800 employees serve utility customers in five Canadian provinces, nine U.S. states and three Caribbean countries.[31]

Why was the company not included?
This company is similar to the Electric Companies that the State Assessed Section is responsible for valuing. This company is in the Electric Utility (Central) Value Line Industry. This company trades on the Toronto and New York Stock Exchanges. All data provided by Value Line is in Canadian Dollars, making conversion to US dollars necessary. Since there are enough comparable companies, will not use to limit the number of additional calculations that can decrease the reliability of the data.

Great Plains Energy
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Great Plains Energy Incorporated, which serves customers as KCP&L, and Westar Energy, Inc. announced on May 24, 2018 that they received final regulatory approval from the Kansas Corporation Commission and Missouri Public Service Commission to combine. The stock-for-stock merger of equals creates a holding company of approximately $15 billion equity value, which will be named Every, Inc.

[30] https://www.firstenergycorp.com/content/fecorp/about.html, accessed 2/20/2019

[31] https://www.fortisinc.com/about-us, accessed 2/20/2019

Its principal business will be conducted by the operating companies today known as Westar and KCP&L.[32]

Why was the company not included?
Company is no longer publicly traded. Evergy, Inc. was recently created through the merger of Great Plains Energy Incorporated and Westar Energy, Inc.

Hawaiian Electric Industries, Inc.
Company Summary from Value Line:
Hawaiian Electric Industries, Inc. is the parent company of Hawaiian Electric Company, Inc. (HECO), American Savings Bank (ASB), and Pacific Current. HECO & its subs., Maui Electric Co. (MECO) & Hawaii Electric Light Co. (HELCO), supply electricity to 462,000 customers on O`ahu, Maui, Molokai, Lanai, & Hawaii. Operating companies' systems are not interconnected. Elec. rev. breakdown: residential, 31%; commercial, 34%; lg. light & power, 34%; other, 1%. Generating sources: oil, 53%; purch., 47%. Fuel costs: 46% of revs. '17 reported depr. rate (util.): 3.2%. Has 3,900 employees.

Additional Company Information from Website:
HEI is a family of three complementary companies that provide energy and financial services across all six Hawaiian islands, supporting a sustainable future. Our businesses are helping Hawaii to be clean, energy independent, innovative and prosperous now and into the future.[33]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

IDACORP, Inc.
Company Summary from Value Line:
IDACORP, Inc. is a holding company for Idaho Power Company, a regulated electric utility that serves 555,000 customers throughout a 24,000-square-mile area in southern Idaho and eastern Oregon (population: 1 million). Most of the company's revenues are derived from the Idaho portion of its service area. Revenue breakdown: residential, 41%; commercial, 24%; industrial, 14%; irrigation, 11%; other, 10%. Generating sources: hydro, 50%; coal, 18%; gas, 8%; purchased, 24%. Fuel costs: 33% of revenues. '17 reported depreciation rate: 2.9%. Has 2,000 employees.

Additional Company Information from Website:
Boise, Idaho-based IDACORP is a holding company comprised of Idaho Power Company, a regulated electric utility; IDACORP Financial, a holder of affordable housing projects and other real estate investments; and Ida-West Energy, an operator of small hydroelectric generation projects that satisfy the requirements of the Public Utility Regulatory Policies Act of 1978.
IDACORP was formed Oct. 1, 1998, following approval by Idaho Power shareholders, the Federal Energy Regulatory Commission and the public utility commissions of Idaho, Oregon, Nevada and Wyoming (states where IDACORP has conducted business or has holdings).

[32] http://www.evergyinc.com/news-releases/news-release-details/merger-great-plains-energy-and-westar-energy-approved-paving-way, accessed 2/20/2019
[33] http://www.hei.com/, accessed 2/20/2019

Under the holding company structure, Idaho Power Company is the primary subsidiary. This regulated utility, created in 1916, is dedicated to providing quality electric service to nearly 555,000 general business customers in a 24,000-square-mile service area in southern Idaho and eastern Oregon. The backbone of the company's generation portfolio is a series of 17 hydroelectric plants it owns and operates on the Snake River and its tributaries. Idaho Power also owns three natural gas-fired power plants and a partial interest in three coal-fired generating stations.[34]

Why was the company not included?
This company is part of Value Line's Electric Utility (West) industry, but it is similar to the Electric Companies that the State Assessed Section is responsible for valuing. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

MDU Resources Group, Inc.
Company Summary from Value Line:
MDU Resources Group, Inc. is a regulated energy delivery and construction materials and services business. Segments: construction materials and contracting (41% of '17 revs; 34% of '17 op. inc.), construction services (31%, 19%), natural gas distribution (19%, 20%); electric (8%, 19%) and pipeline and energy services (1%, 8%). Utilities sell gas & electricity in northwest and upper Midwest U.S. Construction materials has 1.1 billion tons of construction reserves. Has 10,140 employees.

Additional Company Information from Website:
A strong infrastructure is the heart of our economy. It is the natural gas and electricity that power business, industry and our daily lives. It is the pipes and wires that connect our homes, factories, offices and stores to bring them to life. It is the transportation network of roads, highways and airports that keeps our economy moving. Infrastructure is our business. We provide essential products and services through our two lines of business: regulated energy delivery and construction materials and services. Our company was founded in 1924 as a small electric utility serving a handful of farm communities on the border of Montana and North Dakota. We realized early the value of delivering a variety of services, and grew our company by developing businesses around our expertise. Today, MDU Resources is a multibillion-dollar corporation with operations, customers and employees across the country. We have more than 13,000 employees during peak construction season and are authorized to conduct business in 45 states. MDU Resources is the largest publicly traded company headquartered in North Dakota. Our stock has traded since 1948 under the symbol MDU on the New York Stock Exchange. We have paid dividends uninterrupted to our shareholders for 81 years. We have increased dividends 28 consecutive years, a feat accomplished by fewer than 90 of the U.S.-listed companies. Our commitment to paying dividends is reflected in our membership in the S&P High-Yield Dividend Aristocrats index.[35]

Why was the company not included?
This company is reviewed as a potential guideline company because it has an operating subsidiary located in Minnesota. This company is located in the Natural Gas Diversified Company Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota that are very similar

[34] http://www.idacorpinc.com/about-us/at-a-glance, accessed 2/20/2019
[35] http://www.mdu.com/our-business-overview, accessed 2/20/2019

to the companies in Minnesota. MDU Resources Group, Inc.'s majority operating segment is construction materials and contracting.

NextEra Energy, Inc.
Company Summary from Value Line:
NextEra Energy, Inc. (formerly FPL Group, Inc.) is a holding company for Florida Power & Light Company (FPL), which provides electricity to 4.9 million customers in a 27,650-sq.-mi. area in eastern & southern Florida. NextEra Energy Resources is a nonregulated power generator with nuclear, gas, & wind ownership. Has a 79.9% stake in NextEra Energy Partners. Rev. breakdown: residential, 55%; commercial, 35%; industrial & other, 10%. Generating sources: gas, 71%; nuclear, 23%; coal, 4%; purchased, 2%. Fuel costs: 24% of revs. '17 reported depr. rate (utility): 3.7%. Has 13,900 employees.

Additional Company Information from Website:
NextEra Energy, Inc. (NYSE: NEE) is a leading clean energy company with consolidated revenues of approximately $17.2 billion, operates approximately 46,790 megawatts of net generating capacity and employs approximately 14,000 people in 33 states and Canada as of year-end 2017. Headquartered in Juno Beach, Florida, NextEra Energy's principal subsidiaries are Florida Power & Light Company, which serves approximately 5 million customer accounts in Florida and is one of the largest rate-regulated electric utilities in the United States, and NextEra Energy Resources, LLC, which, together with its affiliated entities, is the world's largest generator of renewable energy from the wind and sun. Through its subsidiaries, NextEra Energy generates clean, emissions-free electricity from eight commercial nuclear power units in Florida, New Hampshire, Iowa and Wisconsin. A Fortune 200 company and included in the S&P 100 index, NextEra Energy has been recognized often by third parties for its efforts in sustainability, corporate responsibility, ethics and compliance, and diversity, and has been ranked No. 1 in the electric and gas utilities industry in Fortune's 2018 list of "World's Most Admired Companies."[36]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota. This company has nuclear plants in Wisconsin as well as renewable energy generators in Minnesota. However, these operations are very small considering the overall company.

Ormat Technologies, Inc.
Company Summary from Value Line:
Ormat Technologies, Inc., together with its subsidiaries, provides geothermal and recovered energy power and products through two operating segments. Its electricity division (68% of 2017 revs.) develops, constructs, owns, and operates geothermal power plants that sell electricity. Under the product segment (32% of revs.), the company designs and manufactures power units for geothermal plants and power units for recovered generation. Employs 1.303.

Additional Company Information from Website:
At Ormat Technologies, Inc. (NYSE: ORA), we're always on; delivering renewable power and energy solutions to our customers around the clock and around the world. Clean, reliable energy solutions

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[36] http://www.investor.nexteraenergy.com/phoenix.zhtml?c=88486&p=irol-homeProfile, accessed 2/20/2019

provided from geothermal, recovered energy, as well as energy management and storage solutions, is our expertise, commitment and focus. Built on ingenuity and proven experience, Ormat is recognized globally for developing state-of-the-art, environmentally sound power solutions. We design, build and supply power generating equipment for our customers' geothermal and recovered energy power plants in 30 countries. We understand our customers' operating challenges, because we are operators too. As a geothermal industry leader, we've gained global expertise in exploring, developing, designing, manufacturing, building, owning and operating geothermal power plants in Kenya, Guadalupe, Guatemala, Honduras and the United States. Our vertically integrated structure enables us to leverage our renewable energy expertise, our core capabilities, and our global experience to supply and develop geothermal, recovered energy, and energy management and storage solutions.[37]

Why was the company not included?
This company is located in the Power Company Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to or in Minnesota. Ormat does have generating facilities in Minnesota, but they are a very small portion of their overall company and Ormat is not an accurate reflection of the types of companies we are valuing.

PG&E Corporation (Pacific Gas and Electric Company, Inc.)
Company Summary from Value Line:
PG&E Corporation is a holding company for Pacific Gas and Electric Company and nonutility subsidiaries. Supplies electricity and gas to most of northern and central California (population 16 million). Has 5.4 million electric and 4.5 million gas customers. Electric revenue breakdown: residential, 41%; commercial, 39%; industrial, 12%; agricultural, 8%; other, less than 1%. Generating sources: nuclear, 27%; hydro, 17%; gas, 9%; purchased, 47%. Fuel costs: 30% of revenues. '17 reported depreciation rate (utility): 3.8%. Has 23,000 employees.

Additional Company Information from Website:
Pacific Gas and Electric Company, incorporated in California in 1905, is one of the largest combined natural gas and electric energy companies in the United States. Based in San Francisco, the company is a subsidiary of PG&E Corporation. There are approximately 24,000 employees who carry out Pacific Gas and Electric Company's primary business—the transmission and delivery of energy. The company provides natural gas and electric service to approximately 16 million people throughout a 70,000-square-mile service area in northern and central California. Pacific Gas and Electric Company and other energy companies in the state are regulated by the California Public Utilities Commission. The CPUC was created by the state Legislature in 1911. Service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east. 106,681 circuit miles of electric distribution lines and 18,466 circuit miles of interconnected transmission lines. 42,141 miles of natural gas distribution pipelines and 6,438 miles of transmission pipelines. 5.4 million electric customer accounts. 4.3 million natural gas customer accounts.[38]

[37] http://www.ormat.com/en/company/welcome/profile/ accessed 2/20/2019

[38] https://www.pge.com/en_US/about-pge/company-information/profile/profile.page, accessed 2/20/2019

PG&E Corporation and its primary operating subsidiary, Pacific Gas and Electric Company filed voluntary petitions under Chapter 111 of the U.S. Bankruptcy Code in the United States Bankruptcy Court for the Northern District of California on January 29, 2019.[39]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota. Also, this company recently filed under Chapter 11.

Pinnacle West Capital Corporation
Company Summary from Value Line:
Pinnacle West Capital Corporation is a holding company for Arizona Public Service Company (APS), which supplies electricity to 1.2 million customers in most of Arizona, except about half of the Phoenix metro area, the Tucson metro area, and Mohave County in northwestern Arizona. Discontinued SunCor real estate subsidiary in '10. Electric revenue breakdown: residential, 50%; commercial, 40%; industrial, 5%; other, 5%. Generating sources: nuclear, 29%; gas & other, 26%; coal, 22%; purchased, 23%. Fuel costs: 28% of revenues. '17 reported deprec. rate: 2.8%. Has 6,300 employees.

Additional Company Information from Website:
Pinnacle West Capital Corporation (NYSE: PNW) is an investor owned electric utility holding company based in Phoenix, Arizona with consolidated assets of about $18 billion. For over 125 years, Pinnacle West and our affiliates have provided energy and energy-related products to people and businesses throughout Arizona -- our history and Arizona's history are bound together. Pinnacle West derives essentially all of our revenues and earnings from our wholly-owned subsidiary, Arizona Public Service ("APS"). APS is a vertically-integrated electric utility that provides either retail or wholesale electric service to most of the State of Arizona, 1.2 million customers in total. APS is also the operator and co-owner of the Palo Verde Generating Station – a primary source of electricity for the Southwest. Pinnacle West's other principal subsidiary is Bright Canyon Energy.[40]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

PNM Resources, Inc.
Company Summary from Value Line:
PNM Resources, Inc. is a holding company with two regulated electric utilities. Public Service Company of New Mexico (PNM) serves 524,000 customers in north central New Mexico, incl. Albuquerque and Santa Fe. Texas-New Mexico Power Company (TNMP) transmits and distributes power to 250,000 customers in Texas. Electric rev. breakdown: residential, 39%; commercial, 37%; industrial, 5%; other, 19%. Generating sources: coal, 57%; nuclear, 30%; gas/oil, 12%; solar, 1%. Fuel costs: 28% of revenues. '17 reported deprec. rates: 2.5%-8.4%. Has 1,700 employees.

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[39]https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20190129_pge_files_for_reorganization_under_chapter_11, accessed 2/20/2019
[40] http://www.pinnaclewest.com/about-us/default.aspx, accessed 2/20/2019

Additional Company Information from Website:
PNM Resources, Inc. is an investor-owned energy holding company based in Albuquerque, New Mexico. It provides electricity and electric services in New Mexico and Texas through its two utilities, PNM and TNMP. PNM and TNMP have approximately 2,580 megawatts of generation capacity and serve electricity to more than 773,000 homes and businesses in New Mexico and Texas.
PNM Resources has a solid reputation for shareholder value, customer satisfaction and service reliability. It is publicly traded on the New York Stock Exchange as PNM. In 2017, consolidated operating revenues totaled $1.4 billion.[41]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Portland General Electric Company
Company Summary from Value Line:
Portland General Electric Company (PGE) provides electricity to 885,000 customers in 52 cities in a 4,000-square-mile area of Oregon, including Portland and Salem. The company is in the process of decommissioning the Trojan nuclear plant, which it closed in 1993. Electric revenue breakdown: residential, 48%; commercial, 33%; industrial, 11%; other, 8%. Generating sources: gas, 28%; coal, 15%; wind, 8%; hydro, 8%; purchased, 41%. Fuel costs: 30% of revenues. '17 reported depreciation rate: 3.6%. Has 2,900 employees.

Additional Company Information from Website:
For more than 125 years, we've been powering the pioneering spirit of our region — keeping energy safe, reliable and responsibly generated. We are deeply committed to the success of the communities we serve and strive to bring innovative solutions to our customers and a bright energy future for Oregon. [42]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

PPL Corporation
Company Summary from Value Line:
PPL Corporation (formerly PP&L Resources, Inc.) is a holding company for PPL Electric Utilities (formerly Pennsylvania Power & Light Company), which distributes electricity to 1.4 million customers in eastern & central PA. Acq'd Kentucky Utilities and Louisville Gas and Electric (1.2 million customers) 11/10. Has electric distribution sub. in U.K. (7.8 million customers). Sold gas distribution subsidiary in '08. Spun off power generating subsidiary in '15. The company no longer breaks out data on electric operating statistics. Fuel costs: 19% of revs. '17 reported deprec. rate: 2.7%. Has 12,500 employees.

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[41] http://www.pnmresources.com/about-us/at-a-glance.aspx, accessed 2/20/2019
[42] https://www.portlandgeneral.com/our-company/pge-at-a-glance/quick-facts, 2/20/2019

Additional Company Information from Website:
PPL Corporation and our family of companies provide essential energy services to more than 10 million customers in the United States and the United Kingdom. We provide an outstanding service experience for our customers, consistently ranking among the best utilities in the U.S. and the U.K. As one of the largest regulated utility companies in the United States, we understand the electricity we provide is vital to our customers and communities. To that end, we are investing more than $15 billion through 2022 in new infrastructure and technology that will create a smarter, more reliable and resilient energy grid for generations to come. As the energy grid evolves, so do we. Our companies are addressing new challenges head-on and are finding ways to accommodate new technologies, distributed generation and renewable power sources on our grid. We are also taking steps to reduce our environmental impact and advance a cleaner, more balanced energy mix. We are a positive force in the cities and towns where we do business, and the spirit of volunteerism and philanthropy runs deep at PPL. Our more than 12,000 employees generously volunteer their time and energy to help others. We also partner with hundreds of nonprofit organizations to enhance educational programs, help develop the workforce and revitalize our communities. PPL is committed to providing essential energy in extraordinary ways, and we deliver.[43]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Public Service Enterprise Group, Inc.
Company Summary from Value Line:
Public Service Enterprise Group Incorporated is a holding company for Public Service Electric and Gas Company (PSE&G), which serves 2.2 million electric and 1.8 million gas customers in New Jersey, and PSEG Power LLC, a nonregulated power generator with nuclear, gas, and coal-fired plants in the Northeast. PSEG Energy Holdings is involved in renewable energy. The company no longer breaks out data on electric and gas operating statistics. Fuel costs: 31% of revenues. '17 reported depreciation rates (utility): 1.6%-2.5%. Has 12,900 employees.

Additional Company Information from Website:
The Public Service Corporation was formed in 1903, by amalgamating more than 400 gas, electric and transportation companies in New Jersey. Thomas McCarter was named the Corporation's first president and held the position until 1939. Internally, Public Service consolidated its gas and electric interests into Public Service Electric and Gas, and its transportation interests into Public Service Coordinated Transport (later Transport of New Jersey). Concerns about the concentration of economic power resulted in federal and state actions requiring the breakup of utilities. In 1943, Public Service once again became a stand-alone company, and was renamed Public Service Electric and Gas Company (PSE&G) in 1948.[44]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

[43] https://www.pplweb.com/who-we-are/about-us/, accessed 2/20/2019

[44] https://corporate.pseg.com/aboutpseg/companyinformation, accessed 2/20/2019

SCANA Corporation

Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Dominion Energy, Inc. and SCANA Corporation announced on January 2, 2019 that they have completed their proposed merger.[45]

Why was the company not included?
Company is no longer publicly traded.

Sempra Energy

Company Summary from Value Line:
Sempra Energy is a holding co. for San Diego Gas & Electric Company, which sells electricity & gas mainly in San Diego County, & Southern California Gas Company, which distributes gas to most of Southern California. Owns 80% of Oncor (acq'd 3/18), which distributes electricity in Texas. Customers: 4.9 mill. electric, 6.6 mill. gas. Electric rev. breakdown: residential, 41%; commercial, 42%; industrial, 10%; other, 7%. Purchases most of its power; the rest is gas. Has nonutility subsidiaries~~. Sold commodities business in '10. Power costs: 34% of revs. '17 reported deprec. rates: 2.4%-5.5%. Has 20,000 employees.

Additional Company Information from Website:
Sempra Energy is an energy infrastructure company focused on two main ideals — supporting the communities we serve and planning for our shared tomorrow. Our approximately 20,000 employees pride themselves as leaders in the energy industry, serving more than 40 million consumers worldwide. From our San Diego headquarters to our operations throughout North America, we are making great strides in developing forward-thinking energy solutions and delivering the everyday power our customers count on. Sempra Energy generated more than $11 billion in revenues in 2017 and total shareholder return of 134 percent over the past 10 years. With impactful strategies in place and an inspiring mission to become North America's premier energy infrastructure company, our strong financial performance will keep us on the path for sustainable long-term growth.[46]

Why was the company not included?
This company is located in the Electric Utility (West) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Southern Company

Company Summary from Value Line:
The Southern Company, through its subs., supplies electricity to 4.6 million customers in GA, AL, FL, and MS. Also has a competitive generation business. Acq'd AGL Resources (renamed Southern Company Gas, 4.5 mill. customers in GA, FL, NJ, IL, VA, & TN) 7/16. Electric rev. breakdown:

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[45] https://dominionenergy.mediaroom.com/2019-01-02-Dominion-Energy-Combines-With-SCANA-Corporation, accessed 2/20/2019

[46] http://www.sempra.com/about-us, accessed 2/20/2019

residential, 37%; commercial, 31%; industrial, 18%; other, 14%. Retail revs. by state: GA, 49%; AL, 35%; FL, 9%; MS, 7%. Generating sources: gas & oil, 42%; coal, 27%; nuclear, 15%; other, 7%; purchased, 9%. Fuel costs: 32% of revs. '17 reported depr. rate (utility): 2.9%. Has 31,300 employees.

Additional Company Information from Website:
While Atlanta is our home base, we bring energy to homes and businesses across the country. We've made our name as a leading producer of clean, safe, reliable and affordable energy, and approach each day as a vital step in building its future. We're always looking ahead, and our innovations in the industry—from nuclear advancement to electric transportation and drone technology—help brighten the lives and businesses of millions of customers nationwide.[47]

Why was the company not included?
This company is located in the Electric Utility (East) Value Line Industry. We are limiting the guideline companies for electric to the Electric Utility (Central) Value Line Industry as well as those companies that are located in or directly next to Minnesota.

Vectren Corporation
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
CenterPoint Energy, Inc. and Vectren Corporation announced on February 1, 2019 the successful completion of their merger.[48]

Why was the company not included?
Company is no longer publicly traded.

Westar Energy
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Great Plains Energy Incorporated, which serves customers as KCP&L, and Westar Energy, Inc. announced on May 24, 2018 that they received final regulatory approval from the Kansas Corporation Commission and Missouri Public Service Commission to combine. The stock-for-stock merger of equals creates a holding company of approximately $15 billion equity value, which will be named Every, Inc. Its principal business will be conducted by the operating companies today known as Westar and KCP&L.[49]

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[47] https://www.southerncompany.com/about-us.html, accessed 2/20/2019
[48] http://investors.centerpointenergy.com/news-releases/news-release-details/centerpoint-energy-and-vectren-complete-merger, accessed 2/20/2019
[49] http://www.evergyinc.com/news-releases/news-release-details/merger-great-plains-energy-and-westar-energy-approved-paving-way, accessed 2/20/2019

Why was the company not included?
Company is no longer publicly traded. Evergy, Inc. was recently created through the merger of Great Plains Energy Incorporated and Westar Energy, Inc.

Market Segment: Gas Distribution

Companies Included in the Gas Distribution Market Segment

Atmos Energy Corporation
Company Summary from Value Line:
Atmos Energy Corporation is engaged primarily in the distribution and sale of natural gas to over three million customers through six regulated natural gas utility operations: Louisiana Division, West Texas Division, Mid-Tex Division, Mississippi Division, Colorado-Kansas Division, and Kentucky/Mid-States Division. Gas sales breakdown for fiscal 2017: 65%, residential; 28%, commercial; 5%, industrial; and 2% other. The company sold Atmos Energy Marketing, 1/17.

Additional Company Information from Website:
Atmos Energy has grown from 279,000 customers in 1983 to more than 3 million customers today - mainly by acquiring utility assets. The company has regulated utility operations in Colorado, Kansas, Kentucky, Louisiana, Mississippi, Tennessee, Texas and Virginia. We are the largest natural gas distributor in the states of Texas, Louisiana, and Mississippi. We work closely with our state and federal regulators to operate a safe and reliable natural gas system. [50]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

Chesapeake Utilities Corporation
Company Summary from Value Line:
Chesapeake Utilities Corporation consists of two units: Regulated Energy and Unregulated Energy. The Regulated Energy segment (50% of 2017 revenues) distributes natural gas in Delaware, Maryland, and Florida; distributes electricity in Florida; and transmits natural gas on the Delmarva Peninsula and in Florida. The Unregulated Energy operation (50% of 2017 revenues) wholesales and distributes propane; markets natural gas; and provides other unregulated energy services, including midstream services in Ohio.

Additional Company Information from Website:
We strive to provide operational excellence and positive experiences for our customers and the communities we serve. Chesapeake's regulated energy businesses include natural gas distribution and transmission operations on the Delmarva Peninsula and in Florida, and electric distribution operations in Florida. Chesapeake's unregulated energy businesses include its natural gas marketing subsidiary, its propane distribution operations, and its propane wholesale marketing subsidiary.[51]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

[50] https://www.atmosenergy.com/company/utility-operations, accessed 2/21/2019
[51] http://www.chpk.com/our-company/our-companies/, accessed 2/21/2019

New Jersey Resources Corporation

Company Summary from Value Line:

New Jersey Resources Corp. is a holding company providing retail/wholesale energy svcs. to customers in NJ, and in states from the Gulf Coast to New England, and Canada. New Jersey Natural Gas had 529,810 cust. at 9/30/17 in Monmouth and Ocean and other N.J. counties. Fiscal 2017 volume: 297 bill. cu. ft. (19% interruptible, 21% res., commercial & elec. utility, 60% incentive programs). N.J. Natural Energy subsidiary provides unregulated retail/wholesale natural gas and related energy svcs. 2017 dep. rate: 2.7%. Has 1,052 empls

Additional Company Information from Website:

Guided by our team of talented employees, we are a lifeline service provider dedicated to meeting the needs of our customers, day and night, no matter what challenges we face. For our customers, that means delivering natural gas to heat their homes and run their businesses. For our shareowners, it means providing consistent results. For the communities we serve, it means being a reliable corporate partner. And for the next generation, it demands that we act as a responsible steward of our environment.
Our customers count on us to meet their energy needs and more. They count on us to maintain their quality of life, today, tomorrow and for generations to come. Fulfilling that trust is not only our mission; it is what New Jersey Resources is all about.[52]

Why was the company included?

This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

NiSource, Inc.

Company Summary from Value Line:

NiSource Inc. is a holding company for Northern Indiana Public Service Company (NIPSCO), which supplies electricity and gas to the northern third of Indiana. Customers: 461,000 electric in Indiana, 3.4 million gas in Indiana, Ohio, Pennsylvania, Kentucky, Virginia, Maryland, Massachusetts through its Columbia subsidiaries. Revenue breakdown, 2017: electrical, 36%; gas, 63%; other, less than 1%. Generating sources, 2017: coal, 65.2%; purchased & other, 34.8%. 2017 reported depreciation rates: 3.4% electric, 2.1% gas. Has 8,175 employees.

Additional Company Information from Website:

We're a leading natural gas and electric utility company. Our nearly 8,000 employees ensure Columbia Gas and NIPSCO customers have the energy they need across seven states.
Focused on strategically investing in our energy infrastructure – between $1.6 billion - $1.8 billion annually through 2020 – we will be able to meet our customer commitments for the next 100 years.[53]

Why was the company included?

This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

[52] http://www.njresources.com/about/, accessed 2/21/2019

[53] https://www.nisource.com/company, accessed 2/21/2019

Northwest Natural Gas Company

Company Summary from Value Line:

Northwest Natural Holding Co. distributes natural gas to 1000 communities, 735,000 customers, in Oregon (89% of customers) and in southwest Washington state. Principal cities served: Portland and Eugene, OR; Vancouver, WA. Service area population: 3.7 mill. (77% in OR). Company buys gas supply from Canadian and U.S. producers; has transportation rights on Northwest Pipeline system. Owns local underground storage. Rev. breakdown: residential, 38%; commercial, 22%; industrial, gas transportation, 40%. Employs 1,146.

Additional Company Information from Website:

In 1852, H. C. Leonard and John Green moved from Astoria to Portland. A few years earlier, after emigrating from the East Coast, they had founded a store serving the frontier community. But believing that Portland was the city of the future, they moved upriver. Among other businesses, they founded a gas company. Their purpose was to bring gas lamps to Portland's streets, homes and businesses. On Jan. 7, 1859, they obtained a perpetual franchise from the territorial government to distribute gas. Weeks later, on Feb. 14, Oregon became a state. Today, 160 years later, NW Natural carries on the tradition started by Leonard and Green and the Portland Gas Light Co. A business that started with 49 customers in one square mile of Portland now serves more than 740,000 homes and businesses in 140 communities in Oregon and Southwest Washington. NW Natural is a wholly-owned subsidiary of NW Natural Holdings, and is headquartered in Portland, Oregon. NW Natural also serves customers out of resource centers in Albany, Astoria, Coos Bay, Eugene, Lincoln City, Salem and The Dalles in Oregon, and Vancouver, Washington.[54]

Why was the company included?

This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

ONE Gas Inc.

Company Summary from Value Line:

ONE Gas, Inc. provides natural gas distribution services to over two million customers. It has three divisions: Oklahoma Natural Gas, Kansas Gas Service, and Texas Gas Service. The company purchased 137 Bcf of natural gas supply in 2017, compared to 134 Bcf in 2016. Total volumes delivered by customer (fiscal 2017): transportation, 61%; residential, 29%; commercial & industrial, 9%; wholesale & public authority, 1%. BlackRock owns approximately 10.9% of common stock; The Vanguard Group, 9.3%; T. Rowe Price Associates, 8.7%; officers and directors, less than 1% (4/18 Proxy).

Additional Company Information from Website:

ONE Gas, Inc. (NYSE: OGS) is a 100-percent regulated natural gas utility, and trades on the New York Stock Exchange under the symbol "OGS." ONE Gas is included in the S&P MidCap 400 Index, and is one of the largest natural gas utilities in the United States. ONE Gas provides natural gas distribution services to more than 2 million customers in Oklahoma, Kansas and Texas. ONE Gas is headquartered in Tulsa, Okla., and its divisions include Oklahoma Natural Gas, the largest natural gas distributor in Oklahoma; Kansas Gas Service, the largest in Kansas, and Texas Gas Service, the third largest in Texas, in terms of customers. Its largest natural gas distribution markets by customer count are Oklahoma City and Tulsa, Okla.; Kansas City,

[54] https://www.nwnatural.com/AboutNWNatural/TheCompany/Overview, accessed 2/21/2019

Wichita and Topeka, Kan.; and Austin and El Paso, Texas. ONE Gas serves residential, commercial, industrial, transportation and wholesale customers in all three states.[55]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

South Jersey Industries, Inc.
Company Summary from Value Line:
South Jersey Industries, Inc. is a holding company. Distributes natural gas to approx. 681,000 customers in New Jersey and Maryland. Gas revenue mix '17: residential, 44%; commercial, 21%; cogeneration and electric generation, 14%; industrial, 21%. Nonutility operations include: South Jersey Energy, South Jersey Resources Group, South Jersey Exploration, Marina Energy, South Jersey Energy Service Plus, and SJI Midstream. Has about 760 employees.

Additional Company Information from Website:
South Jersey Industries (NYSE: SJI), is a customer-focused, energy services company providing expertise and resources that meet the diverse energy needs of our region's residents, businesses, schools, hospitals, and more. We do this through three primary subsidiaries: South Jersey Gas – delivers safe, reliable, affordable natural gas and promotes energy efficiency to approximately 385,000 residential, commercial, and industrial customers in the seven southernmost counties of New Jersey. South Jersey Energy Solutions – promotes efficiency, clean energy technology and renewable energy through a group of non-utility businesses. SJI Midstream – houses the company's interest in the PennEast Pipeline Project under the SJI regulated umbrella.[56]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

Southwest Gas Holdings, Inc.
Company Summary from Value Line:
Southwest Gas Holdings, Inc. is the parent holding company of Southwest Gas and Centuri Construction Group. Southwest Gas is a regulated gas distributor serving about 2.0 million customers in sections of Arizona, Nevada, and California. Centuri provides construction services. 2017 margin mix: residential and small commercial, 85%; large commercial and industrial, 3%; transportation, 12%. Total throughput: 2.1 billion therms. Has 7,771 employees.

Additional Company Information from Website:
Southwest Gas Corporation was founded in 1931 and is a subsidiary of Southwest Gas Holdings Inc. We provide natural gas service to Arizona, Nevada, and portions of California. Our communities, and the more than 2 million customers we serve, are the reasons why we've been heating things up for decades. So, whether you're enjoying a backyard barbeque with friends, getting cozy indoors during the

[55] http://www.onegas.com/en/About.aspx, accessed 2/21/2019
[56] https://www.sjindustries.com/about-sji/company-history-(1), accessed 2/21/2019

winter, or preparing an epicurean delight in your new restaurant, Southwest Gas is here to support your comfort and your lifestyle..[57]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

Spire, Inc., formerly The Laclede Group
Company Summary from Value Line:
Spire Inc., formerly known as the Laclede Group, Inc., is a holding company for natural gas utilities, which distributes natural gas across Missouri, including the cities of St. Louis and Kansas City. Has roughly 1.7 million customers. Acquired Missouri Gas 9/13, Alabama Gas Co 9/14. Utility therms sold and transported in fiscal 2017: 3.0 bill. Revenue mix for regulated operations: residential, 29%; commercial and industrial, 15%; transportation, 49%; other, 6%. Has around 3,279 employees. Officers and directors own 3.0% of common shares (1/18 proxy).

Additional Company Information from Website:
We're dedicated to understanding our customers' needs and goals to better serve them today and tomorrow. Spire's natural gas utilities and natural gas-related businesses work together to enrich the lives of the 1.7 million customers we serve across Missouri, Mississippi and Alabama. Our gas marketing business maintains the balance between our natural gas supplies and our customers' needs, ensuring the highest reliability at the lowest costs. And we're investing in infrastructure to strengthen the regions we serve for a better, more resilient tomorrow.[58]

Why was the company included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing.

Companies Not Included in the Gas Distribution Market Segments

Adams Resources and Energy, Inc.
Company Summary from Value Line:
Adams Resources & Energy, Inc. is primarily engaged in the business of crude oil marketing, transportation, and storage in various crude oil and natural gas basins in the lower 48 states of the US. Its marketing segment consists of the operations of its subsidiary, Gulfmark Energy, Inc. The crude oil marketing activities generate revenue from the sale and delivery of crude oil purchased either directly from producers or from others on the open market. The company also conducts tank truck transportation of liquid chemicals and dry bulk and ISO tank container storage and transportation primarily in the lower 48 states of the US with deliveries into Canada and Mexico and with terminals in the Gulf Coast region of the US. In October 2018, Adams completed the purchase of a trucking company for $10.0 million that owned approximately 113 tractor trailer trucks and 125 trailers operating in the Red River area in North Texas and South Central Oklahoma. Has 575 employees.

[57] https://www.swgas.com/en/about-us, accessed 2/21/2019
[58] https://www.spireenergy.com/about-spire, accessed 2/21/2019

Additional Company Information from Website:
Adams Resources & Energy, Inc. (NYSE:AE) ("Adams" or "AE") is primarily engaged in the business of crude oil marketing and tank truck transportation of liquid chemicals and dry bulk through its two wholly-owned subsidiaries GulfMark Energy, Inc. ("GulfMark") and Service Transport Company.[59]

Why was the company not included?
The company's main business segments market crude oil, natural gas, and petroleum products.

AltaGas Canada Inc.
Company Summary from Value Line:
Not available yet.

Additional Company Information from Website:
AltaGas, a Canadian corporation, is a North American diversified energy infrastructure business with a focus on owning and operating assets to provide clean and affordable energy to its customers. AltaGas' business strategy is underpinned by the growing demand for clean energy with natural gas as the key fuel source.[60]

AltaGas Canada Inc. successfully completed the initial public offering and sale of 16,500,000 common shares at $14.50 per common share for gross proceeds of approximately $239 million on October 25, 2018.[61]

Why was the company not included?
Company's initial public offering was on 10/25/2018.

RGC Resources, Inc.
Company Summary from Value Line:
RGC Resources, Inc. is an energy services company primarily engaged in the regulated sale and distribution of natural gas to approximately 60,500 residential, commercial, and industrial customers in Roanoke, Virginia and the surrounding localities through its Roanoke Gas Company subsidiary. Natural gas service is provided at rates and for terms and conditions set by the Virginia State Corporation Commission (SCC). Resources also provides certain unregulated services through Roanoke Gas and its other subsidiaries. The unregulated operations represent less than 2% of total revenues and margin of Resources on an annual basis. The company's utility operations are regulated by the SCC, which oversees the terms, conditions, and rates to be charged to customers for natural gas service, safety standards, extension of service, accounting, and depreciation. Over 98% of its annual revenues are derived from the sale and delivery of natural gas to Roanoke Gas customers. Has 106 employees.

Additional Company Information from Website:
RGC Resources Inc. is a public utility holding Company providing energy and related products and services through its operating subsidiaries Roanoke Gas Company and RGC Midstream, LLC. Roanoke Gas, which began in 1883, provides safe, reliable natural gas service to more than 60,000 customers in the greater Roanoke Valley. RGC Midstream owns a 1 percent interest in the Mountain Valley Pipeline project.[62]

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[59] https://www.adamsresources.com/about-us/, accessed 2/21/2019
[60] https://www.altagas.ca/about, accessed 2/21/2019
[61] https://www.altagas.ca/newsroom/news-releases/altagas-ltd-announces-completion-initial-public-offering-altagas-canada-inc, accessed 2/21/2019
[62] https://www.rgcresources.com/about/, accessed 2/22/2019

Why was the company not included?
This company is similar to the Gas Distribution Companies that the State Assessed Section is responsible for valuing. However, the company is the only Gas Distribution Guideline company with limited analysts' estimates available.

Southern Co
Company Summary from Value Line:
The Southern Company, through its subs., supplies electricity to 4.6 million customers in GA, AL, FL, and MS. Also has a competitive generation business. Acq'd AGL Resources (renamed Southern Company Gas, 4.5 mill. customers in GA, FL, NJ, IL, VA, & TN) 7/16. Electric rev. breakdown: residential, 37%; commercial, 31%; industrial, 18%; other, 14%. Retail revs. by state: GA, 49%; AL, 35%; FL, 9%; MS, 7%. Generating sources: gas & oil, 42%; coal, 27%; nuclear, 15%; other, 7%; purchased, 9%. Fuel costs: 32% of revs. '17 reported depr. rate (utility): 2.9%. Has 31,300 employees.

Additional Company Information from Website:
While Atlanta is our home base, we bring energy to homes and businesses across the country. We've made our name as a leading producer of clean, safe, reliable and affordable energy, and approach each day as a vital step in building its future. We're always looking ahead, and our innovations in the industry—from nuclear advancement to electric transportation and drone technology—help brighten the lives and businesses of millions of customers nationwide.[63]

Why was the company not included?
Company is mainly an electric utility company in the Southeast region of the U.S. Southern Co purchased AGL Resources and renamed AGL Resources to Southern Company Gas (July 11, 2016).[64]

Star Group, L.P. (formerly Star Gas Partners, L.P.)
Company Summary from Value Line:
Star Group, L.P. is a full service provider specializing in the sale of home heating and air conditioning products and services to residential and commercial home heating oil and propane customers. The company's operations are conducted through Petro Holdings, Inc. and its subsidiaries. Petro is primarily a Northeast, Central, and Southeast region retail distributor of home heating oil and propane that at June 30, 2018 served approximately 459,000 residential and commercial home heating oil and propane customers. Petro also sells diesel fuel, gasoline, and home heating oil to approximately 76,000 customers on a delivery only basis. It installed, maintained, and repaired heating and air conditioning equipment and provided these services outside its heating oil and propane customer base, including about 16,000 service contracts for natural gas and other heating systems. In addition, the company provided home security and plumbing to approximately 31,000 customers. Has 3362 employees.

Additional Company Information from Website:
Star Group, L.P. is a full service energy provider specializing in the sale of home heating and air conditioning products and services to residential and commercial customers. The Company also services and sells heating and air conditioning equipment and for certain areas, provides plumbing services. In addition, Star sells diesel fuel, gasoline and home heating oil on a delivery-only basis. Star is the nation's

[63] https://www.southerncompany.com/about-us.html, accessed 2/22/2019
[64] https://www.southerncompany.com/newsroom/news-releases.html, accessed 2/22/2019

largest retail distributor of home heating oil, based upon sales volume, operating throughout the Northeast and Mid-Atlantic.[65]

Why was the company not included?
This company's business segments include sale of home heating products and services to residential and commercial customers.

UGI Corporation
Company Summary from Value Line:
UGI Corp. operates six business segments: AmeriGas Propane (accounted for 10.2% of net income in 2017), UGI International (36.3%), Gas Utility (26.6%), Midstream & Marketing (19.9%), and Corp. & Other 7.0%. UGI Utilities distributes natural gas and electricity to over 635,000 customers mainly in Pennsylvania; 26%-owned AmeriGas Partners is the largest U.S. propane marketer, serving about 1.3 million users in 50 states. Acquired remaining 80% interest in Antargaz (3/04); Energy Transfer Partners (1/12). Vanguard Group, 10% of stock; Blackrock, 9%; Officers/directors, 2.4% (12/17 proxy). Has 8,100 empls.

Additional Company Information from Website:
UGI Corporation is a holding company that, through subsidiaries, distributes, stores, transports and markets energy products and related services. We are a domestic and international retail distributor of propane and butane (which are liquefied petroleum gases ("LPG")); a provider of natural gas and electric service through regulated local distribution utilities; a generator of electricity; a regional marketer of energy commodities; an owner and manager of midstream assets; and a regional provider of heating, ventilation, air conditioning, refrigeration and electrical contracting services.[66]

Why was the company not included?
This company's non-gas utility segments accounted for almost 73.4% of net income in 2017. Their gas utility segment only accounted for 26.6% of their net income.

WGL Holdings, Inc.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
On July 6, 2018, Altagas Ltd. announced the closing of its approximately $9 billion acquisition of WGL Holdings, Inc.[67]

Why was the company not included?
Company is no longer publicly traded.

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[65] http://www.star-gas.com/about-us, accessed 2/22/2019

[66] http://www.ugicorp.com/about-us/, accessed 2/22/2019

[67] https://www.altagas.ca/newsroom/news-releases/altagas-ltd-announces-closing-its-acquisition-wgl-holdings-inc, accessed 2/22/2019

Market Segment: Gas Transmission Pipeline and Fluid Transportation Pipeline

Companies Included in the Gas Transmission Pipeline Market Segment

Kinder Morgan, Inc.
Company Summary from Value Line:
Kinder Morgan, Inc. owns the general partner and limited partner interests in both Kinder Morgan Energy Partners, L.P. (KMP) and El Paso Pipeline Partners, L.P. (EPB). With more than 80,000 miles of pipelines and 180 terminals, it is the largest domestic transporter of petroleum products, natural gas, and carbon dioxide. Kinder also owns the only pipeline that serves the West Coast of Canada. The company employs more than 11,000 individuals. Chairman: Richard D. Kinder. CEO: Steven J. Kean. Officers/directors own 14.2% of the common stock; The Vanguard Group, 6.5% (4/18 proxy).

Additional Company Information from Website:
Kinder Morgan is one of the largest energy infrastructure companies in North America. We own an interest in or operate approximately 84,000 miles of pipelines and 152 terminals. Our pipelines transport natural gas, refined petroleum products, crude oil, carbon dioxide (CO_2) and more. Our terminals store and handle petroleum products, chemicals and other products. We are a market leader in each of our businesses – Natural Gas Pipelines, Products Pipelines, CO_2, and Terminals. We have an unparalleled, large footprint of diversified and strategically located assets that are core to North American energy infrastructure and help deliver needed energy products to high-demand markets.[68]

Why was the company included?
This company is similar to the Gas Transmission Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the transportation natural gas as well as operates terminals and storage facilities. Parent company for one of the companies that the department values.

ONEOK, Inc.
Company Summary from Value Line:
ONEOK, Inc. is a leading midstream service provider. It owns premier natural gas liquids systems connecting supply in the Mid-Continent, Permian, and Rocky Mountain regions with key market centers. Has three operating segments: natural gas liquids, natural gas gathering and processing, and natural gas pipelines. Completed separation of natural gas distribution business in February of 2014. Has 2,470 employees. The Vanguard Group, Inc. owns 10.7% of common stock; BlackRock, Inc., 7.8%; State Street Corporation, 5.1%; off. and dir., less than 1.0% (4/18 Proxy).

Additional Company Information from Website:
ONEOK, Inc. (pronounced ONE-OAK) (NYSE: OKE) is one of the largest energy midstream service providers in the U.S., connecting prolific supply basins with key market centers. It owns and operates one of the nation's premier natural gas liquids (NGL) systems and is a leader in the gathering, processing, storage and transportation of natural gas. ONEOK's operations include a 38,000-mile

[68] https://www.kindermorgan.com/about_us, accessed 2/22/2019

integrated network of NGL and natural gas pipelines, processing plants, fractionators and storage facilities in the Mid-Continent, Williston, Permian and Rocky Mountain regions.[69]

Why was the company included?
This company is similar to the Gas Transmission Pipeline Companies that the State Assessed Section is responsible for valuing. The company is a midstream services provider including natural gas liquids, natural gas gathering and processing, and natural gas pipelines. Parent company for one of the companies that the department values.

TransCanada Corporation
Company Summary from Value Line:
TransCanada Corp. operates the most extensive natural gas pipeline system in Canada, transporting natural gas from the Alberta border to Ontario, Quebec, and the U.S. with more than 57,100 mi. of natural gas pipelines, and 3,000 mi. of liquids pipeline (Keystone). Its three major segments are natural gas pipelines (58% of '17 rev.), oil pipelines (15%), and energy (27%). It has interests in 7,000 mw of power generation assets, and has 118 bill. Bcf of regulated/nonregulated gas storage. Acq. ANR 2/07. Has more than 7,500 employees.

Additional Company Information from Website:
With one of North America's largest energy infrastructure portfolios, no one powers day-to-day life like TransCanada. We share technical, stakeholder and operating expertise across all of our operations. Natural Gas: Safe operation of 91,500 km (56,900 miles) of pipeline & 653 billion ft3 of natural gas storage. Oil & Liquids: Safe operation of approximately 4,800 km (3,000 miles) of pipeline. Power: Approximately 6,200 megawatts of capacity – enough to power more than six million homes.[70]

TransCanada Corporation announced January 9, 2019 its intention to change its name to TC Energy.[71]

Why was the company included?
This company is similar to the Gas Transmission Pipeline Companies that the State Assessed Section is responsible for valuing. The company operates a natural gas pipeline system (57,000 miles) and 650 billion cubic feet of natural gas storage. Parent company for two of the companies that the department values.

Williams Companies, Inc.
Company Summary from Value Line:
The Williams Companies, Inc., gathers, processes, and transports natural gas throughout the United States. It also performs gas marketing services. Acquired Access Midstream Partners, 7/14; Barrett Resources, 8/01; MAPCO, 3/98. Sold Texas Gas Pipeline, 5/03; Kern River Pipeline, 3/02. Spun off Williams Communications, 4/01; WPX Energy, 1/12. Initial public offering for Williams Partners L.P., 8/05; Williams Pipeline Partners L.P., 1/08. Has about 5,425 employees.

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[69] http://www.oneok.com/en/about, accessed 2/22/2019

[70] https://www.transcanada.com/en/operations/, accessed 2/22/2019

[71] https://www.transcanada.com/en/announcements/2019-01-09transcanada-plans-name-change-to-tc-energy/, accessed 2/22/2019

Additional Company Information from Website:
Williams is an energy infrastructure company focused on connecting North America's significant hydrocarbon resource plays to growing markets for natural gas and natural gas liquids (NGLs). Williams' interstate gas pipeline and gathering & processing operations span the United States, including strategic assets in the deep water Gulf of Mexico, the Rockies, the Pacific Northwest and the Eastern Seaboard. Williams owns and operates midstream gathering and processing assets, and interstate natural gas pipelines.[72]

The Williams Companies, Inc. and Williams Partners, L.P. announced on August 10, 2018 the closing of the merger of Williams partners with a subsidiary of Williams. Pursuant to the merger, Williams acquired all of the outstanding common units of Williams Partners it did not previously own. Williams Partners is no longer publicly traded.[73]

Why was the company included?
Previously, the department did not include this company because the department used a subsidiary, Williams Partners, L.P., which is no longer publicly traded. This company gathers, processes, and transports natural gas.

Even though this company was recently involved in an acquisition, the department is including them as a guideline company and considering the acquisition's impact on this guideline when selecting rates for the market segment.

Companies Included in the Fluid Transportation Pipeline Market Segment

Buckeye Partners, L.P.
Company Summary from Value Line:
Buckeye Partners, L.P., is a master limited partnership engaged in carriage transportation of refined petroleum products, including gasoline (52% of 2017 volume), jet fuel (26%), distillates (21%), and other (1%). Its subs. own and operate 6,000 miles of pipeline mostly in the Northeast and upper Midwest. The L.P. also owns 135 liquid petro. product terminals. Marine terminal Buckeye Bahamas Hub, is one of the world's largest. Acquired 50% of VITTI from Vitrol, 1/17; 80% Buckeye Texas Part. 9/14; storage assets from Hess, 12/13.

Additional Company Information from Website:
Buckeye Partners, L.P. (NYSE: BPL) is a publicly traded master limited partnership which owns and operates a diversified global network of integrated assets providing midstream logistic solutions, primarily consisting of the transportation, storage, processing and marketing of liquid petroleum products**.** Buckeye is one of the largest independent liquid petroleum products pipeline operators in the United States in terms of volumes delivered, with approximately 6,000 miles of pipeline. Buckeye also uses its service expertise to operate and/or maintain third-party pipelines and perform certain engineering and construction services for its customers. Buckeye's global terminal network comprises more than 115 liquid petroleum products terminals with aggregate tank capacity of over 118 million

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[72] https://co.williams.com/our-company/, accessed 2/22/2019
[73] https://investor.williams.com/press-release/williams/williams-completes-acquisition-williams-partners, accessed 2/26/2019

barrels across our portfolio of pipelines, inland terminals and marine terminals located primarily in the East Coast, Midwest and Gulf Coast regions of the United States as well as in the Caribbean. Buckeye's global network of marine terminals enables it to facilitate global flows of crude oil and refined petroleum products, offering its customers connectivity between supply areas and market centers through some of the world's most important bulk liquid storage and blending hubs. Buckeye's flagship marine terminal in The Bahamas, Buckeye Bahamas Hub, is one of the largest marine crude oil and refined petroleum products storage facilities in the world and provides an array of logistics and blending services for the global flow of petroleum products. Buckeye's Gulf Coast regional hub, Buckeye Texas Partners, offers world-class marine terminalling, storage and processing capabilities. Buckeye is also a wholesale distributor of refined petroleum products in certain areas served by its pipelines and terminals.[74]

Why was the company included?
This company is similar to the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

Holly Energy Partners, L.P.
Company Summary from Value Line:
Holly Energy Partners, L.P. (HEP) is a publicly held master limited partnership. The company is engaged in ownership and operation of petroleum product and crude oil pipelines, terminal, tankage and loading rack facilities, and refinery processing units that support Holly Frontier Corp.'s (HFC) refining and marketing operations in the mid-continent, southwest, and northwest regions of the US and Alon USA, Inc. s refinery in Big Spring, TX. The company has two segments: Pipelines and Terminals, which transports light refined products from HollyFrontier Corporation's (HFC's) Navajo refinery and Alon USA, Inc.'s Big Spring refinery to customers; and Refinery Processing Unit, which supports HFC's refineries daily operations, which chemically transform crude oil into various petroleum products, including gasoline, diesel, liquefied petroleum gases, and asphalt. In July 2018, the company announced it has engaged AECOM to perform a feasibility study on a potential refined product pipeline from Orla, TX to Midland, TX.

Additional Company Information from Website:
Holly Energy Partners, L.P. ("HEP") is a Delaware limited partnership formed in early 2004 by HollyFrontier and is headquartered in Dallas, Texas. HEP provides petroleum product and crude oil transportation, terminalling, storage and throughput services to the petroleum industry, including HollyFrontier Corporation subsidiaries. The Partnership, through its subsidiaries and joint ventures, owns and/or operates petroleum product and crude gathering pipelines, tankage and terminals in Texas, New Mexico, Arizona, Washington, Idaho, Oklahoma, Utah, Nevada, Wyoming and Kansas as well as refinery processing units in Kansas and Utah. Business Highlights: Our assets are located in attractive high-growth markets; Revenues are mainly fee based revenues with limited commodity risk; A substantial part of our business operates under long-term contracts with minimum volume commitments; Track record of increasing the quarterly distribution every quarter since our initial public offering in 2004; Strategic relationship with HollyFrontier; Experienced management team with a proven track record.[75]

[74] http://www.buckeye.com/AboutUs/tabid/54/Default.aspx, accessed 2/26/2019

[75] http://www.hollyenergy.com/about-us/corporate-structure/default.aspx, accessed 2/26/2019

Why was the company included?
This company is similar to the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

Magellan Midstream Partners, L.P.
Company Summary from Value Line:
Magellan Midstream Partners, L.P., engages in the transportation, storage, and distribution of hydrocarbons and related products, largely in the U.S. Gulf coast and upper Midwest regions. Segments: Refined products (72% of 2017 Revs., 58% of operating income) has 9,700 miles of pipeline and 53 terminals; Crude oil (20%, 36%) has 2,200 miles of pipeline and storage capacity of 28 million barrels; Marine storage (8%, 6%) has storage capacity of 26 million barrels. Acq'd. Longhorn Pipeline, 7/09; storage and pipeline from BP, 9/10. Employs 1,802.

Additional Company Information from Website:
Magellan Midstream Partners, L.P. is a publicly traded oil pipeline, storage and transportation company based in Tulsa, Okla. Formerly a part of Williams Companies, Magellan began trading as Williams Energy Partners in February 2001. In September 2003, we changed our name to Magellan Midstream Partners and began trading under the stock ticker MMP. In 2004, Magellan purchased significant assets from Shell, including more than 3,000 miles of refined product pipelines as well as terminals and storage capacity. In 2007, another acquisition expanded Magellan's footprint with increased capabilities in Texas. In 2009, we bought the Longhorn Pipeline running from Houston to El Paso. The reversal of this line has played a key part in Magellan's growth the last few years. In 2010, Magellan purchased another 100 miles of pipeline and 7.8 million barrels of storage from BP. In 2013, Magellan acquired approximately 800 miles of refined petroleum products pipeline, four terminals and 1.7 million barrels of storage from Plains All American Pipeline. This purchase added assets in Colorado, New Mexico, South Dakota and Wyoming. Today, Magellan has 9,700-mile refined products pipeline system with 53 connected terminals as well as 26 independent terminals not connected to our pipeline system and our 1,100-mile ammonia pipeline system. In addition, we own approximately 2,200 miles of crude oil pipelines and storage facilities with an aggregate storage capacity of about 28 million barrels, of which 17 million are used for leased storage. We also operate five marine terminals located along coastal waterways with an aggregate storage capacity of approximately 26 million barrels.[76]

Why was the company included?
This company is similar to, and is one of, the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

MPLX, L.P.
Company Summary from Value Line:
MPLX, LP is a diversified, growth-oriented master limited partnership (MLP) formed in 2012 by Marathon Petroleum Corporation to own, operate, develop and acquire midstream energy infrastructure assets. It is engaged in the gathering, processing, storage, marketing, and transportation of natural gas, crude oil, and other refined petroleum products. MPLX's assets consist of a network of common carrier

[76] https://www.magellanlp.com/AboutUs/Default.aspx, accessed 2/26/2019

crude oil and products pipelines located in the Midwest and Gulf Coast regions of the US. Has no direct employees.

Additional Company Information from Website:
MPLX is a diversified, growth-oriented master limited partnership formed in 2012 by MPC to own, operate, develop and acquire midstream energy infrastructure assets. We are engaged in the gathering, processing and transportation of natural gas; the gathering, transportation, fractionation, storage and marketing of NGLs; the transportation, storage and distribution of crude oil and refined petroleum products; as well as refining logistics and fuels distribution services. MPLX provides services in the midstream sector across the hydrocarbon value chain through our Logistics and Storage and Gathering and Processing segments.[77]

Why was the company included?
This company is similar to the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

Phillips 66 Partners, L.P.
Company Summary from Value Line:
Phillips 66 Partners LP is engaged in the ownership, operation, development, and acquisition of crude oil, refined petroleum, and natural gas liquids pipelines and terminals. As of 12/31/17, its assets included more than 2,070 miles of pipelines with a gross capacity of approximately 1,920 million barrels per day (MBD). It also owns more than 25 terminals and other storage assets. Phillips 66 Partners LP is managed by the executives of its general partners, Phillips 66 Partners GP LLC.

Additional Company Information from Website:
Phillips 66 Partners (NYSE: PSXP) began trading on the New York Stock Exchange on July 23, 2013. Headquartered in Houston, Texas, Phillips 66 Partners is a growth-oriented, traditional master limited partnership formed by Phillips 66 to own, operate, develop and acquire primarily fee-based crude oil, refined petroleum product and natural gas liquids ("NGL") pipelines and terminals and other transportation and midstream assets. [78]

Why was the company included?
This company is similar to the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

Plains All American Pipeline, L.P.
Company Summary from Value Line:
Plains All American Pipeline, L.P., is a publicly traded master limited partnership which operates through various subsidiaries. It engages in the transportation, storage, terminating, and marketing of crude oil, refined products, and liquefied petroleum gas. As of December 31, 2017, the company owned or leased approximately 18,700 miles of active pipelines and gathering systems. Storage capacity 32 million barrels of natural gas liquids (NGL) storage facilities; About 80 millions barrels of crude oil and

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[77] http://www.mplx.com/About_MPLX/, accessed 2/26/2019
[78] https://www.phillips66partners.com/, accessed 2/26/2019

refined product. Also owns 810 trailers (primarily in Canada); 60 transport storage barges. Has 4,850 employees.

Additional Company Information from Website:
Plains All American Pipeline is a publicly-traded master limited partnership that owns and operates midstream energy infrastructure and provides logistics services for crude oil, natural gas liquids (NGL) and natural gas. We own an extensive network of pipeline transportation, terminalling, storage and gathering assets in key crude oil and NGL producing basins and transportation corridors and at major market hubs in the United States and Canada. On average, PAA handles more than 5 million barrels per day of crude oil and NGL in its Transportation segment. The company is headquartered in Houston, Texas.[79]

Why was the company included?
This company is similar to the Fluid Transportation Pipeline Companies that the State Assessed Section is responsible for valuing. The company engages in the common transportation of refined petroleum products.

Companies Not Included in the Gas Transmission Pipeline or Fluid Transportation Pipeline Market Segments

American Midstream Partners, L.P.
Company Summary from Value Line:
In November 2018, American Midstream Partners, LP (AMID or partnership) agreed to sell its refined products terminalling business to Sunoco LP for $125 million in cash. The transaction is expected to close in the fourth quarter of 2018. In September 2018, AMID announced the Board of Directors of American Midstream GP, LLC (GP Board) received an unsolicited non-binding proposal from affiliates of ArcLight Energy Partners Fund V, L.P. pursuant to which ArcLight would acquire all common units of the Partnership that ArcLight and its affiliates do not already own in exchange for $6.10 per common unit. Due to this news, the company's ranks were suspended. American Midstream Partners, LP was formed to provide critical midstream infrastructure that links producers of natural gas, crude oil, NGLs, and condensate to end-use markets. Its assets are strategically located in some of the most prolific offshore and onshore basins in the Permian, Eagle Ford, East Texas, Bakken, and Gulf Coast.

Additional Company Information from Website:
We are a growth-oriented limited partnership that was formed in August 2009 to own, operate, develop and acquire a diversified portfolio of midstream energy assets. We provide critical midstream infrastructure that links producers of natural gas, crude oil, NGLs, condensate and specialty chemicals to numerous intermediate and end-use markets. We are committed to a stable cash flow business model, with limited commodity exposure and majority of our contracts structured under fee-based and fixed-margin arrangements. Our primary assets are strategically located in some of the most prolific onshore and offshore producing regions and key demand markets in the United States. We have direct exposure to prolific producing regions including the Eagle Ford Shale of South Texas, the Deepwater Gulf of Mexico, the Permian Basin of West Texas, the Williston basin in North Dakota and the Cotton Valley/Haynesville Shale of East Texas. Our Assets Include: 5,100 miles of onshore and offshore

[79] https://www.plainsallamerican.com/about-us, accessed 2/26/2019

natural gas, crude oil and NGL pipelines; 17 gathering systems; 7 natural gas processing plants; 4 fractionation facilities; a terminal site with approximately 3.0 MMBbls of above-ground storage capacity.[80]

American Midstream Partners, L.P. announced January 3, 2019 that the Board of Directors of American Midstream GP, LLC has received a revised non-binding proposal from an affiliate of ArcLight Energy Partners Fund V, L.P. … pursuant to which ArcLight would acquire all common units from the Partnership that ArcLight and its affiliates do not already own in exchange for a revised offer price of $4.50 per common unit.[81]

Why was the company not included?
This company is mainly located in the Gulf Coast. The Gulf Coast is a different market than the market of the companies for which the State Assessed Section is responsible for valuing. Also, this company engages in gathering, treating, processing, fractionating, storing specialty chemical products, etc. Also, company is being actively pursued for an acquisition.

AmeriGas Partners, L.P.
Company Summary from Value Line:
AmeriGas Partners, L.P., is one of the country's largest retail propane distributors, serving approximately two million customers (including residential, commercial, industrial, agricultural, and motor fuel) in all 50 states via some 1,900 propane distribution locations. It also sells, installs, and services propane appliances. Fiscal 2017 sales by customer: residential, 37%; commercial/industrial, 38%; motor fuel, 17%; agricultural, 4%; other, 4%. UGI Corp., through subsidiaries, is the sole general partner and owns 26% of the company, while the public holds the remaining 74%.

Additional Company Information from Website:
AmeriGas Partners, L.P. is a publicly traded master limited partnership (NYSE: APU). We are the nation's largest retail propane marketer, serving approximately 1.8 million customers in all 50 states from approximately 1,900 distribution locations. We conduct our business principally through our subsidiary AmeriGas Propane, L.P. UGI Corporation, through subsidiaries, is the sole General Partner and owns 26% of the Partnership.[82]

Why was the company not included?
This company operates as a retail and wholesale distributor of propane gas.

Andeavor Logistics, L.P. (formerly Tesoro Logistics, L.P.)
Company Summary from Value Line:
Andeavor Logistics LP, formerly Tesoro Logistics LP, is a full-service logistics company operating primarily in the western and midcontinent US. It owns/operates a network of crude oil, refined products, & natural gas pipelines; terminals with storage capacity for crude oil and refined products, rail facilities, marine terminals, a trucking fleet, and natural gas processing and fractionation complexes. Business

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80 http://www.americanmidstream.com/about-amid/default.aspx, accessed 2/26/2019

81 http://www.americanmidstream.com/investor-relations/press-releases/press-release-details/2019/American-Midstream-Receives-Revised-Buyout-Offer-from-ArcLight/default.aspx, accessed 2/26/2019

82 https://investors.amerigas.com/about-amerigas/investor-overview/default.aspx, accessed 2/26/2019

incl.: Terminalling/Transportation (26% of '17 rev.), Gathering (34%), and Processing (40%). Employs 1900.

Additional Company Information from Website:
Andeavor Logistics LP is a leading full-service logistics company operating primarily in the western and mid-continent regions of the United States. We are highly focused on delivering a superior customer experience through safe, reliable performance, attention to detail, and offering smart, flexible solutions. Andeavor Logistics owns and operates a network of crude oil, refined products and natural gas pipelines. We also own and operate crude oil and refined products truck terminals, marine terminals and dedicated storage facilities. In addition, Andeavor Logistics owns and operates natural gas processing and fractionation complexes. Headquartered in San Antonio, Texas, our assets are well positioned around key basins and connected to major gathering, storage, transportation and processing hubs. By optimizing our existing operations, pursuing organic expansion opportunities and growing through strategic acquisitions, Andeavor Logistics is on a distinctive path and the premier partner of choice for midstream service.[83]

Why was the company not included?
This company is more aligned with the fluid transportation companies that the State Assessed Section is responsible for valuing. In the past, the department considered the company's pipeline transportation business segment to be a smaller part of its overall operations. For the 2017 calendar year, gathering and processing were main sources of revenues. Also, not including for the 2018 study because the company was recently involved in an acquisition of Western Refining Logistics, L.P.

Antero Midstream GP, L.P.
Company Summary from Value Line:
Antero Midstream GP, LP (AMGP) owns 100% of the membership interests of Antero Midstream Partners GP LLC (AMP GP), which owns the non-economic general partner interest in Antero Midstream, and owns all of the Series A capital interests in IDR LLC, which owns the IDRs of Antero Midstream. Antero Midstream was formed by Antero Resources to own, operate, and develop midstream energy assets to service Antero Resources oil and gas producing assets located in the Marcellus Shale and Utica Shale in West Virginia and Ohio. In October 2018, AMGP and Antero Midstream Partners LP (AM) entered into a definitive agreement for AMGP to acquire all outstanding AM common units in a stock and cash transaction. In connection with the transaction, AMGP will convert into a corporation and the combined entity will be renamed Antero Midstream Corp. (new AM). Additionally, Antero Resources board approved a share repurchase program of up to $600 million.

Additional Company Information from Website:
Antero Midstream is a master limited partnership formed by Antero Resources Corporation to service its rapidly increasing natural gas and NGL production in the Appalachian Basin. Headquartered in Denver, Colorado, we are focused on creating value through developing midstream infrastructure in two of the premier North American Shale plays, the Marcellus and Utica Shales. Due to its market leading firm transportation portfolio and midstream ownership through Antero Midstream, Antero is the most integrated NGL and natural gas business in the U.S.[84]

[83] http://www.andeavorlogistics.com/about/, accessed 2/26/2019
[84] https://www.anteromidstream.com/about-us, accessed 2/26/2019

Antero Midstream GP LP and Antero Midstream Partners LP announced October 9, 2018 that they have entered into a definitive agreement for Antero Midstream GP LP to acquire all outstanding Antero Midstream Partners LP common units, in a stock and cash transaction. Renamed Antero Midstream Corporation.[85]

Why was the company not included?
This company is mainly provides gathering services and water for hydro fracturing. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing. Also, the company recently announced an agreement related to simplification.

Antero Midstream Partners, L.P.
Company Summary from Value Line:
Antero Midstream Partners, LP is a limited partnership formed by Antero Resources Corp. (AR) to own, operate, and develop midstream energy assets to service its energy production. The partnership's assets consist of gathering pipelines, compressor stations, and interests in processing and fractionation plants. NGLs, and oil from AR's wells in the Marcellus and Utica Shales. Also owns water handling and treatment infrastructure that deliver fresh water and wastewater handling services for well completion operations.

Additional Company Information from Website:
Antero Midstream is a master limited partnership formed by Antero Resources Corporation to service its rapidly increasing natural gas and NGL production in the Appalachian Basin. Headquartered in Denver, Colorado, we are focused on creating value through developing midstream infrastructure in two of the premier North American Shale plays, the Marcellus and Utica Shales. Due to its market leading firm transportation portfolio and midstream ownership through Antero Midstream, Antero is the most integrated NGL and natural gas business in the U.S.[86]

Antero Midstream GP LP and Antero Midstream Partners LP announced October 9, 2018 that they have entered into a definitive agreement for Antero Midstream GP LP to acquire all outstanding Antero Midstream Partners LP common units, in a stock and cash transaction. Renamed Antero Midstream Corporation.[87]

Why was the company not included?
This company is mainly provides gathering services and water for hydro fracturing. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing. Also, the company recently announced an agreement related to simplification.

Antero Resources
Company Summary from Value Line:
Antero Resources Corporation is an energy company engaged in the exploration and development of natural gas, NGLs, and oil properties in the Appalachian Basin. Holds 620,000 acres in parts of West

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[85] https://www.anteromidstream.com/investors/news-events/press-releases/detail/58/amgp-to-acquire-antero-midstream-partners-in-a, accessed 2/26/2019
[86] https://www.anteromidstream.com/about-us, accessed 2/26/2019
[87] https://www.anteromidstream.com/investors/news-events/press-releases/detail/58/amgp-to-acquire-antero-midstream-partners-in-a, accessed 2/26/2019

Virginia, Ohio, and Pennsylvania. 2017 proved reserves: 17,261 bcfe consisting of 11,100 bcfe of natural gas, 528 mmbbl NGLs, and 38 mmbbl oil. Net daily production averaged 2,347 mmcfe per day in 2017. Employees: 593. Depreciation rate: 5.0% (2017 10-K). Dir. and off. own less than 9.4% of common shares outstanding; Peter R. Kagan, 14.8%; Warburg Pincus Funds, 14.7% (4/18). Incorporated: Delaware.

Additional Company Information from Website:
Antero Midstream is a master limited partnership formed by Antero Resources Corporation to service its rapidly increasing natural gas and NGL production in the Appalachian Basin. Headquartered in Denver, Colorado, we are focused on creating value through developing midstream infrastructure in two of the premier North American Shale plays, the Marcellus and Utica Shales. Due to its market leading firm transportation portfolio and midstream ownership through Antero Midstream, Antero is the most integrated NGL and natural gas business in the U.S.[88]

Why was the company not included?
This company is involved in exploration and development, which is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

ARC Logistics Partners
Company Summary from Value Line:
No Longer Publicly Traded.

Additional Company Information from Website:
Zentih Energy U.S., L.P. announced December 21, 2017 the completion of the previously-announced acquisition of Arc Logistic Partners, L.P. and its general partner Arc Logistics, LLC. As a result of the transaction, Arc Logistics is now a wholly owned subsidiary of Zenith and Zenith U.S. GP, LLC.[89]

Why was the company not included?
Company is no longer publicly traded.

Archrock, Inc.
Company Summary from Value Line:
Archrock, Inc. is a pure play natural gas contract operations services business and the leading provider of natural gas compression services to customers in the oil and natural gas industry throughout the US and a leading supplier of aftermarket services to customers that own compression equipment in the US. The company operates in two business segments. As of December 31, 2017, its contract operations business was largely comprised of its significant equity investment in Archrock Partners, L.P. and its subsidiaries, in addition to the company's owned fleet of natural gas compression equipment that it uses to provide operations services to its customers. Archrock's aftermarket services business provides a full range of services to support the compression needs of customers. The company sells parts and components and provide operations, maintenance, overhaul and reconfiguration services to customers who own compression equipment. Has 1700 employees.

[88] https://www.anteromidstream.com/about-us, accessed 2/26/2019

[89] https://www.zeniththerminals.com/news/2017/12/21/zenith-energy-us-completes-acquisition-of-arc-logistics-partners, accessed 2/26/2019

Additional Company Information from Website:
Archrock is the leading provider of natural gas contract compression services to customers throughout the U.S. Our expertise is unmatched and our team of highly qualified, certified technicians is backed by more than 60 years of industry experience. Our customers benefit from the fact that we have the largest fleet in the United States, well-established relationships with OEM manufacturers and distributors, and an unmatched aftermarket parts and service capability. We are strategically located where our clients need us, and offer more operating capacity and resources than any other in the industry. This, coupled with our first-in-class customer service, make us the leading provider of natural gas contract compression services, including parts and repair services, in the United States and ensures you benefit from the highest degree of service availability possible.[90]

Why was the company not included?
This company provides compression services. This business segment is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Archrock Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Archrock, Inc. announced April 26, 2018 that it has completed the acquisition of all outstanding common units of Archrock Partners, L.P. that it did not previously own. As a result of the transaction, Archrock Partners common units will no longer be publicly traded.[91]

Why was the company not included?
Company is no longer publicly traded.

Blueknight Energy Partners, L.P.
Company Summary from Value Line:
Blueknight Energy Partners, LP, a publicly traded master limited partnership with operations in 27 states, provides integrated terminalling, gathering, and transportation services for companies engaged in the production, distribution, and marketing of liquid asphalt and crude oil. The company manages its operations through four operating segments: asphalt terminalling services, crude oil terminalling services, crude oil pipeline services; and crude oil trucking services. Its portfolio of assets consist of: 8.8 million barrels of liquid asphalt storage located at 53 terminals in 26 states; 6.9 million barrels of above-ground crude oil storage capacity, approximately 6.6 million barrels of which are located at the Cushing Interchange terminalling facility in Cushing, Oklahoma; 655 miles of crude oil pipeline located primarily in Oklahoma and Texas; and 65 crude oil transportation vehicles deployed in Kansas, Oklahoma and Texas. Has 370 employees.

Additional Company Information from Website:
Blueknight Energy Partners, L.P. is a publicly traded master limited partnership formed in July 2007. Blueknight owns and operates a diversified portfolio of complementary midstream energy assets. The

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[90] http://www.archrock.com/, accessed 2/26/2019

[91] https://globenewswire.com/news-release/2018/04/26/1488690/0/en/Archrock-Inc-Announces-Completion-of-Merger-Transaction.html, accessed 2/26/2019

depth of our experience in the midstream energy business is second to none. Our strategically located assets allow us to be a leading provider of midstream services in the energy industry. We provide services to our customers by focusing on two operational areas: Product terminalling (Liquid asphalt and Crude oil) and Crude oil logistics (Pipeline transportation and Trucking). Our general partner, Blueknight Energy Partners G.P., L.L.C., is owned by affiliates of Ergon, Inc. based in Jackson, MS. Ergon is a privately held company formed in 1954 with over 2,500 employees globally. Ergon and its subsidiaries are engaged in a wide range of operations. Ergon is an exceptional company with a solid track record and a like-minded disciplined approach to management. We know the importance of optimizing commercial opportunities for our customers, starting with the consistent delivery of safe and reliable solutions. Our customers include independent oil and gas producers, petroleum product wholesalers and distributors, refiners and energy traders. Asset Portfolio. Our strategic asset portfolio includes the following: 15.7 million barrels of storage capacity; Approximately 655 miles of pipeline; Approximately 65 crude oil transportation vehicles; 50 acres of development property in the Cushing Interchange; 53 liquid asphalt terminals and storage facilities located in 26 states.[92]

Why was the company not included?
This company focuses on two operational areas: 1. Product Terminalling (which includes liquid asphalt and crude oil) and 2. Crude Oil Logistics (which includes pipeline transportation and trucking and producer field services). This business segment is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Boardwalk Pipeline Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Loews Corporation announced June 29, 2018 that Boardwalk GP, LP, the general partner of Boardwalk Pipeline Partners, LP and an indirect wholly-owned subsidiary of Loews, has elected to exercise its right to purchase all of the issued and outstanding common units representing limited partner interests in the Partnership not already owned by the General Partner or its affiliates.[93]

Why was the company included?
Company is no longer publicly traded.

BP Midstream Partners, L.P.
Company Summary from Value Line:
BP Midstream Partners, LP is a fee-based, growth-oriented master limited partnership recently formed by BP Pipelines, an indirect wholly owned subsidiary of BP, to own, operate, develop and acquire pipelines and other midstream assets. The company's assets consist of interests in entities that own crude oil, natural gas, refined products and diluent pipelines serving as key infrastructure for BP and other customers to transport onshore crude oil production to BP s Whiting Refinery and offshore crude oil and natural gas production to key refining markets and trading and distribution hubs. BP Midstream owns one onshore crude oil pipeline system, one onshore refined products pipeline system, one onshore diluent pipeline system, interests in four

[92] http://www.bkep.com/about, accessed 2/26/2019

[93] http://ir.loews.com/phoenix.zhtml?c=102789&p=irol-newsArticle&ID=2356689, accessed 2/26/2019

offshore crude oil pipeline systems and an interest in one offshore natural gas pipeline system. Its onshore crude oil pipeline, BP2, indirectly links Canadian crude oil production with BP s Whiting Refinery.

Additional Company Information from Website:
We are a fee-based, growth-oriented master limited partnership formed by BP Pipelines (which is an indirect wholly owned subsidiary of BP), to own, operate, develop and acquire pipelines and other midstream assets. Our assets consist of interests in entities that own crude oil, natural gas, refined products and diluent pipelines, and refined products terminals, serving as key infrastructure for BP and its affiliates and other customers to transport onshore and offshore production to key refining markets and trading and distribution hubs.[94]

Why was the company not included?
This company's initial public offering was 10/16/2017.[95] Consider this company in the future after it has at least three to five years of financial data available. Consider the location of the assets and the type of assets before including as a guideline company.

Cabot Oil and Gas Corp
Company Summary from Value Line:
Cabot Oil & Gas develops, exploits, and explores oil & gas properties, primarily in Appalachia, east and south Texas, and Oklahoma. In 2017, produced 641.7 Bcfe of natural gas, 2% more than 2016; Crude oil/condensate/NGL production of 5.0 MMbbls a 11% increase. The company had yearend 2017 proved reserves of approximately 9.7 Tcfe, of which approximately 96% were natural gas or NGLs (in '16: 8.6 Tcfe, 97%). Has 308 employees. Off.& dir. own 1.8% of common stock; Vanguard, 11.1%; Capital World Investors, 8.4%; BlackRock, 6.9%; State Street Corp., 5.5%; (3/18 proxy).

Additional Company Information from Website:
Cabot Oil & Gas Corporation is an independent oil and gas company engaged in the development, exploitation and exploration of oil and gas properties exclusively in the continental United States. As of December 31, 2017 the Company had approximately 9.7 Tcfe of total proved reserves. Cabot continues to refine its operating focus, narrowing its natural gas development effort to the Marcellus Shale in northeast Pennsylvania.[96]

Why was the company not included?
Company's development, exploitation, and exploration of oil and gas properties is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Callon Petroleum Co.
Company Summary from Value Line:
Callon Petroleum Co. is an independent oil and natural gas company focused on the acquisition and development of unconventional onshore, oil, and natural gas reserves in the Permian Basin. Oil sales comprised 88% of total revenue for 2017. Estimated net proved reserves totaled 137.0 million barrels of oil equivalent. Estimated pretax present value of reserves: $1.630 billion. Had 169 employees at

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[94] https://www.bp.com/en/global/bp-midstream-partners.html, accessed 2/26/2019

[95] https://www.bp.com/en_us/bp-us/media-room/press-releases/bp-midstream-partners-lp-launches-initial-public-offering.html, accessed 10/17/2017

[96] http://www.cabotog.com/about-cabot/, accessed 2/26/2019

12/31/17. Wellington Management Group, LLP, owns 12.1% of common; BlackRock, Inc., 10.7%; The Vanguard Group, 8.6%; off. and dir., less than 1% (3/18 proxy).

Additional Company Information from Website:
Founded in 1950, we are an independent oil and natural gas company focused on the acquisition, exploration and development of high-quality assets in the heart of the Permian Basin. Our mission is to build trust, create value and drive sustainable growth responsibly for our investors, our employees and the communities in which we operate.[97]

We entered the Permian Basin in 2009 with the acquisition of approximately 8,800 net acres for $16 million. Through focused execution of our acquisition and leasing strategy, we have increased our footprint to over 83,000 net acres in the Midland and Delaware Basins. Our size allows us to efficiently pivot our business and capitalize on new opportunities. As a pure-play, Permian company operating the vast majority of our acreage, we have the flexibility to modify development plans to appropriately address continuously-changing industry conditions and commodity price cycles. We have also proven our ability to move quickly to capitalize on opportunities to acquire new acreage and integrate into our operations, positioning us for additional consolidation of assets in the future.[98]

Why was the company not included?
Company's acquisition, exploration, and development oil and gas properties is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Centennial Resource Development, Inc.
Company Summary from Value Line:
Centennial Resource Development, Inc. is an independent oil and natural gas company focused on the development of unconventional oil and natural gas reserves. The company operates in Reeves, Ward, and Pecos counties in the Delaware Basin of west Texas. As of December 31, 2017, Centennial had 181 horizontal wells. It leased or acquired 76,067 net acres, approximately 85% of which it operates. It has undeveloped reserves of 111,525 mboe. Employs about 120. Off. & Dir. own 31% of stock; Riverstone Holdings, 29.9%; FMR, 14.1%; T. Rowe Price, 8.0%; Capital Research, 5.9% (3/18 Proxy).

Additional Company Information from Website:
Centennial Resource Development is an independent oil producer with assets in the core of the Delaware Basin, a sub-basin of the Permian Basin in West Texas. With approximately 80,100 net acres and 2,400 drilling locations, we are pursuing a growth strategy grounded in technical leadership, strong well results, attractive investment returns and a conservative balance sheet. Centennial is headquartered in Denver, Colorado.[99]

Why was the company not included?
Company's development of unconventional oil and gas reserves is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[97] https://www.callon.com/about-callon, accessed 2/26/2019
[98] https://www.callon.com/operations, accessed 2/26/2019
[99] http://www.cdevinc.com/, accessed 2/26/2019

Cheniere Energy, Inc.
Company Summary from Value Line:
Cheniere Energy, Inc. engages in the liquefied natural gas (LNG) business and related natural gas pipelines in the Gulf Coast of the U.S. It operates the Sabine Pass LNG terminal in western Louisiana on the Sabine Pass Channel, and is developing Corpus Christi LNG near Corpus Christi, Texas; and Creole Trail LNG at the Calcasieu Channel in Louisiana. It operates the Creole Trail Pipeline, consisting of 94 miles of pipeline connecting the Sabine Pass LNG terminal to various existing interstate natural gas pipelines in southwest Louisiana. Has 642 employees.

Additional Company Information from Website:
Cheniere Energy, Inc. is an international energy company headquartered in Houston, Texas, and is the leading producer of liquefied natural gas in the United States. We provide clean, secure, and affordable energy to the world, while responsibly delivering a reliable, competitive, and integrated source of LNG, in a safe and rewarding work environment. Cheniere's operations, construction and development also support energy and economic development across the United States. By 2020, Cheniere is expected to be a top-5 global provider of LNG. In February 2016, Cheniere became the first company to ship LNG from a commercial facility in the contiguous United States. Since startup, more than 500 cumulative cargoes of LNG originating from Cheniere have been delivered to 30 countries and regions worldwide. In support of that global reach, Cheniere has additional offices in London, Singapore, Washington, Beijing, and Tokyo. LNG is natural gas in liquid form. It is produced through a refrigeration process that drops the temperature of natural gas down to -260 degrees Fahrenheit, at which point it converts to liquid, and its volume shrinks by 600 times, enabling global transport in LNG carriers. LNG is non-toxic and non-flammable. When burned, natural gas emits less carbon than coal and oil, with significantly less traditional air pollutants. Additionally, all mercury is removed during the LNG process.[100]

Why was the company not included?
This company is mainly located in the Gulf Coast. The Gulf Coast is a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

Cheniere Energy Partners, L.P.
Company Summary from Value Line:
Cheniere Energy Partners, L.P., through its subsidiary, Sabine Pass Liquefaction, LLC (SPL), is developing, constructing, and operating natural gas liquefaction (NGL) facilities at the Sabine Pass LNG terminal located in Cameron Parish, Louisiana. The company also owns a 94-mile pipeline that connects the Sabine Pass LNG terminal with a number of large interstate pipelines via its subsidiary, Cheniere Creole Trail Pipeline, L.P. (CTPL). Finally, through the Sabine Pass LNG, L.P. (SPLNG) subsidiary, Cheniere owns and operates regasification facilities at the Sabine Pass LNG terminal.

Additional Company Information from Website:
Cheniere Energy Partners, L.P. (NYSE MKT: CQP) (Cheniere Partners) is a Delaware limited partnership formed by Cheniere Energy, Inc. Through wholly owned subsidiaries, it owns and operates the Sabine Pass LNG receiving terminal and the Creole Trail Pipeline located in western Cameron Parish, Louisiana on the Sabine-Neches Waterway. Its primary business objectives are to generate stable cash flows sufficient to pay the initial quarterly distribution to unitholders and, over time, to increase quarterly cash distributions. Cheniere Partners is currently developing, constructing and operating

[100] https://www.cheniere.com/about-us/, accessed 2/26/2019

liquefaction facilities (SPL Project) situated adjacent to the regasification facilities at the Sabine Pass LNG terminal. The SPL Project currently consists of up to six natural gas liquefaction trains with expected aggregate nominal production capacity of approximately 27.0 mtpa, or roughly equivalent to over 3.5 Bcf/d. Train 1-4 have commenced operations and Train 5 is currently under construction. All regulatory approvals have been received to construct and operate Train 6, and FID is expected to be reached upon obtaining an EPC contract, commercial contracts and financing sufficient to support the construction.[101]

Why was the company not included?
This company is mainly located in the Gulf Coast. The Gulf Coast is a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

Chesapeake Energy Corp
Company Summary from Value Line:
Chesapeake Energy is an independent exploration and production company engaged in the acquisition and development of properties for the production of oil, natural gas and natural gas liquids (NGL). The company is owns several positions in South Texas, Appalachian Basin, Arkansas/Louisiana/Texas border area. 2017 net production: natural gas, 33.0 mmbbl, oil, and natural gas, 878 bcf mbbl. 2017 proved reserves 1.912 bboe. Has about 3,200 employees. Off./Dir. own 1.7% of outstanding shares; The Vanguard Group, 10.2%; Harris Associates, 7.1%; State Street Corp., 6.1%; BlackRock, Inc., 5.7% (4/18 proxy).

Additional Company Information from Website:
Chesapeake's portfolio includes high-quality unconventional oil and natural gas assets in top U.S. onshore plays. Our value-driven strategy focuses on continuously generating capital efficiencies and operating with low, industry-leading production and G&A costs, along with a disciplined approach to liquidity. The safety of our employees, contractors, the public and the environment is our number one priority and reflects our commitment to conducting our business responsibly and living our core values.[102] From the Rockies to South Texas to Appalachia, Chesapeake’s operating areas represent leading positions in top U.S. plays. Focused on operating efficiencies, minimizing our environmental impact and drilling our best well next, we are committed to growing production while responsibly discovering and developing oil, natural gas and natural gas liquids. [103]

Why was the company not included?
Company is an independent exploration company engaged in the acquisition and development of properties for the production of oil, natural gas, and natural gas liquids. These exploration and production business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Cimarex Energy Co
Company Summary from Value Line:
Cimarex Energy Co. is an independent oil & gas exploration and production company. Its operations are mainly located in the Mid-Continent (Oklahoma, the Texas Panhandle, and Kansas), and the Permian

[101] http://www.cheniere.com/about-us/cheniere-partners/, accessed 2/27/2019
[102] http://www.chk.com/about, accessed 2/27/2019
[103] http://www.chk.com/operations, accessed 2/27/2019

Basin. 2017 production total 416.9 million cubic feet equivalent per day (mmcfe), including 187.5 mmcfe gas and 38.1 barrels of liquids. Proved oil and gas reserves totaled 3.3 trillion cubic feet equivalent. 2017 depreciation rate: 2.5%. Has about 910 employees. Officers & directors own 1.7% of common stock; The Vanguard Group, 10.6%; BlackRock Inc., 7.4% (4/18 proxy).

Additional Company Information from Website:
Cimarex is an exploration and production company with operations in Oklahoma, Texas and New Mexico. The majority of our activity is currently in the Permian Basin and the Anadarko Basin in Western Oklahoma. We pride ourselves on a strong technical team. The cornerstone to the Cimarex approach is detailed pre- and post-drill economic evaluation of after-tax rate of return on invested capital for every well drilled. We continually strive to maximize cash flow from producing properties for reinvestment in drill-bit driven growth opportunities.[104]

Why was the company not included?
Company is an exploration and production company. These exploration and production business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Clean Energy Fuels Corp
Company Summary from Value Line:
Clean Energy Fuels Corp. provides natural gas as an alternative fuel for vehicle fleets in the United States and Canada. It designs, builds, finances, and operates fueling stations and supplies compressed natural gas and liquefied natural gas. It serves about 650 fleet customers operating over 30,600 natural gas vehicles in various markets, including public transit, refuse hauling, airports, taxis, and trucking. It owns, operates, and supplies about 224 natural gas fueling stations. The company also constructs fueling stations and sells or leases the stations to customers. Has about 710 employees.

Additional Company Information from Website:
Clean Energy is changing the way the world fuels its vehicles. Reducing pollution from the transportation industry is an important goal for our nation, and we at Clean Energy know just how realistic and attainable that goal is with natural gas fuel.
Moving forward in our thinking as well as in our vehicles means a safer, healthier planet for all of us. This change is happening. Natural gas is abundant and economically viable and is increasingly being adopted as transportation fuel by countries around the world.[105]

Why was the company not included?
This company provides natural gas an alternative fuel for vehicle fleets. This business segment is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

CNX Midstream Partners, L.P.
Company Summary from Value Line:
CNX Midstream Partners, LP (CNXM) is focused on the ownership, operation, development, and acquisition of natural gas gathering and other midstream energy assets to service its customers'

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[104] https://www.cimarex.com/about-cimarex/about-cimarex-overview/default.aspx, accessed 2/27/2019
[105] https://www.cleanenergyfuels.com/about-us/, accessed 2/27/2019

production in the Marcellus Shale and Utica Shale in Pennsylvania and west Virginia. Its assets include natural gas gathering pipelines and compression and dehydration facilities, as well as condensate gathering, collection, separation, and stabilization facilities. CNXM's midstream operations currently consist of two operating segments: Anchor Systems, in which the partnership owns a 100% controlling interest in developed midstream systems, which includes its four primary midstream systems (the McQuay System, the Majorsville System, the Mamont System, and the Shirley-Penns System) and related assets; and Additional Systems, in which the partnership owns a 5% controlling interest, including several gathering systems. Has 100 employees.

Additional Company Information from Website:
CNX Midstream NYSE:CNXM is a growth-oriented master limited partnership that owns, operates, and develops gathering and other midstream energy assets to service natural gas production in the Marcellus Shale in Pennsylvania and West Virginia.[106]

Why was the company not included?
This company's main business segments are natural gas gathering pipelines, compression and dehydration facilities, and condensate gathering, collection, separation, and stabilization facilities. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

CNX Resources Corp
Company Summary from Value Line:
CNX Resources Corp. is one of the largest independent natural gas exploration, development and production companies, with operations centered in the major shale formations of the Appalachian basin. It produced 407.2 bcfe of natural gas in 2017. Proved natural gas reserves: 7.6 trillion cubic feet at 12/31/17. Bought Dominion Resources' Appalachian gas operations, 4/10. Spun off CONSOL Energy 11/17. Has 572 employees. Southeastern Asset Management owns 24.6% of stock; other 5% holders, 27.5%; officers/directors own 2.0% (4/18 proxy).

Additional Company Information from Website:
Focused on the future and fueled by a proud pedigree of energy leadership that stretches back more than 150 years, CNX is a premiere independent oil and gas exploration and production company with operations centered in the Appalachian Basin. Embodying a renowned spirit of innovation, we're pioneering a new tomorrow through technological advancements in shale gas exploration and production in the most prolific natural gas basin in the world. Like few other companies can, we're drawing on our proud past while embracing fresh thinking and leveraging the ingenuity of our people to, once again, forge a new energy future for the Pittsburgh region and beyond.[107]

Why was the company not included?
Company is an exploration, development, and production company. These exploration and production business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[106] http://www.cnxmidstream.com/, accessed 2/27/2019
[107] https://www.cnx.com/about-us, accessed 2/27/2019

Concho Resources, Inc.

Company Summary from Value Line:

Concho Resources, Inc. engages in the acquisition, development, exploitation, and exploration of oil and natural gas properties. The company's principal operating areas are focused in the Permian Basin of southeast New Mexico and west Texas. As of December 2017, the company's estimated proved reserves were 840.0 mmboe (approximately 60% oil and 40% natural gas). Has 1,203 employees. Off./dir. own 1.1% of stock; Vanguard, 10.3%; Cap'l Research Global, 9.9%; Cap'l World, 8.0%; BlackRock, 6.5%; State Street, 5.2%; JPMorgan, 5.1% (4/18 Proxy).

Additional Company Information from Website:

The Permian Basin is one of the most prolific oil and gas regions in the United States, with its first commercial discovery in 1923. It stretches approximately 250 miles wide and 300 miles long, underlying much of southeast New Mexico and west Texas. Concho's operations are centered on acquiring, exploring, developing and producing oil and natural gas in the Permian Basin. Concho is at the forefront of applying advanced technology and large scale development to safely and efficiently maximize resource recovery and returns. Our core operating areas include the Delaware Basin and the Midland Basin and spans nearly one million gross acres.[108]

Why was the company not included?

Company engages in acquisition, development, exploitation, and production of oil and natural gas properties. These exploration and production business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

CONSOL Energy

Company Summary from Value Line:

Not yet available.

Additional Company Information from Website:

CONSOL Energy, a publicly owned Canonsburg-based producer and exporter of high-BTU bituminous thermal coal, is one of the leading energy companies in the United States of America. We own and operate some of the most productive longwall mining operations in the nation and one of the largest export terminals on the Eastern seaboard. As we like to say, America’s energy truly does start here. Since the origins of our company in 1860 and our first active mining operations in 1864, CONSOL has powered the nation with affordable, abundant, reliable domestic energy. Today, CONSOL's employees help generate the fuel that accounts for nearly one-third of the nation's power supply. Our energy supports the American way of life by helping deliver electricity 24/7/365, creating family-sustaining jobs and keeping our nation competitive in the global marketplace. Our strong record on safety and environmental stewardship, as well as our commitment to the communities where we have lived and worked for generations, has helped enable us to become the accomplished energy company we are today. Our core values -- Safety, Compliance and Continuous Improvement -- are the foundational elements and guiding principles of our business model and distinguish us from our peers. CONSOL Energy's coal mines are highly technical operating environments that require specialized training. Pick axes and shovels have been replaced with technologically advanced processes such as longwall mining, enhanced safety protocols, digital technologies and sophisticated communications technologies. These advances have helped turn the mining process into a safer and more productive work environment. Built

[108] https://www.concho.com/operations, accessed 2/27/2019

on our proud history, CONSOL Energy strives each and every day to be one of the safest and most respected energy producers in the world, now and into the future.[109]

Why was the company not included?
Company is a producer and exporter of coal. This is not a similar market segment to the main business segments of the companies the State Assessed Section is responsible for valuing. This company was reviewed because it was spun-off from CNX Resources Corp.[110]

Crestwood Equity Partners, L.P.
Company Summary from Value Line:
Crestwood Equity Partners, LP is engaged in development, acquisition, ownership or control, and operation of primarily fee-based assets and operations within the energy midstream sector. Its portfolio of assets are located in the Marcellus Shale, Bakken Shale, Delaware Permian Basin, PRB Niobrara Shale, Barnett Shale, and Fayetteville Shale. Crestwood offers infrastructure solutions across the value chain to service premier liquids-rich natural gas and crude oil shale plays across the US. At December 31, 2017 year end, its assets portfolio included: natural gas facilities with approximately 2.4 Bcf/d of gathering capacity; NGL facilities with approximately 20,000 Bbls/d of fractionation capacity, as well as its portfolio of transportation assets; and crude oil facilities with approximately 125,000 Bbls/d of gathering capacity. The partnership is a holding company and all of its consolidated operating assets are owned through its subsidiary, Crestwood Midstream. Has 954 employees.

Additional Company Information from Website:
Crestwood Equity Partners LP (NYSE: CEQP) is a publicly traded master limited partnership that owns and operates midstream assets located primarily in the Bakken Shale, Delaware Basin, Powder River Basin, Marcellus Shale, Barnett Shale and Fayetteville Shale. Our operations and financial results are divided into three segments that include Gathering & Processing, Storage & Transportation and Marketing, Supply & Logistics. Across our three segments Crestwood is engaged in the gathering, processing, treating, compression, storage and transportation of natural gas; storage, transportation, terminalling and marketing of NGLs; gathering, storage, transportation, terminalling and marketing of crude oil; and gathering and disposal of produced water. Our goal is to create long-term value for our unitholders by delivering increasing distributable cash flow through organic expansion, development projects and acquisitions, while at the same time ensuring the ongoing stability of our business. We aim to provide the highest quality of customer service while maintaining focus on safety, compliance and the environment.[111]

Why was the company not included?
This company is involved in three business segments: gathering and processing; storage and transportation; and marketing, supply, and logistics. The company's transportation services are small lines in key areas. The business segment is not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[109] http://www.consolenergy.com/about, accessed 2/27/2019
[110] http://investors.consolenergy.com/2017-11-29-CONSOL-Energy-Completes-Spin-Off-as-Independent-Publicly-Traded-Low-Cost-Producer-and-Exporter-of-Coal, accessed 2/27/2019
[111] http://www.crestwoodlp.com/about-us/, accessed 2/27/2019

CrossAmerica Partners, L.P.

Company Summary from Value Line:
CrossAmerica Partners, LP is a wholesale distributor of motor fuels and owner and lessee of real estate used in the retail distribution of motor fuels. Its general partner, CrossAmerica GP LLC, is a subsidiary of CST Brands, Inc., one of the largest independent retailers of motor fuels and convenience merchandise in North America. The company's wholesale segment includes the wholesale distribution of motor fuel to lessee dealers, independent dealers, commission agents, DMS, CST and company operated retail sites. The Retail segment includes the sale of convenience merchandise items, the retail sale of motor fuel at company operated retail sites and the retail sale of motor fuel at retail sites operated by commission agents. It is a distributor of branded and unbranded petroleum for motor vehicles in the US and distributes motor fuel to nearly 1,300 sites in 31 states and owns or leases approximately 900 sites. Has 604 employees.

Additional Company Information from Website:
Formed in 2012, CrossAmerica Partners LP, is a publicly traded master limited partnership that is a leading wholesale distributor of motor fuels and owner and lessee of real estate used in the retail distribution of motor fuels. CrossAmerica Partners distributes branded and unbranded petroleum for motor vehicles in the United States to approximately 1,200 locations and owns or leases approximately 900 sites. Units of CrossAmerica Partners are traded on the New York Stock Exchange under the symbol "CAPL.[112]

Why was the company not included?
This company is a wholesale distributor of motor fuels. Also, owner and lessee of real estate used in the retail distribution of motor fuels. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

DCP Midstream, L.P.

Company Summary from Value Line:
DCP Midstream, LP (formerly DCP Midstream Partners, LP) was formed through a January, 2017 merger with DCP Midstream, LLC. It owns, operates, and develops a diversified portfolio of domestic midstream energy assets, including more than 60 plants and 64,000 miles of natural gas and natural gas liquids (NGLs) pipelines. It is the nation’s largest NGL producer and natural gas processor. Has three segments: Natural Gas Services, NGL Logistics, and Wholesale Propane Logistics. Officers/directors own less than 1% of units; DCP Midstream, LLC, 36.8%; four institutions combined, 17.6% (’16 10-K).

Additional Company Information from Website:
DCP Midstream is a Fortune 500 company and one of the largest producers of NGLs and one of the largest natural gas processing companies in the U.S. DCP is leveraging their strategic footprint to extend the value chain through integrated pipelines. We have a competitive footprint and strong geographic diversity with leading positions in key economic-producing basins where producers are focused, including the DJ Basin, the Permian Basin, and the STACK/SCOOP areas of the Midcontinent. We provide natural gas gathering services to the wellhead, and we’re leveraging our strategic footprint to

[112] http://www.crossamericapartners.com/about-us/about-lehigh-gas-partners/page.aspx?id=1002, accessed 2/27/2019

extend the value chain through our integrated NGL pipelines and other marketing and logistics infrastructure.[113]

Why was the company not included?
This company's main business segments are gathering, processing and logistics, and marketing. Natural gas liquids pipelines appear to be a smaller portion of business. NGL pipelines are in the Gulf Coast, Colorado, Kansas, Texas, Oklahoma, and New Mexico. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Delek Logistics Partners, L.P.
Company Summary from Value Line:
Delek Logistics Partners, LP owns and operates logistics and marketing assets for crude oil, and intermediate and refined products in the United States. The company consists of assets, including pipelines and trucks and ancillary assets that provide crude oil gathering and crude oil, intermediate and finished products transportation, and storage services primarily in support of the Tyler and El Dorado refineries, as well as offers crude oil and other products transportation services to third parties. Its pipelines and transportation segment consists of approximately 400 miles of crude oil pipelines, 16 miles of refined product pipelines, an approximately 600-mile crude oil gathering system, and associated crude oil storage tanks with an aggregate of approximately 1.4 million barrels of active shell capacity. In addition to these operating systems, Delek owns or leases 133 tractors and 167 trailers used to haul primarily crude oil and other products for related and third parties.

Additional Company Information from Website:
Delek Logistics Partners LP (NYSE: DKL), headquartered in Brentwood, Tennessee, is a growth-oriented publicly traded master limited partnership (MLP) formed by Delek US Holdings, Inc. (NYSE:DK) ("Delek") in 2012 to own, operate, acquire, and construct crude oil and refined products logistics and marketing assets. A substantial majority of our existing assets are integral to the success of Delek's refining and marketing operations. We gather, transport and store crude oil and market, distribute, transport and store refined products in select regions of the southeastern United States and west Texas for Delek and third parties, primarily in support of Delek's refineries in Tyler, Texas and El Dorado, Arkansas.[114]

Why was the company not included?
This company is mainly located in the Texas, Louisiana, Arkansas, and Tennessee area. This operating area is a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

Devon Energy Corp.
Company Summary from Value Line:
Devon Energy Corp. is a North American oil, NGL, and gas exploration and production company. Also, the company controls EnLink, a publicly-traded MLP. It has properties in the Barnett Shale, Delaware Basin, Eagle Ford, Heavy Oil (Canada) plays, and the STACK in the Anadarko Basin. 2017 production: 198 MMboe, including 439 Bcf gas and 125 Mbbls liquids. Proved reserves at 12/31/17: 2.15 bill. Bbls.

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[113] http://www.dcpmidstream.com/company, accessed 2/27/2019

[114] http://www.deleklogistics.com/investor-relations, accessed 2/27/2019

of oil equiv., including 272 MMbls liquids and 5,974 bcf naturals gas. Has about 4,900 emplys. Off./Dir. own less than 1.0% of common; The Vanguard Group, 8.6% (4/18 proxy)

Additional Company Information from Website:
Devon Energy Corporation is a leading independent oil and natural gas exploration and production company. Devon's operations are focused onshore in the United States and Canada. The company's portfolio of oil and gas properties provides stable, environmentally responsible production and a platform for future growth. Devon has more than doubled its onshore North American oil production since 2011. Today the company produces approximately 250,000 barrels a day and has a deep inventory of development opportunities to deliver future oil growth. Devon also produces about 1.2 billion cubic feet of natural gas a day and about 100,000 barrels of natural gas liquids per day.[115]

Why was the company not included?
Company is a gas exploration and production company. These exploration and production business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Dominion Energy Midstream Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Dominion Energy Inc. and Dominion Energy Midstream Partners LP completed their proposed merger on January 28, 2019. The merger resulted in Dominion Energy acquiring all the outstanding public common units of Dominion Energy Midstream Partners in exchange for Dominion Energy common shares and Dominion Energy Midstream Partners becoming and indirect, wholly owned subsidiary of Dominion Energy. [116]

Why was the company not included?
Company is no longer publicly traded.

Emerge Energy Service, L.P.
Company Summary from Value Line:
Emerge Energy Services, LP is a growth-oriented energy services company engaged in the business of mining, producing, and distributing silica sand that is a key input for the hydraulic fracturing of oil and gas wells. The company operates its continuing business in a single sand segment. It conducts its Sand operations through its subsidiary Superior Silica Sands LLC. The Sand business conducts mining and processing operations from facilities located in Wisconsin and Texas. In addition to mining and processing silica sand for the oil and gas industry, the Sand business sells its product for use in building products and foundry operations. Its Wisconsin facilities consist of three dry plants located in Arland, Barron and New Auburn, Wisconsin with a total permitted capacity of 6.3 million finished tons per year, and five wet plants and mine complexes that supply the dry plants with northern white silica sand.

[115] https://www.devonenergy.com/about-us, accessed 2/27/2019

[116] http://www.dommidstream.com/, accessed 2/27/2019

Additional Company Information from Website:
Emerge Energy Services LP is a growth-oriented limited partnership engaged in the businesses of mining, producing, and distributing silica sand, a key input for the hydraulic fracturing of oil and natural gas wells. Emerge Energy also processes transmix, distributes refined motor fuels, operates bulk motor fuel storage terminals, and provides complementary fuel services. Emerge Energy operates its sand segment through its subsidiary Superior Silica Sands LLC and its fuel segment through its subsidiaries Direct Fuels LLC and Allied Energy Company LLC. Our Sand operations are primarily located in Barron County, WI as well as in neighboring counties, with an additional facility in Kosse, TX and headquarters in Fort Worth, TX. Our Fuel Processing and Distribution operations are located in Birmingham, AL and Euless, TX. Through our direct access to multiple rail lines and pipelines, we are uniquely positioned to service customers across North America.[117]

Why was the company not included?
This company's main business segments are mining, producing, and distributing silica sand for hydraulic fracturing. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Enable Midstream Partners, L.P.
Company Summary from Value Line:
Enable Midstream Partners, LP owns natural gas and crude oil infrastructure assets. It has two segments: Gathering & Processing and Transportation & Storage. Enable's assets include 12,900 miles of gathering pipelines, 15 major processing plants with 2.6 billion cubic feet per day of capacity, 7,800 miles of interstate pipelines, 2,200 miles of intrastate pipelines, and eight storage facilities. 2017 depr. rate: 3.0%. Has 1,630 employees. CenterPoint Energy owns 54.1% of shares out.; OGE Energy, 25.7%; ArcLight Cap'l. Partners, 10.0%; off. and dir., less than 1% (2017 10-K).

Additional Company Information from Website:
Enable Midstream (NYSE:ENBL) is a publicly traded master limited partnership formed in May 2013 that owns, operates and develops strategically located natural gas and crude oil infrastructure assets serving major producing basins and markets.
Operations

- 13,900 miles of gathering lines
- 15 major processing plants with approximately 2.6 billion cubic feet per day
- ~7,800 miles of interstate pipelines (including Southeast Supply Header, LLC) with 8.4 billion cubic feet per day of transport capacity
- ~2,300 miles of intrastate pipelines
- 84.5 billion cubic feet of natural gas storage capacity[118]

Why was the company not included?
This company began trading on April 11, 2014. As of January 2, 2019, the company has less than five full years of financials. This company performs a substantial amount of gathering and processing functions. Most of the assets are located in Oklahoma, Arkansas, Louisiana, and Texas. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[117] http://ir.emergelp.com/profile, accessed 3/6/2019
[118] https://www.enablemidstream.com/html/pages/p002-about.html, accessed 3/6/2019

Enbridge Energy Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, Enbridge Energy Partners, L.P. and Enbridge Energy Management, LLC, announced December 20, 2018 that they have completed the previously announced respective merger of EEP with a wholly owned subsidiary of Enbridge, and the merger of EEQ with a wholly owned subsidiary of Enbridge, each pursuant to an Agreement and Plan of Merger dated as of September 17, 2018. The EEP merger resulted in Enbridge acquiring all of the outstanding public Class A common units of EEP, and EEP becoming an indirect, wholly owned subsidiary of Enbridge, and the EEQ Merger resulted in Enbridge acquiring all of the outstanding public Listed Shares of EEQ, and EEQ becoming a direct, wholly owned subsidiary of Enbridge.[119]

Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, and Spectra Energy Partners, LP announced December 17, 2018 that they have competed the previously announced merger pursuant to an Agreement and Plan of Merger dated as of August 24, 2018. The Merger resulted in Enbridge acquiring all of the outstanding public common units of SEP and SEP becoming an indirect, wholly owned subsidiary of Enbridge.[120]

Why was the company included?
Company is no longer publicly traded.

Enbridge, Inc.
Company Summary from Value Line:
Enbridge Inc., is a leader in energy transportation and distribution in North America and intl. As a transporter of energy, it operates the world's longest crude oil and liquids pipeline system. The company also has international oper. and a growing involvement in natural gas transmission and midstream businesses. As a distributor of energy, it owns and operates Canada's largest natural gas distribution company, and provides services in Ontario, Quebec, New Brunswick, and New York State. Owns 38.9% of Noverco. In '17, Merged with Spectra Energy Corp. (SE). Emplys. 8,600.

Additional Company Information from Website:
Enbridge is a North American leader in delivering energy. We exist to fuel people's quality of life, and we have done so for nearly 70 years. Enbridge operates the world's longest crude oil and liquids transportation system. We're also a North American leader in the transportation, processing and storage of natural gas. Enbridge is Canada's largest natural gas distribution provider, with about 3.7 million retail customers in Ontario, Quebec, New Brunswick and New York State. Enbridge has interests in about 1,750 MW of net renewable generation capacity, based on projects in operation or under construction.[121]

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119 https://www.enbridgepartners.com/Media-Center/News.aspx?queryYear=2018&ReleaseId=123009, accessed 3/6/2019

120 https://www.enbridge.com/media-center/news/details?id=123546&lang=en, accessed 3/6/2019

121 https://www.enbridge.com/about-us accessed 3/6/2019

Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, Enbridge Energy Partners, L.P. and Enbridge Energy Management, LLC, announced December 20, 2018 that they have completed the previously announced respective merger of EEP with a wholly owned subsidiary of Enbridge, and the merger of EEQ with a wholly owned subsidiary of Enbridge, each pursuant to an Agreement and Plan of Merger dated as of September 17, 2018. The EEP merger resulted in Enbridge acquiring all of the outstanding public Class A common units of EEP, and EEP becoming an indirect, wholly owned subsidiary of Enbridge, and the EEQ Merger resulted in Enbridge acquiring all of the outstanding public Listed Shares of EEQ, and EEQ becoming a direct, wholly owned subsidiary of Enbridge.[122]

Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, and Spectra Energy Partners, LP announced December 17, 2018 that they have competed the previously announced merger pursuant to an Agreement and Plan of Merger dated as of August 24, 2018. The Merger resulted in Enbridge acquiring all of the outstanding public common units of SEP and SEP becoming an indirect, wholly owned subsidiary of Enbridge.[123]

Why was the company included?
This company recently completed a merger of Spectra Energy Partners, LP and mergers of related companies. Will consider this company as a guideline company for future studies.

Encana Corporation
Company Summary from Value Line:
Encana Corporation is a leading North American energy producer focused on developing natural gas, oil, and NGL resource plays. The company's core holdings are in the Permian, Eagle Ford, Montney, and Duvernay basins. Total proved reserves ('17 10-K), 794.9 million barrels of oil equivalent. 2017 Production; 313,200 barrels of oil equivalent per day, including 1,104 million cubic feet equivalent of natural gas, 52,800 barrels of NGL, and 76,300 barrels of oil. Has approx. 2,107 employees. Viking Global Investors LP. owns 9.6% of common stock (3/18 proxy).

Additional Company Information from Website:
Encana is a leading North American energy producer that is focused on growing its strong portfolio of diverse resource plays producing natural gas, oil and natural gas liquids. By partnering with employees, community organizations and other businesses, Encana contributes to the strength and sustainability of the communities where it operates.[124]

Encana Corporation announced February 13, 2019 that it has completed its acquisition of Newfield Exploration Company in an all-stock transaction.[125]

[122] https://www.enbridgepartners.com/Media-Center/News.aspx?queryYear=2018&ReleaseId=123009, accessed 3/6/2019
[123] https://www.enbridge.com/media-center/news/details?id=123546&lang=en, accessed 3/6/2019
[124] https://www.encana.com/about/, accessed 3/6/2019
[125] https://www.encana.com/news-stories/news-releases/details.html?release=17261, accessed 3/8/2019

Why was the company not included?
Encana is an energy producer focused on developing natural gas, oil, and natural gas liquid plays. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Energy Transfer, L.P. (formerly known as Energy Transfer Equity, L.P.)
Company Summary from Value Line:
Energy Transfer, LP (ET) is a master limited partnership that owns a diversified portfolio of energy assets in the U.S. Its core operations include complimentary natural gas midstream, intrastate and interstate transportation and storage assets; crude oil, natural gas liquids and refined product transportation and terminating assets. Energy Transfer also owns the Lake Charles LNG Company. On a consolidated basis, the ET family owns and operates approximately 71,000 miles of natural gas pipeline along with retail fuel operations. Has about 29,500 employees.

Additional Company Information from Website:
Energy Transfer is a Texas-based company that began in 1995 as a small intrastate natural gas pipeline operator and is now one of the largest and most diversified investment grade master limited partnerships in the United States. Growing from roughly 200 miles of natural gas pipelines in 2002 to more than 83,000 miles of natural gas, natural gas liquids (NGLs), refined products, and crude oil pipelines today. The Energy Transfer family of partnerships remains dedicated to providing exceptional service to its customers and attractive returns to its investors. Through several transformative transactions, we have expanded our scope of services. While we remain committed to the natural gas industry, we enhanced our diversified portfolio of assets by making a strategic entrance into the NGL business through the acquisition of Louis Dreyfus' NGL storage, fractionation and transportation operations in 2011. In 2012, we acquired Southern Union Company, a leading diversified natural gas company, which expanded our national footprint and added more than 20,000 miles of gathering and transportation pipelines to our portfolio. We made a strong entrance into the crude oil and refined products business by acquiring Sunoco, Inc. in 2012, including its interest in Sunoco Logistics Partners L.P. (NYSE: SXL). Through the merger with Regency Energy Partners in 2015, we significantly diversified our footprint, both geographically and across business lines. We expanded our reach in the refined products and convenience store business with the acquisition of Susser Holdings Corporation, including its interest in Susser Petroleum Partners LP, (now Sunoco LP - NYSE: SUN). In April 2017, Energy Transfer Partners and Sunoco Logistics Partners merged. And in October 2018, Energy Transfer Equity and Energy Transfer Partners merged. The combined company, now called Energy Transfer LP (NYSE: ET), is one of the largest MLPs by Enterprise Value, with a fully integrated midstream/liquids platform. These acquisitions, together with our already robust asset base, have enabled Energy Transfer to become a premier provider of services to producers and consumers of natural gas, NGLs, crude oil, and refined products. [126]

Why was the company not included?
This company's business segments include natural gas midstream, intrastate and interstate transportation and storage assets; crude oil, natural gas liquids and refined produce transportation and terminating assets. Due to the recent merger with Sunoco Logistics Partners and Energy Transfer Partners, L.P., this company is not used as a guideline company for the current assessment. Will consider in the future.

[126] https://www.energytransfer.com/company_overview.aspx, accessed 3/6/2019

Energy Transfer Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
In April 2017, Energy Transfer Partners and Sunoco Logistics Partners merged. And in October 2018, Energy Transfer Equity and Energy Transfer Partners merged. The combined company, now called Energy Transfer LP (NYSE: ET), is one of the largest MLPs by Enterprise Value, with a fully integrated midstream/liquids platform. [127]

Why was the company not included?
Company is no longer publicly traded.

Enerplus Corporation
Company Summary from Value Line:
Enerplus Corporation engages in the exploration and development of crude oil and natural gas in the U.S. (Montana, North Dakota, Pennsylvania, West Virginia, and Wyoming) and Canada (Alberta, British Columbia, and Saskatchewan). Average daily production in 2017: crude oil, 36.935 bbls; natural gas liquids, 3,858 bbls; natural gas, 263.506 mcf. At 12/31/17 proved plus probable reserves of 397.4 MBOE, including: 191.0 Mbbls of crude oil, 20.8 Mbbls of NGLs; 77.3 Bcf of conventional natural gas; and 1,036.8 Bcf of shale gas. Has 404 employees. Inc.: Canada.

Additional Company Information from Website:
Founded in 1986, Enerplus was Canada's first oil and gas royalty trust with a proven track record for delivering competitive returns for our shareholders. As we transitioned our assets to focus on unconventional, organic growth opportunities, we have continued to prioritize responsible development and thoughtful investment to create value for our shareholders. Today, we're an independent North American exploration and production company focused on developing our high-quality assets through a disciplined, returns-based capital program. This focus, our accountability and our people will help us deliver differentiated long-term shareholder value.[128]

Why was the company not included?
This company's main business segments are exploration and development of crude oil and natural gas. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

EnLink Midstream Partners, L.P.
Company Summary from Value Line:
EnLink Midstream Partners L.P., formerly Crosstex Energy, L.P., is a master limited partnership (MLP) that provides midstream energy services, including gathering, transmission, processing, fractionation, and marketing, to producers of natural gas, natural gas liquids (NGLs), crude oil, and condensate. Has five segments: Texas (24% of '17 revenues, 43% of gross operating margin); Louisiana (51%, 23%); Oklahoma (15%, 26%); Crude & Condensate (25%, 9%); and Corporate (-15%, -1%). Has 1,494 employees.

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[127] https://www.energytransfer.com/company_overview.aspx, accessed 3/6/2019
[128] https://www.enerplus.com/about/our-story.cfm, accessed 3/6/2019

Additional Company Information from Website:
EnLink Midstream reliably operates a differentiated midstream platform that is built for long-term, sustainable value creation. EnLink's best-in-class services span the midstream value chain, providing natural gas, crude oil, condensate, and NGL capabilities. Our integrated asset platforms are strategically located in premier production basins and core demand centers, including the Permian Basin, Oklahoma, North Texas, and the Gulf Coast. EnLink's focus is on a strong financial foundation and a commitment to execution excellence to drive attractive returns and significant value for our employees, customers, and investors. Headquartered in Dallas, EnLink is publicly traded through EnLink Midstream, LLC (NYSE: ENLC). [129]

Why was the company not included?
Most of this company's operations are located in Texas and Oklahoma. This is a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

Enterprise Products Partners
Company Summary from Value Line:
Enterprise Products Partners, LP, is a leading integrated provider of natural gas and natural gas liquids (NGLs) processing, fractionation, transportation, and storage services in the U.S. and Canada. Acquired GulfTerra Energy 9/04; TEPPCO, L.P. 10/09; M2 Midstream, 5/10; Enterprise GP, 11/10; Oil tanking Partners, 2/15. Assets include 50,000 miles of pipelines, 260 MMBbls of storage capacity for liquids and 14 Bcf for natural gas. Four segments: NGL Pipeline (58% of 2017 revenues); Crude Oil Pipelines, (17%); Petrochemical & Refined Products, (12.5%); Natural Gas Pipelines, (12.5%); Employs 6,800.

Additional Company Information from Website:
Enterprise Products Partners L.P. is one of the largest publicly traded partnerships and a leading North American provider of midstream energy services to producers and consumers of natural gas, NGLs, crude oil, refined products and petrochemicals. Our services include: natural gas gathering, treating, processing, transportation and storage; NGL transportation, fractionation, storage and import and export terminals; crude oil gathering, transportation, storage and terminals; petrochemical and refined products transportation, storage and terminals; and a marine transportation business that operates primarily on the United States inland and Intracoastal Waterway systems.[130]

Why was the company not included?
This company is similar to the Gas Transmission Pipeline Companies that the State Assessed Section is responsible for valuing. However, the department is using corporations, not partnerships as guideline companies in the Gas Transmission Pipeline market segment.

EOG Resources, Inc.
Company Summary from Value Line:
EOG Resources, Inc. engages in the exploration, development, and production of natural gas and crude oil. Utilizes producing basins mainly in the U.S., Canada, China, the U.K., and offshore Trinidad. In 2017, total net proved natural gas reserves were 4.3 trillion cubic feet equivalent, and net proved crude oil and natural gas liquids reserves were 1,816 million barrels. Est'd pretax present value of reserves: $21.8 billion. Has

[129] https://www.enerplus.com/about/our-story.cfm, accessed 3/6/2019
[130] http://www.enterpriseproducts.com/about-us, accessed 3/6/2019

2,664 employees. Off. and dir. own less than 1% of common stock; Capital Research Global Investors, 7.6%; The Vanguard Group, 7.3%; BlackRock, Inc., 6.0% (3/18 Proxy).

Additional Company Information from Website:
EOG Resources, Inc. is one of the largest independent (non-integrated) crude oil and natural gas companies in the United States with proved reserves in the United States, Trinidad, the United Kingdom and China. In order to find and develop low-cost reserves, EOG prioritizes exploration and drilling of internally generated prospects. This strategy is intended to consistently deliver cost-effective oil and natural gas production that maximizes cash flow and earnings, allowing the company to deliver long-term shareholder value while maintaining a strong balance sheet.[131]

Why was the company not included?
EOG Resources, Inc. main business segments include exploration, development, and production of natural gas and crude oil. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

EQT Corporation
Company Summary from Value Line:
EQT Corporation, Inc. conducts its business through five segments: EQT Production, EQM Gathering, EQM Transmission, RMP Gathering, and RMP Water. EQT Production is the leading natural gas producer in the U.S., with total proved reserves of 21.4 Tcfe across 4.0 million acres (including 1.1 million acres in the Marcellus Shale). 2017 production, 887.5 Mmcfe. Completed acquisition of Rice Energy 11/17. Has approximately 1,810 employees. Officers/directors own less than 1.0% of common stock; The Vanguard Group , 10.2%; BlackRock, Inc., 7.0% (3/18 proxy).

Additional Company Information from Website:
With 130 years of experience in the natural gas industry and a long-standing history of good corporate citizenship, EQT Corporation is the largest producer of natural gas in the United States. As a natural gas production company with emphasis in the Appalachian Basin and operations in Pennsylvania, West Virginia, and Ohio, EQT has a renewed, strategic focus on our upstream business. As a technology-driven leader in advanced horizontal drilling, our ability to drill long laterals from large pads in some of the most productive areas in the world gives us one of the lowest cost structures in the natural gas industry, while consistently working safely and responsibly to minimize impacts to the environment. EQT's commitment to capital discipline and operational efficiencies drives value for our shareholders, our employees and the communities where we operate as we resourcefully develop our world-class asset base in Appalachia.[132]

On February 21, 2018, EQT Corporation (EQT) announced plans to separate its separately managed gathering, transmission and storage, and water services operations (Midstream Business) from its natural gas, oil and natural gas liquids development, production and sales and commercial operations (Upstream Business). The separation of the Midstream Business from the Upstream Business will culminate in the spinoff from EQT of a new company named Equitrans Midstream Corporation. Equitrans Midstream will trade on the NYSE under the ticker symbol ETRN. The separation of the two companies is intended

[131] https://www.eogresources.com/wp-content/uploads/2018/10/FactSheet_new-color-Oct-2018.pdf, accessed 3/6/2019
[132] https://www.eqt.com/about/corporate-profile, accessed 3/11/2019

to provide shareholders with equity ownership in two, separate, publicly traded companies that will be able to focus exclusively on each of their respective businesses.[133]

Why was the company not included?
EQT Corporation is the largest producer of natural gas in the United States. This company's business segments also include production, gathering, transmission, and water. Some of the business segments are similar to those of the companies the State Assessed Section is responsible for valuing, but EQT Corporation is not similar enough.

EQT MidStream Partners, L.P.
Company Summary from Value Line:
EQT Midstream Partners, LP is a growth-oriented limited partnership formed by EQT Corp. to own, operate, acquire, and develop midstream assets in the Appalachian Basin of Pennsylvania, West Virginia and Ohio. The partnership provides substantially all of its natural gas transmission, storage, and gathering services under contracts with long-term, firm reservation and/or usage fees. EQT Corp. accounted for approximately 73% of Partnership revenues for the year ended December 31, 2017. Acquired Rice Midstream Partners 7/18.

Additional Company Information from Website:
EQT Midstream Partners, LP is a growth-oriented limited partnership formed by EQT Corporation to own, operate, acquire, and develop midstream assets in the Appalachian Basin. The Partnership provides midstream services to EQT Corporation and third-party companies through its strategically located transmission, storage, and gathering systems that service the Marcellus and Utica regions. The Partnership owns approximately 950 miles of FERC-regulated interstate pipelines; and also owns approximately 1,800 miles of high-and low-pressure gathering lines.[134]

EQT Midstream Partners, LP (EQM) and Rice Midstream Partners LP announced July 20, 2018 unitholder approval of RMP's previously announced merger transaction with EQM.[135]

Why was the company not included?
This company's operations are located in the Appalachian Basin, which is a different market than the market of the companies for with the State Assessed Section is responsible for valuing. This company was also involved in a merger recently.

Equitrans Midstream Corporation
Company Summary from Value Line:
Not available. Began trading on New York Stock Exchange on 11/13/2018.

Additional Company Information from Website:
On February 21, 2018, EQT Corporation (EQT) announced plans to separate its separately managed gathering, transmission and storage, and water services operations (Midstream Business) from its natural gas, oil and natural gas liquids development, production and sales and commercial operations (Upstream

[133] https://www.equitransmidstream.com/, accessed 3/6/2019
[134] https://ir.eqt.com/press-release/eqt-announces-plan-separate-midstream-business, accessed 3/6/2019
[135] https://ir.eqm-midstreampartners.com/press-release/eqgp/rice-midstream-partners-unitholders-approve-merger-eqt-midstream-partners?referrer=eqm, accessed 3/6/2019

Business). The separation of the Midstream Business from the Upstream Business will culminate in the spinoff from EQT of a new company named Equitrans Midstream Corporation. Equitrans Midstream will trade on the NYSE under the ticker symbol ETRN. The separation of the two companies is intended to provide shareholders with equity ownership in two, separate, publicly traded companies that will be able to focus exclusively on each of their respective businesses.[136]

Equitrans Midstream Corporation (NYSE:ETRN), one of the largest natural gas gatherers and transmission pipeline operators in the United States , with a premier asset footprint in the Marcellus and Utica Shale region, today announced that it has completed the previously announced spin-off from EQT Corporation (NYSE: EQT). As a standalone publicly traded company, Equitrans Midstream's common stock begins "regular-way" trading today on the NYSE under the symbol "ETRN."[137]

Why was the company not included?
Began trading on New York Stock Exchange on 11/13/2018. Consider after financials are established.

Extraction Oil & Gas, Inc.
Company Summary from Value Line:
Extraction Oil & Gas, Inc. is an independent oil and gas company. It acquires, develops, and produces oil, natural gas, and natural gas liquids reserves in the Rocky Mountain region, primarily in the Wattenberg Field of Colorado's DJ Basin. Estimated total proved reserves were 292.7 MBoe at 12/31/17. Estimated pretax present value of reserves: $2.0 billion. Has 227 employees. Officers and directors own 7.9% of common stock; YT Extraction Co. Investment Partners, LP, 11.6%; Yorktown Energy Partners X, L.P., 10.0%; BlackRock Inc. 7.4%; Bronco Investments, LLC, 6.0% (4/18 proxy).

Additional Company Information from Website:
Denver-based Extraction Oil & Gas is a domestic energy company focusing on the exploration and production of oil and gas reserves in the Rocky Mountains. We are committed to safe and responsible operations in the Greater Wattenberg Field of Colorado's Denver-Julesburg Basin.
Extraction Oil & Gas was created in December 2012 and has since assembled a strong technical team with years of experience in horizontal drilling and completion operations. Our growth strategy includes high-quality acreage acquisitions and forming strategic joint ventures with select operators in the Greater Wattenberg Field.[138]

Why was the company not included?
Extraction Oil & Gas, Inc. acquires, develops, and produces oil, natural gas, and natural gas liquids reserves. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Ferrellgas Partners, L.P.
Company Summary from Value Line:
Ferrellgas Partners, L.P., through its operating partnership, Ferrellgas, L.P., and subsidiaries, serves propane customers in all 50 states, the District of Columbia, and Puerto Rico, and provides midstream services to major energy companies in the US. Its operations primarily include the distribution and sale

[136] https://www.equitransmidstream.com/, accessed 3/6/2019
[137] https://ir.equitransmidstream.com/news/news-archives/news-details/2018/Equitrans-Midstream-Launches-as-a-Strong-Standalone-Midstream-Company-with-a-Premier-Asset-Footprint/default.aspx, accessed 3/6/2019
[138] http://www.extractionog.com/, accessed 3/7/2019

of propane and related equipment and supplies. Sales from propane distribution are generated principally from transporting propane purchased from third parties to propane distribution locations and then to tanks on customers' premises or to portable propane tanks delivered to nationwide and local retailers. Sales from portable tank exchanges, nationally branded under the name Blue Rhino, are generated through a network of independent and partnership-owned distribution outlets. Ferrellgas conducts crude oil logistics operations and related activity under the Bridger Logistics tradename, as well as water solutions operations, under midstream operations segment.

Additional Company Information from Website:
Ferrellgas Partners, L.P. is a publicly-traded Master Limited Partnership. Through strategic partnerships with diverse and growth-oriented companies, we deliver rigorous results, and we do so ethically, honestly, and transparently. We take pride in this position, and the peace of mind it provides our stakeholders. Our headquarters are located in Liberty, Missouri and our Initial Public Offering was June 28, 1994. As of October 31, 2017, we have 97,152,665 units, with our employees indirectly owning 22.8 million units of the partnership through an Employee Stock Ownership Plan. We trade on the New York Stock Exchange under the symbol FGP.[139]

Why was the company not included?
This company’s main business segment is propane, which is a different business segment of the companies for with the State Assessed Section is responsible for valuing.

Genesis Energy, L.P.
Company Summary from Value Line:
Genesis Energy, LP is a growth-oriented master limited partnership focused on the midstream segment of the crude oil and natural gas industry. Its segments consist of: offshore pipeline transportation and processing of crude oil and natural gas in the Gulf of Mexico; sodium minerals and sulfur services involving trona and trona-based exploring, processing, and selling activities, and processing of high sulfur gas streams for refineries to remove the sulfur, and selling the related by-product, sodium hydrosulfide (NaHS); onshore facilities and transportation, which include terminalling, storing, and transporting crude oil, petroleum products, and CO 2; and marine transportation to provide waterborne transportation of petroleum products and crude oil. Genesis' operations are primarily located in Texas, Louisiana, Arkansas, Mississippi, Alabama, Florida, Wyoming and the Gulf of Mexico. Has 2118 employees.

Additional Company Information from Website:
Genesis Energy, L.P., is a growth-oriented master limited partnership headquartered in Houston, Texas. Through our four divisions: offshore pipeline transportation, refinery services, marine transportation and onshore facilities and transportation, we provide an integrated suite of services to refineries, oil producers, and industrial and commercial enterprises. Our operations are primarily located in Texas, Louisiana, Arkansas, Mississippi, Alabama, Florida, Wyoming and the Gulf of Mexico. Our business activities are primarily focused on providing services around and within refinery complexes. Upstream of refineries, we provide gathering and transportation of crude oil. Within refineries, we provide services to assist in their sulfur balancing requirements. Downstream of refineries, we provide transportation services as well as market outlets for the finished refined products. We have a diverse portfolio of customers, operations and assets, including pipelines, refinery-related plants, storage tanks

[139] https://www.ferrellgas.com/our-company/investor-information/, accessed 3/7/2019

and terminals, railcars, rail loading and unloading facilities, barges and trucks. We also have interests in pipelines offshore in the Gulf of Mexico. That business includes approximately 2,600 miles of offshore crude oil and natural gas pipelines and six offshore hub platforms that serve some of the most active drilling and development regions in the United States, including deepwater production fields in the Gulf of Mexico offshore of Texas, Louisiana, Mississippi, and Alabama.[140]

Why was the company not included?
This company's main business segments are grouped in four divisions: offshore pipeline transportation, refinery services, marine transportation, and onshore facilities and transportation. These market segments are not similar enough to the market segments of the companies for which the State Assessed Section is responsible for valuing.

Global Partners, L.P.
Company Summary from Value Line:
Global Partners, LP is engaged in the purchasing, selling, and logistics of transporting petroleum and related products, including domestic and Canadian crude oil, gasoline and gasoline blendstocks (such as ethanol and naphtha), distillates (such as home heating oil, diesel, and kerosene), residual oil, renewable fuels, natural gas and propane. It also receives revenue from convenience store sales and gasoline station rental income. Global owns, controls, or has access to one of the largest terminal networks of refined petroleum products and renewable fuels in the northeast. It owns transload and storage terminals in North Dakota and Oregon that extend its origin-to-destination capabilities from the mid-continent region of the US and Canada to the east and west coasts. As of September 30, 2018, the partnership had a portfolio of 1,589 owned, leased and/or supplied gasoline stations, including 301 directly operated convenience stores, primarily in the Northeast, Maryland and Virginia. Has 2000 employees.

Additional Company Information from Website:
With approximately 1,600 locations primarily in the Northeast, Global Partners is one of the region's largest independent owners, suppliers and operators of gasoline stations and convenience stores. Global also owns, controls or has access to one of the largest terminal networks in New England and New York, through which it distributes gasoline, distillates, residual oil and renewable fuels to wholesalers, retailers and commercial customers. In addition, Global engages in the transportation of petroleum products and renewable fuels by rail from the mid-continental U.S. and Canada. Global, a master limited partnership, trades on the New York Stock Exchange under the ticker symbol "GLP."[141]

Why was the company not included?
This company is one of the largest distributors of gasoline, distillates, residual oil and renewable fuels to wholesalers, retailers, and commercial customers in New England and New York. This company also owns, supplies, and operates gasoline stations and convenience stores. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[140] http://genesisenergy.com/about/, accessed 3/7/2019
[141] http://www.globalp.com/, accessed 3/11/2019

Green Plains Partners, L.P.

Company Summary from Value Line:

Green Plains Partners L.P. provides fee-based fuel storage and transportation services by owning, operating, developing and acquiring ethanol and fuel storage tanks, terminals, transportation assets, and other related assets and businesses. The company was formed by Green Plains, Inc., a vertically integrated ethanol producer, to support its marketing and distribution activities as its primary downstream logistics provider. The company generates a substantial portion of its revenues under fee-based commercial agreements with Green Plains Trade for receiving, storing, transferring and transporting ethanol and other fuels, which are supported by minimum volume or take-or-pay capacity commitments. Green Plains owns 39 ethanol storage facilities at or near 17 ethanol production plants in Indiana, Illinois, Iowa, Michigan, Minnesota, Nebraska, Tennessee, Texas, and Virginia, and which have a current combined ethanol production capacity of roughly 1.5 billion gallons annually.

Additional Company Information from Website:

Green Plains Partners LP is a fee-based, limited partnership formed by our parent, Green Plains Inc., to provide ethanol and fuel storage, terminal and transportation services by owning, operating, developing and acquiring ethanol and fuel storage tanks, terminals, transportation assets and other related assets and businesses. We intend to seek opportunities to grow our business by pursuing organic projects and acquisitions of complementary assets from third parties in cooperation with our parent.[142]

Our transportation assets include a leased railcar fleet of approximately 2,700 railcars with an aggregate capacity of 81.0 million gallons that is dedicated to transporting products under commercial agreements with our parent, including ethanol and other fuels, from our fuel terminal facilities or third-party production facilities to refineries throughout the United States and international export terminals.[143]

Why was the company not included?

This company's main operating segments are ethanol storage, fuel terminals, and transportation. The transportation segment includes railcars. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Martin Midstream Partners, L.P.

Company Summary from Value Line:

Martin Midstream Partners, L.P. is a publicly traded limited partnership with a diverse set of operations focused primarily in the US Gulf Coast region. Its four primary business lines include: natural gas services, including liquids transportation and distribution services and natural gas storage; terminalling and storage services for petroleum products and by-products, including the refining of naphthenic crude oil, blending and packaging of finished lubricants; sulfur and sulfur-based products processing, manufacturing, marketing and distribution; and marine transportation services for petroleum products and by-products. The petroleum products and by-products the company collects, transports, stores and markets are produced by oil and gas companies. In August 2018, the company announced the completion of the divestiture of its 20 percent non-operating partnership interests in the West Texas LPG Pipeline Limited Partnership to ONEOK, Inc.

[142] http://www.greenplainspartners.com/about, accessed 3/7/2019

[143] http://www.greenplainspartners.com/operations/transportation-assets/, accessed 3/7/2019

Additional Company Information from Website:
Martin Midstream Partners L.P. is a publicly traded limited partnership with a diverse set of operations focused primarily in the United States Gulf Coast region. Our four primary business lines include:

- Terminalling and storage services for petroleum products and by-products, including the refining of naphthenic crude oil and the blending and packaging of finished lubricants;
- Natural gas liquids transportation and distribution services and natural gas storage;
- Sulfur and sulfur-based products gathering, processing, marketing, manufacturing and distribution including fertilizer manufacturing and distribution
- Marine transportation services for petroleum products and by-products

The petroleum products and by-products we collect, transport, store and market are produced primarily by major and independent oil and gas companies who often turn to third parties, such as us, for the transportation and disposition of these products. In addition to these major and independent oil and gas companies, our primary customers include independent refiners, large chemical companies, fertilizer manufacturers and other wholesale purchasers of these products. We operate primarily in the U.S. Gulf Coast region, which is a major hub for petroleum refining, natural gas gathering and processing and support services for the exploration and production industry.[144]

Why was the company not included?
This company is mainly located in the Gulf Coast. The Gulf Coast is a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

MDU Resources Group, Inc.
Company Summary from Value Line:
MDU Resources Group, Inc. is a regulated energy delivery and construction materials and services business. Segments: construction materials and contracting (41% of '17 revs; 34% of '17 op. inc.), construction services (31%, 19%), natural gas distribution (19%, 20%); electric (8%, 19%) and pipeline and energy services (1%, 8%). Utilities sell gas & electricity in northwest and upper Midwest U.S. Construction materials has 1.1 billion tons of construction reserves. Has 10,140 employees. Officers/directors own 1.0% of common stock; The Vanguard Group, 11.1% (3/18 Proxy).

Additional Company Information from Website:
A strong infrastructure is the heart of our economy. It is the natural gas and electricity that power business, industry and our daily lives. It is the pipes and wires that connect our homes, factories, offices and stores to bring them to life. It is the transportation network of roads, highways and airports that keeps our economy moving. Infrastructure is our business. We provide essential products and services through our two lines of business: regulated energy delivery and construction materials and services. Our company was founded in 1924 as a small electric utility serving a handful of farm communities on the border of Montana and North Dakota. We realized early the value of delivering a variety of services, and grew our company by developing businesses around our expertise. Today, MDU Resources is a multibillion-dollar corporation with operations, customers and employees across the country. We have more than 13,000 employees during peak construction season and are authorized to conduct business in 45 states. MDU Resources is the largest publicly traded company headquartered in North Dakota. Our stock has traded since 1948 under the symbol MDU on the New York Stock Exchange. We have paid dividends uninterrupted to our shareholders for 81 years. We have increased dividends 28 consecutive

[144] http://www.martinmidstream.com/about-us, accessed 3/11/2019

years, a feat accomplished by fewer than 90 of the U.S.-listed companies. Our commitment to paying dividends is reflected in our membership in the S&P High-Yield Dividend Aristocrats index.[145]

Why was the company not included?
MDU Resources Group, Inc. largest business segment is construction materials and contracting, and second largest business segment is construction services. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

National Fuel Gas Company
Company Summary from Value Line:
National Fuel Gas Company is engaged in the production, gathering, transportation, distribution, and marketing of natural gas & oil. Exploration/Production (46.1% of '18 profit), Pipeline/Storage (21.3%), Gathering (14.2%), Utility (13.1%), Energy Marketing (.1%), and Other (-5.2%). NFG has a large position in the Marcellus Shale basin in western NY & PA and oil reserves in CA. Proved reserves as of 9/30/18: 27,663 Mbbl of oil, and 2,357,342 MMcf of natural gas. Has 2,105 employees. Off./dir. own 2.4% of stock; Vanguard, 12.0%; BlackRock, 7.7%; Gabelli, 7.6%; State St., 6.0% (1/18 proxy).

Additional Company Information from Website:
National Fuel Gas Distribution Corporation sells or transports natural gas to more than 740,000 customers through a local distribution system located in western New York and northwestern Pennsylvania. National Fuel Gas Supply Corporation provides interstate natural gas transmission and storage for affiliated and nonaffiliated companies through an integrated gas pipeline system that extends over 2,300 miles from southwestern Pennsylvania to the New York-Canadian border at the Niagara River. Empire Pipeline, Inc. provides interstate natural gas transmission services for affiliated and nonaffiliated companies through a high-pressure gas pipeline system that extends throughout Western and Central New York, over 245 miles from the New York-Canadian border at the Niagara River to interconnections with the Millennium Pipeline near Corning, NY and Marcellus Shale producers in North-Central Pennsylvania, and east to the Syracuse, NY area. Empire delivers gas to other interstate pipelines, large manufacturing facilities, local gas utilities and electric generation plants that are located along its pipeline. These local gas utilities and electric generators rely on this delivered natural gas to dependably provide energy to over 1 million consumers. National Fuel Gas Midstream Company, LLC's primary business is to build, own and operate natural gas processing and pipeline gathering facilities in the Appalachian region. Seneca Resources Company, LLC explores for, develops and produces natural gas and oil reserves in California and Appalachia, including the Marcellus Shale. National Fuel Resources, Inc. (NFR) markets natural gas to industrial, wholesale, commercial, public authority and residential customers primarily in western and central New York and northwestern Pennsylvania, offering competitively priced natural gas for its customers. *National Fuel's Marcellus Shale production assets, Appalachian pipeline and storage operations, and retail service territories share the same geographic area. The company also owns significant crude oil production assets in California.*[146]

Why was the company not included?
National Fuel Gas Company's largest business segment is exploration and production. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[145] https://www.mdu.com/our-business-overview, accessed 3/7/2019
[146] https://www.natfuel.com/aboutus.aspx, accessed 3/7/2019

Newfield Exploration Company
Company Summary from Value Line:
Newfield Exploration explores and produces crude oil, NGL, and natural gas primarily in the Anadarko and Arkoma basins of Oklahoma, the Williston Basin of North Dakota, and the Uinta Basin of Utah. 2017 production: 152 million barrels of oil equivalent (boe) per day. Proved reserves at December 31, 2017: 680 million boe, 99% of total reserves are in the U.S. Acquired additional land in the Anadarko Basin in 6/16. Sold Texas assets in 9/16. Has 1,100 employees. Officers and directors own less than 1.0% of common stock; Wellington Management Group, 13.9%, (3/18 proxy).

Additional Company Information from Website:
Encana Corporation announced February 13, 2019 that it has completed its acquisition of Newfield Exploration Company in an all-stock transaction.[147]

Why was the company not included?
No longer publicly traded.

NGL Energy Partners
Company Summary from Value Line:
NGL Energy Partners, LP, together with its subsidiaries, engages in the crude oil logistics, water solutions, liquids, retail propane, and refined products and renewables businesses. It purchases crude oil from producers and transports it to refineries for resale at pipeline injection stations, storage terminals, barge loading facilities, rail facilities, refineries, and other trade hubs; and provides storage, terminating, trucking, marine, and pipeline transportation services. It is involved in the treatment and disposal of wastewater generated from crude oil and natural gas production operations; disposal of solids, such as tank bottoms, drilling fluids, and drilling muds. It supplies natural gas liquids to retailers, wholesalers, refiners, and petrochemical plants in the United States and Canada through its 21 terminals. It sells propane, distillates, and equipment and supplies to end users consisting of residential, agricultural, commercial, and industrial customers. Has 2400 employees.

Additional Company Information from Website:
We are a publicly traded Master Limited Partnership listed under the ticker symbol "NGL" on the New York Stock Exchange. NGL Energy Partners LP is a diversified midstream MLP that provides multiple services to producers and end-users, including transportation, storage, blending and marketing of crude oil, NGLs, refined products / renewables, and water solutions. Vertical integration enables NGL to be the full service provider:

- Transport crude oil from the wellhead to refiners
- Wastewater from the wellhead to treatment for disposal, recycle or discharge
- Natural Gas Liquids from fractionators / hubs to refineries and end users
- Refined Products from refiners to customers[148]

Why was the company not included?
NGL Resources has several other business segments besides transportation, including blending and marketing of crude oil, water solutions, and settling propane, distillates, and equipment and supplies to end

[147] https://www.encana.com/news-stories/news-releases/details.html?release=17261, accessed 3/8/2019
[148] http://www.nglenergypartners.com/about-ngl/, accessed 3/8/2019

users. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Noble Midstream Partners, L.P.

Company Summary from Value Line:

Noble Midstream Partners, LP is a growth-oriented Delaware master limited partnership formed to own, operate, develop, and acquire a wide range of domestic midstream infrastructure assets. It provides crude oil, natural gas, and water-related midstream services through long-term, fixed-fee contracts. The company's current focus areas are in the Denver-Julesburg (DJ) Basin in Colorado and the Southern Delaware Basin position of the Permian Basin (Delaware Basin) in Texas. It also serves as the operator of the Advantage system, which includes a 70 -mile crude oil pipeline in the southern Delaware Basin from Reeves County, TX to Crane County, TX, with 150,000 barrels of daily shipping capacity and 490,000 barrels of storage capacity. The company was founded in 2014 by its parent company Noble Energy, Inc. Has 143 employees.

Additional Company Information from Website:

Noble Midstream Partners is a growth-oriented master limited partnership formed by Noble Energy to own, operate, develop and acquire midstream infrastructure assets. Our assets reside in two of the most resilient oil basins in the United States: the DJ Basin in Colorado and the Delaware Basin in Texas. In these areas, we provide crude oil, natural gas and water-related midstream services for Noble Energy and third parties. In the Denver-Julesburg Basin (DJ Basin) in Colorado, we have acreage dedications spanning approximately 300,000 acres (235,000 dedicated acres from Noble and 65,000 from a third party). We have approximately 111,000 dedicated acres in Reeves County in the Delaware Basin where we will provide crude oil, natural gas and water-related midstream services under long-term, fixed fee contracts. In addition to these existing operations and acreage dedications, Noble Energy has granted us rights of first refusal (ROFR) on a combination of midstream assets. Retained assets include natural gas gathering and processing facilities serving the East Pony area in the DJ Basin and approximately 31,000 acres in Webb and Dimmit Counties in the Eagle Ford Shale area of South Texas. Noble Midstream Partners owns and operates the Advantage Pipeline, a 16-inch common carrier crude oil pipeline serving the southern Delaware Basin (assets owned by joint venture with Plains All American Pipeline).[149]

Why was the company not included?

Noble Midstream Partners business segments include operations and acreage dedications in the DJ Basin and Delaware Basin, natural gas gathering and processing facilities. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing. However, Noble Midstream Partners has co-ownership of a common carrier pipeline with Plains All American Pipeline. The department reviews Plains All American Pipeline as a guideline company.

NuStar Energy, L.P.

Company Summary from Value Line:

NuStar Energy, LP, through its subsidiaries, engages in the transportation, terminalling, and storage of crude oil and refined products. It conducts operations through its subsidiaries, primarily NuStar Logistics, LP, and NuStar Pipeline Operating Partnership, LP. The company's Storage segment provides storage and handling services on a fee basis for petroleum products, specialty chemicals and other liquids, including crude oil and other feedstock. Its Pipeline segment owns common carrier refined

[149] http://www.nblmidstream.com/about-us/, accessed 3/8/2019

product pipelines in Colorado, Iowa, Kansas, Minnesota, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas. Within its Fuels Marketing operations, the company purchases crude oil and refined petroleum products for resale. NuStar currently has 9,300 miles of pipeline and 81 terminal and storage facilities that store and distribute crude oil, refined products, and specialty liquids. NuStar Energy, L.P. was founded in 1999 and is headquartered in San Antonio, Texas. Has 1694 employees.

Additional Company Information from Website:
With an enterprise value of around $7 billion, NuStar Energy L.P. (NYSE: NS) is a master limited partnership based in San Antonio, TX. NuStar currently has more than 9,700 miles of pipeline and 75 terminal and storage facilities that store and distribute crude oil, refined products and specialty liquids. The partnership's combined system has more than 88 million barrels of storage capacity at its facilities around the world, and NuStar has operations in the United States, Canada, Mexico and St. Eustatius in the Caribbean.[150]

NuStar GP Holdings LLC and NuStar Energy LP announced completion of their merger on July 20, 2018. “We are very pleased to see this transaction close,” said Brad Barron, president and chief executive officer of NS and NSH. “By simplifying our corporate structure and eliminating the incentive distribution rights, we are able to lower our cost of capital and create a more efficient and transparent structure, which is a key component of a comprehensive plan to position NuStar for long-term financial strength and allow us to successfully de-lever and deliver strong, sustainable distribution coverage in the future.” The surviving entity is NuStar Energy LP.[151]

Why was the company not included?
This company is aligned with, and is one of, the fluid transportation companies that the State Assessed Section is responsible for valuing. However, this company was recently involved in a merger.

NuStar GP Holdings, LLC
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
NuStar GP Holdings LLC and NuStar Energy LP announced completion of their merger on July 20, 2018. “We are very pleased to see this transaction close,” said Brad Barron, president and chief executive officer of NS and NSH. “By simplifying our corporate structure and eliminating the incentive distribution rights, we are able to lower our cost of capital and create a more efficient and transparent structure, which is a key component of a comprehensive plan to position NuStar for long-term financial strength and allow us to successfully de-lever and deliver strong, sustainable distribution coverage in the future.” The surviving entity is NuStar Energy LP.[152]

[150] http://investor.nustarenergy.com/phoenix.zhtml?c=123440&p=irol-irhome, accessed 3/8/2019
[151] http://investor.nustarenergy.com/phoenix.zhtml?c=123440&p=irol-newsArticle&ID=2359296, accessed 3/8/2019
[152] http://investor.nustarenergy.com/phoenix.zhtml?c=123440&p=irol-newsArticle&ID=2359296, accessed 3/8/2019

Why was the company not included?
Company is no longer publicly traded.

Paramount Resources Ltd.
Company Summary from Value Line:
Paramount Resources Ltd. is an independent exploration and production company that produces, develops, acquires, and explores for crude oil, natural gas, and natural gas liquids, with primary operations in Canada. Its principal properties are located in the Southern and Western portions of Alberta, as well as British Columbia. The company also invests in public and private corporations. Acquired Apache Canada Ltd. (8/17) and completed a merger transaction with Trilogy Energy Corporation. (9/17). Has 692 employees.

Additional Company Information from Website:
Paramount Resources Ltd. is a leading, independent Canadian energy company that is focused on responsibly developing its world-class portfolio of diverse resource plays while consistently building value for shareholders. Paramount explores for, develops, produces and markets natural gas, oil and natural gas liquids in Alberta, British Columbia, Saskatchewan and the Northwest Territories. Operating in Canada since 1976, Paramount's combination of focused approach, technical expertise and financial depth has propelled the Company into one of the top exploration and production firms in Canada. With daily production now nearing 100,000 Boe/d since the acquisition of Apache Canada Ltd. and merger with Trilogy Energy Corp., Paramount is poised for tremendous growth as it works to develop top-tier positions in the heart of Alberta's Duvernay and Montney plays.[153]

Why was the company not included?
Paramount Resources Ltd.'s main business segments include explores, develops, produces, and markets natural gas, oil, and natural gas liquids. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

PBF Logistics, L.P.
Company Summary from Value Line:
PBF Logistics, LP is a fee-based, growth-oriented master limited partnership formed by PBF Energy, Inc. to own or lease, operate, develop and acquire crude oil and refined petroleum products terminals, pipelines, storage facilities, and similar logistics assets. The company operates in two segments: Transportation and Terminaling, and Storage. The company's assets include Delaware City rail unloading terminal, a light crude oil rail unloading terminal, which serves Delaware City and Paulsboro refineries; Toledo truck unloading Terminal, that serves Toledo refinery; Delaware City west heavy unloading rack, a heavy crude oil unloading facility, which serves Delaware City refinery; and a terminaling facility that consists of 27 propane storage bullets and a truck loading facility. Its storage facility consists of 30 tanks for storing crude oil, refined products, and intermediates. The company was founded in 2012 and is based in Parsippany, New Jersey. Has 39 employees.

[153] http://www.paramountres.com/about-us, accessed 3/8/2019

Additional Company Information from Website:
PBF Logistics LP, headquartered in Parsippany, New Jersey, is a fee-based, growth-oriented master limited partnership formed by PBF Energy to own or lease, operate, develop and acquire crude oil and refined petroleum products, terminals, pipelines, storage facilities and similar logistics assets.[154]

Why was the company not included?
This company's market segments are terminaling and storage. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

PDC Energy, Inc.
Company Summary from Value Line:
PDC Energy, Inc. is a domestic independent exploration and production company that produces, develops, acquires, and explores for crude oil, natural gas, and natural gas liquids, with primary operations in the Wattenberg Field in Colorado and the Delaware Basin in Texas. As of Dec. 31, 2017, the company owned an interest in approximately 2,800 gross producing wells, of which approximately 895 were horizontal. Production of 31.8 MMboe from continuing operations for the year ended December 2017, an increase of 44% compared to 2016. Has 425 employees.

Additional Company Information from Website:
Founded in 1969, PDC Energy is an independent exploration and production company focused on responsible development of natural resources in some of the most prolific oil and gas regions in the United States, specifically in the core of the Wattenberg Field in Colorado and the Delaware Basin in West Texas. We apply our multi-disciplined technical expertise to the development of unconventional oil and gas resources to generate positive results in a responsible manner. PDC Energy is committed and dedicated to serving the interests of all our stakeholders by being both a good steward of the resources we operate and delivering attractive returns to our investors.[155]

Why was the company not included?
PDC Energy, Inc.'s main business segments are exploration and production of crude oil, natural gas, and natural gas liquids. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Pembina Pipeline Corporation
Company Summary from Value Line:
Pembina Pipeline Corp. gathers, processes, and transports oil and natural gas in Western Canada. It owns and operates an integrated system of pipelines, gas gathering and processing facilities, and an oil and NGL infrastructure and logistics line. 2017 net volumes (operating income): Conventional Pipelines: 33% (34%); Oil Sands & Heavy Oil: 46% (7%); Midstream: 6% (33%); Gas Services: 8% (14%) Veresen: 7% (12%). Daily 2017 liquids throughput: 2.3 bill. bar.; Oil Sands & Heavy Oil, 51%; Conventional Pipelines, 36%; Midstream NGLs, 7%; Gas Services, 6%. Has 1,539 employees.

Additional Company Information from Website:
Pembina is a leading transportation and midstream service provider that has been serving North America's energy industry for over 60 years. Pembina owns an integrated system of pipelines that

[154] http://www.pbflogistics.com/, accessed 3/8/2019
[155] http://www.pdce.com/about-pdc-energy/l, accessed 3/8/2019

transports various hydrocarbon liquids and natural gas products produced primarily in western Canada. The Company also owns gas gathering and processing facilities and an oil and natural gas liquids infrastructure and logistics business. Pembina's integrated assets and commercial operations along the majority of the hydrocarbon value chain allow it to offer a full spectrum of midstream and marketing services to the energy sector. Pembina is committed to identifying additional opportunities to connect hydrocarbon production to new demand locations throughout the development of infrastructure that would extend Pembina's service offering even further along the hydrocarbon value chain. These new developments will contribute to ensuring that hydrocarbons produced in the Western Canadian Sedimentary Basin and the other basins where Pembina operates, can reach the highest value markets throughout the world.[156]

Why was the company not included?
This company is not traded on an American Stock Exchange; financial information is provided in Canadian dollars.

Plains GP Holdings, L.P.
Company Summary from Value Line:
Plains GP Holdings, LP owns and operates midstream energy infrastructure in the United States and Canada. It engages in the transportation of crude oil and natural gas liquids (NGLs) on pipelines, gathering systems, trucks, and barges. It is involved in the provision of storage, terminalling, and throughput services primarily for crude oil, NGLs, and natural gas; NGL fractionation and isomerization services; and natural gas and condensate processing services. The company engages in merchant-related activities, including purchase of crude oil, as well as NGL from producers, refiners, processors, and other marketers; storage of NGL and natural gas; and resale and transport of crude oil and NGL. The company offers logistics services, principally for crude oil, NGLs, and natural gas. PAA GP Holdings, LLC operates as a general partner of the company. Plains GP Holdings, LP was founded in 2013 and is headquartered in Houston, Texas. Has 4850 employees.

Additional Company Information from Website:
Plains GP Holdings, L.P. ("PAGP") is a Delaware limited partnership formed in July 2013 that has elected to be taxed as a corporation for United States federal income tax purposes. PAGP does not directly own any operating assets; as of December 31, 2018, its principal sources of cash flow are derived from an indirect investment in Plains All American Pipeline, L.P ("PAA"), a publicly traded Delaware limited partnership.[157]

Why was the company not included?
This company was not included because we used Plains All American Pipeline, L.P. as a guideline company.

QEP Resources, Inc.
Company Summary from Value Line:
QEP Resources, Inc. is an independent energy company spun off from Questar Corp. in June of 2010. The company acquires, explores for, develops, and produces natural gas, oil, and natural gas liquids in

[156] http://www.pembina.com/about-us, accessed 3/8/2019
[157] http://www.edgarexplorer.com/EFX_dll/EdgarPro.dll?FetchFilingConvPDF1?SessionID=0F6tUeTT_C8kiwc&ID=13256321, accessed 3/8/2019

North Dakota, Wyoming, Utah, Texas, Louisiana, and Colorado. Sold midstream business, 12/14. Total proved reserves at 12/31/17: 684.7 million barrels of oil equivalent. Liquids production represented 47% of the total. Had 656 employees at 12/31/2017. Officers and directors own 1.6% of common; BlackRock, Inc., 8.6%; Vanguard Group, Inc., 8.5% (4/18 Proxy).

Additional Company Information from Website:
With a proud legacy and an exciting future, QEP Resources is a leading independent crude oil and natural gas exploration and production company focused on two of the most prolific resource plays in the continental United States — the Permian Basin in Texas and the Williston Basin in North Dakota. Our portfolio of low-cost, high-quality resource plays provides a solid foundation for sustainable growth with 658.2 MMboe of year-end 2018 proved reserves. Our total 2018 production of 51,857.9 Mboe consisted of approximately 52% crude oil. Headquartered in Denver, Colorado, QEP is an S&P MidCap 400 Index member company and its common shares trade on the New York Stock Exchange under the ticker symbol QEP.[158]

Why was the company not included?
QEP Resources Inc.'s business segments include exploration, development, and production of natural gas, oil, and natural gas liquids. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Rice Midstream Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
EQT Midstream Partners, LP (EQM) and Rice Midstream Partners LP announced July 20, 2018 unitholder approval of RMP's previously announced merger transaction with EQM.[159]

Why was the company not included?
Company is no longer publicly traded.

Shell Midstream Partners, L.P.
Company Summary from Value Line:
Shell Midstream Partners, L.P. was formed in March 2014 and is a subsidiary of Shell Pipeline Company LP. It owns and operates pipelines and other midstream assets, including refined products terminals and processing facilities. It operates both onshore and offshore pipelines that originate in Louisiana, Mississippi, and the Gulf of Mexico. Its processing terminals are in Washington, Oregon, Michigan, Illinois, and Texas.

Additional Company Information from Website:
Shell Midstream Partners, L.P., headquartered in Houston, growth-oriented midstream master limited partnership formed by Royal Dutch Shell plc to own, operate, develop and acquire pipelines and other midstream assets. Shell Midstream Partner, L.P.'s assets include interests in entities that own crude oil

[158] http://www.qepres.com/about/, accessed 3/8/2019
[159] https://ir.eqm-midstreampartners.com/press-release/eqgp/rice-midstream-partners-unitholders-approve-merger-eqt-midstream-partners?referrer=eqm, accessed 3/6/2019

and refined products pipelines and terminals that serve as key infrastructure to (i) transport onshore and offshore crude oil production to Gulf Coast and Midwest refining markets and (ii) deliver refined products from those markets to major demand centers. Our assets also include interests in entities that own natural gas and refinery gas pipelines that transport offshore natural gas to market hubs and deliver refinery gas from refineries and plants to chemical sites along the Gulf Coast.[160]

Why was the company not included?
This company is mainly services the Gulf Coast (including offshore assets), the Gulf Coast to New York City, and the Gulf Coast to the Midwest. The Explorer pipeline system from the Gulf Coast to the Midwest transports gasoline, diesel, fuel oil, and jet fuel from the US Gulf Coast to Hammon, IL. The Explorer pipeline system is the company's only asset that is similar to the companies the State Assessed Property Section is responsible for valuing. The Explorer pipeline system is not a large enough portion of the company's overall business segments (Shell Midstream Partners, L.P. only owns 2.62% ownership interest in Explorer).

Southcross Energy Partners, L.P.
Company Summary from Value Line:
Not able to access.

Additional Company Information from Website:
Southcross Energy Partners, L.P. ("Southcross") is a master limited partnership that provides natural gas gathering, processing, treating, compression and transportation services and NGL fractionation and transportation services. It also sources, purchases, transports and sells natural gas and NGLs. Its assets are located in South Texas, Mississippi and Alabama and include two cryogenic gas processing plants, a fractionation facility and approximately 3,100 miles of pipeline. The South Texas assets are located in or near the Eagle Ford shale region. Southcross is headquartered in Dallas, Texas. Our integrated operations provide a full range of complementary services extending from wellhead to market, including gathering natural gas at the wellhead, treating natural gas to meet downstream pipeline and customer quality standards, processing natural gas to separate NGLs from the natural gas, fractionating the resulting NGLs into the various components and selling or delivering pipeline quality natural gas and NGLs to various industrial and energy markets as well as large pipeline systems. Through our network of pipelines, we provide the means of connecting our suppliers of natural gas to our customers, which include industrial, commercial and power generation customers and local distribution companies.[161]

Why was the company not included?
This company is located in Texas, Mississippi, and Alabama. Those locations are in a different market than the market of the companies for which the State Assessed Section is responsible for valuing.

Southwestern Energy Company
Company Summary from Value Line:
Southwestern Energy Company is primarily engaged in the exploration & production of natural gas and oil. Exploration & production property locations include the Fayetteville Shale and the Marcellus Shale. Also has E&P activities in Colorado and Louisiana. At 12/17, the company owned 14,775 billion cubic feet equivalent of total proven natural gas and oil reserves. ~Sold utility Arkansas Western Gas Co.,

[160] http://www.shellmidstreampartners.com/investor-relations, accessed 3/8/2019
[161] http://www.southcrossenergy.com/about/, accessed 3/8/2019

7/08. ~Has 1,575 employees. Off. & dir. own less than 1.0% of common; BlackRock, Inc., 10.4%; The Vanguard Group, 8.3%; Capital Research Global Investors, 8.3%; FMR LLC, 6.0% (4/18 Proxy).

Additional Company Information from Website:
We are energy. For more than 80 years, Southwestern Energy Company has thrived because of a deep commitment to providing the energy that powers our world. Our success continues to be dependent upon the dedication of our employees to the company and to the communities in which we operate. Southwestern Energy Company is an independent energy company whose wholly-owned subsidiaries are engaged in natural gas, natural gas liquids and oil exploration, development, production, gathering and marketing. We are explorers and producers. Though we search far beyond our current operating footprint, our work is principally focused on the development of natural gas and natural gas liquids in the Appalachian Basin in Pennsylvania and West Virginia, and the exploration of oil and natural gas in other new venture plays in North America. We are Midstream Services. Our commitment to creating value through innovation is evident in our Midstream Services segment, which primarily supports our E&P operations. Midstream Services generates revenue from gathering fees associated with the transportation of natural gas and natural gas liquids to market and through the marketing of our own gas production and some third-party natural gas.

Why was the company not included?
Southwestern Energy Company main business segments include exploration and production of natural gas and oil. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Spectra Energy Corp.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Enbridge Inc. announced February 27, 2017 the completion of the previously announced stock-for-stock merger transaction to acquire all of the outstanding common stock of Spectra Energy Corp. Trading in shares of Spectra Energy common stock on the New York Stock Exchange (NYSE) will be suspended effective as of the opening of trading today. In connection with the completion of the merger, the shares of common stock of Spectra Energy will be delisted from the NYSE and will be de-registered under the U.S. Securities Exchange Act of 1934. Common shares of Enbridge will continue to trade on both the NYSE and the Toronto Stock Exchange under the symbol "ENB".[162]

Why was the company not included?
Company is no longer publicly traded.

Spectra Energy Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

[162] https://www.enbridge.com/media-center/news/details?id=122510&lang=en, accessed 3/8/2019

Additional Company Information from Website:
Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, Enbridge Energy Partners, L.P. and Enbridge Energy Management, LLC, announced December 20, 2018 that they have completed the previously announced respective merger of EEP with a wholly owned subsidiary of Enbridge, and the merger of EEQ with a wholly owned subsidiary of Enbridge, each pursuant to an Agreement and Plan of Merger dated as of September 17, 2018. The EEP merger resulted in Enbridge acquiring all of the outstanding public Class A common units of EEP, and EEP becoming an indirect, wholly owned subsidiary of Enbridge, and the EEQ Merger resulted in Enbridge acquiring all of the outstanding public Listed Shares of EEQ, and EEQ becoming a direct, wholly owned subsidiary of Enbridge.[163]

Enbridge Inc., on behalf of itself and certain of its wholly owned U.S. subsidiaries, and Spectra Energy Partners, LP announced December 17, 2018 that they have competed the previously announced merger pursuant to an Agreement and Plan of Merger dated as of August 24, 2018. The Merger resulted in Enbridge acquiring all of the outstanding public common units of SEP and SEP becoming an indirect, wholly owned subsidiary of Enbridge.[164]

Why was the company not included?
Company is no longer publicly traded.

Sprague Resources, L.P.
Company Summary from Value Line:
Sprague Resources, LP engages in the purchase, storage, distribution, and sale of refined petroleum products and natural gas in the United States. The company purchases and sells various refined products, such as heating oil, diesel fuel, residual fuel oil, kerosene, jet fuel, gasoline, and asphalt to wholesale and commercial customers. Its wholesale customers consist of approximately 1,100 home heating oil retailers, and diesel fuel and gasoline resellers; and commercial customers include federal and state agencies, municipalities, regional transit authorities, large industrial companies, real estate management companies, hospitals, educational institutions, and asphalt paving companies. It purchases, sells, and distributes natural gas to approximately 15,000 commercial and industrial customer locations across 13 states in the Northeast and Mid-Atlantic. Sprague Resources LP was founded in 1870 and is headquartered in Portsmouth, New Hampshire. Has 880 employees.

Additional Company Information from Website:
Throughout our history, Sprague has focused relentlessly on exceeding customer expectations—moving their businesses forward with our insights, knowledge and wide-ranging strategic experience. We strive every day to be a premier energy partner. With a deep understanding of each customer's unique energy needs, we create custom-tailored solutions that give them greater control over their natural gas, fuel, electricity and materials handling costs. Founded in 1870 as a distributor of coal and petroleum-based products, today Sprague is one of the largest independent suppliers of energy products and related services in the Northeast. Our strategically located refined products and materials handling terminals, coupled with our natural gas pipeline capacity, give us unprecedented access to energy products and services. We market products to over 20,000 retail, commercial, industrial, utility and wholesale

[163] https://www.enbridgepartners.com/Media-Center/News.aspx?queryYear=2018&ReleaseId=123009, accessed 3/6/2019
[164] https://www.enbridge.com/media-center/news/details?id=123546&lang=en, accessed 3/6/2019

customers. Our goal is to consistently exceed your expectations and earn your business with every interaction. We work tirelessly to provide you with the knowledge and tools to administer your energy buying and reporting needs—all to help your business thrive.[165]

Why was the company not included?
This company purchases and sells various refined products and purchases, sells and distributes natural gas. The company also offloads, stores, and prepares for delivery of customer owned products. The company engages in the marketing and distribution of coal. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Suburban Propane Partners, L.P.
Company Summary from Value Line:
Suburban Propane Partners, L.P., is a master limited partnership (MLP) that markets and distributes propane, fuel oil, and other refined fuels in the U.S., operating in Propane; Fuel Oil and Refined Fuels; Natural Gas and Electricity; and Heating, Ventilation, and Air Conditioning (HVAC). As of 9/30/17, serves about 1.0 million active propane customers through roughly 668 locations in 41 states, concentrated on the east and west coasts of the United States. Sold approximately 420 million gallons of propane and 30.9 million gallons of fuel oil in fiscal 2017. Has 3,221 employees.

Additional Company Information from Website:
Headquartered in Whippany, New Jersey, Suburban Propane is a nationwide marketer and distributor of a diverse array of products to meet the energy needs of our customers. Specializing in propane, heating oil and refined fuels, as well as the marketing of natural gas and electricity in deregulated markets. With nearly 3,200 full-time employees, Suburban Propane maintains business operations in 41 states, providing prompt, reliable service to approximately 1.1 million residential, commercial, industrial and agricultural customers through 668 locations.[166]

Why was the company not included?
This company specializes in marketing and distributing fuel oil and refined fuels as well as the marketing of natural gas and electricity in deregulated markets. These specializations are not the same market segments as the companies in which the State Assessed Section is responsible for valuing.

Summit Midstream Partners, L.P.
Company Summary from Value Line:
Summit Midstream Partners, LP focuses on owning, developing, and operating midstream energy infrastructure assets primarily shale formations in the continental United States. The company provides natural gas gathering, treating, and processing services, as well as crude oil and produced water gathering services. It operates in five unconventional resource basins, including the Appalachian Basin, which comprises the Utica and Point Pleasant shale formations in southeastern Ohio, and the Marcellus Shale formation in northern West Virginia; the Williston Basin that consists of the Bakken and Three Forks shale formations in northwestern North Dakota; the Fort Worth Basin, which includes the Barnett Shale formation in north-central Texas; the Piceance Basin that comprises the Mesaverde formation, and the Mancos and Niobrara shale formations in western Colorado and eastern Utah; and the Denver-Julesburg Basin, which includes the Niobrara and Codell shale formations in northeastern Colorado.

[165] https://www.spragueenergy.com/about, accessed 3/8/2019
[166] https://suburbanpropane.com/about/about-suburban-propane.php, accessed 3/8/2019

Additional Company Information from Website:
Headquartered in The Woodlands, Texas, Summit Midstream Partners, LP (NYSE: SMLP) is a growth-oriented master limited partnership focused on developing, owning and operating midstream energy infrastructure assets that are strategically located in the core producing areas of unconventional resource basins, primarily shale formations, in the continental United States. We currently operate natural gas, crude oil and produced water gathering systems in five unconventional resource basins. SMLP is in the process of developing new gathering and processing infrastructure in a sixth basin, the Delaware Basin, in New Mexico. SMLP also owns a 40% ownership interest in Ohio Gathering, which is included in the Utica Shale segment. Ohio Gathering is developing natural gas gathering and condensate stabilization infrastructure in the Utica Shale in southeastern Ohio. We generate a substantial majority of our revenue under primarily long-term and fee-based gathering agreements with our customers. The majority of our gathering agreements are underpinned by areas of mutual interest ("AMIs") and minimum volume commitments ("MVCs"). Our AMIs provide that any production drilled by our customers within the AMIs will be shipped on our gathering systems. The MVCs are designed to ensure that we will generate a minimum amount of gathering revenue over the life of each respective gathering agreement. The fee-based nature of the majority of the gathering agreements enhances the stability of our cash flows and limits our direct commodity price exposure.[167]

Why was the company not included?
This company's main business segments are natural gas gathering, treating and compression services. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Tallgrass Energy, LP (formerly known as Tallgrass Energy GP, L.P.)
Company Summary from Value Line:
Tallgrass Energy GP, LP, through its interests in Tallgrass Equity, LLC, provides crude oil transportation services to customers in Wyoming, Colorado, and the surrounding regions of the United States. The company operates through three segments: Natural Gas Transportation; Crude Oil Transportation; and Gathering, Processing & Terminalling. It also provides natural gas transportation and storage services for customers in the Rocky Mountain, Midwest, and Appalachian regions; natural gas and crude oil gathering and processing services for customers in Wyoming; and natural gas liquids (NGLs) transportation services in Northeast Colorado and Wyoming. In August 2018, the company announced plans to develop a new crude oil pipeline from Cushing, Okla., to the St. James, La., refining complex, as well as a separate new export-capable liquids terminal strategically located near the mouth of the Mississippi River.

Additional Company Information from Website:
We're a growth-oriented midstream energy company, transporting crude oil and natural gas from some of the nation's most prolific basins in the Rocky Mountains, Upper Midwest and Appalachian regions with access to major demand markets in the Rockies, the Midwest, eastern Ohio and points beyond. Since our inception in 2012, we've built a strong portfolio of integrated transportation, storage, terminal, water management, gathering, processing and treating assets to support our customers, increase value and deliver pace-setting shareholder returns.

[167] http://www.summitmidstream.com/about, accessed 3/8/2019

We own and operate more than 8,300 miles of natural gas pipeline, more than 800 miles of crude pipeline, and more than 300 miles of water pipeline across a broad portion of the U.S. We also have one of the industry's leading water reclamation programs situated in close proximity to producers.
At every step of the way, our focus is on creating value for our customers, helping them move product in ways that lead to timely, accurate and safe delivery at higher margins.
At Tallgrass Energy, we work hard to create value for our customers and provide creative solutions that help them succeed in any market environment.[168]

Tallgrass Energy Partners, LP (TEP) and Tallgrass Energy GP, LP (TEGP) announced on June 26, 2018 that a special meeting, TEP unitholders overwhelmingly approved the stock-for-unit merger transaction in which TEGP will acquire the approximately 47.6 million TEP common unit held by the public at a ratio of 2.0 TEGP Class A shares for each outstanding TEP common unit. The merger transaction is expected to close on June 29, 2018 and be effective as of June 30, 2018. Upon completion of the transaction, TEGP will change its name to Tallgrass Energy, LP. Beginning July 2, 2018, TEGP's Class A shares will trade on the NYSE under the ticker symbol "TGE" and TEP's common units will no longer be publicly traded.[169]

Why was the company not included?
This company was not included due to the recent merger. Consider for future studies.

Tallgrass Energy Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Tallgrass Energy Partners, LP (TEP) and Tallgrass Energy GP, LP (TEGP) announced on June 26, 2018 that a special meeting, TEP unitholders overwhelmingly approved the stock-for-unit merger transaction in which TEGP will acquire the approximately 47.6 million TEP common unit held by the public at a ratio of 2.0 TEGP Class A shares for each outstanding TEP common unit. The merger transaction is expected to close on June 29, 2018 and be effective as of June 30, 2018. Upon completion of the transaction, TEGP will change its name to Tallgrass Energy, LP. Beginning July 2, 2018, TEGP's Class A shares will trade on the NYSE under the ticker symbol "TGE" and TEP's common units will no longer be publicly traded.[170]

Why was the company not included?
Company is no longer publicly traded.

Targa Resources Corporation
Company Summary from Value Line:
Targa Resources is a leading provider of midstream services and is one of the largest independent midstream energy companies in N.A. It operates a diversified portfolio of midstream energy assets. Targa is engaged in the business of gathering, compressing, treating, processing, and selling natural gas, along with storing, fractionating, treating, transporting, and selling NGLs. Plant natural gas inlet 3,473.7

[168] http://www.tallgrassenergylp.com/About.aspx, accessed 3/8/2019
[169] http://ir-tge.tallgrassenergylp.com/file/Index?KeyFile=394018954, accessed 3/8/2019
[170] http://ir-tge.tallgrassenergylp.com/file/Index?KeyFile=394018954, accessed 3/8/2019

MMcf/d; Gross NGL production, 333.2 MBbl/d; Crude oil gathered 113.6 MBbl/d (all as of 12/31/17). 2017 depr. rate: 4.0%. Has 2,130 employees.

Additional Company Information from Website:
Targa is a leading provider of midstream services and is one of the largest independent midstream energy companies in North America. We own, operate, acquire, and develop a diversified portfolio of complementary midstream energy assets. We are primarily engaged in the business of: gathering, compressing, treating, processing, and selling natural gas; storing, fractionating, treating, transporting, and selling NGLs and NGL products, including services to LPG exporters; gathering, storing, terminaling and selling crude oil; storing, terminaling, and selling refined petroleum products.[171]

Why was the company not included?
Targa Resources Corporation has several other main business segments besides common carrier transportation of gas or fluids. These include, selling, services to LPG exporters, gathering, compressing, treating, processing, fractionating, etc. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

TC PipeLines, L.P.
Company Summary from Value Line:
TC PipeLines, LP, a wholly owned subsidiary of TransCanada Corp., acquires, owns, and participates in the management of energy infrastructure assets in North America. The company owns interests in six natural gas interstate pipeline systems, through which it transports approximately 9.1 billion cubic feet of natural gas per day from producing regions and import facilities to market hubs and consuming markets, primarily in the western and midwestern United States. It serves large utilities, local distribution companies, and natural gas marketers and producing companies. Also, the company invests in long-term critical energy infrastructure that provides reliable delivery of energy to customers in the United States; develops or acquires assets that provide stable cash distributions and opportunities for new capital additions; and maximize the utilization of pipeline systems, with a commitment to safe and reliable operations.

Additional Company Information from Website:
TC PipeLines, LP is a United States limited partnership which has delivered value to its investors while maintaining a solid cash distribution coverage ratio. Through its disciplined investment philosophy, TC PipeLines now has investments in eight critical FERC regulated, low-risk energy infrastructure pipelines, capable of moving 9.4 billion cubic feet per day of natural gas. Revenues from these assets are derived almost entirely from fee-based charges. With access to new gas supplies through support from its sponsor, TransCanada Corporation, who also operates our assets on our behalf, TC PipeLines' assets are connected to two of the largest supply basins in North America that are positioned to grow over the next decade. With a strong and conservative balance sheet, a low general partner cash take and an ample amount of available liquidity, we are well positioned.[172]

[171] http://www.targaresources.com/about-us/overview, accessed 3/11/2019
[172] http://www.tcpipelineslp.com/, accessed 3/11/2019

Why was the company not included?
This company is similar to the Gas Transmission Pipeline Companies that the State Assessed Section is responsible for valuing. However, the department is using corporations, not partnerships as guideline companies in the Gas Transmission Pipeline market segment.

TransMontaigne Partners, L.P.
Company Summary from Value Line:
TransMontaigne Partners, LP provides integrated terminaling, storage, transportation, and related services. The company operates through Gulf Coast terminals, Midwest terminals and pipeline system, Brownsville terminals, River terminals, Southeast terminals, and West Coast terminals segments. It offers its services for companies engaged in the trading, distribution, and marketing of light and heavy refined petroleum products, crude oil, chemicals, fertilizers, and other liquid products. The company operates eight refined product terminals in Florida with approximately 7.0 million barrels of aggregate active storage capacity; a 67 mile interstate refined products pipeline; two refined product terminals with approximately 5.0 million barrels of active storage capacity; and 5.4 million barrels of aggregate storage capacity. TransMontaigne Partners L.P. was founded in 2005 and is headquartered in Denver, Colorado. Has 504 employees.

Additional Company Information from Website:
TransMontaigne Partners (NYSE: TLP) is a leading provider of terminaling, storage, transportation and related services to the energy industry. We are a growth-oriented master limited partnership that owns and operates a diversified network of midstream terminals located in strategic markets throughout the United States. Our highly-contracted terminals and pipelines provide essential storage and transportation services to our customers, who are distributors and marketers for a wide array of petroleum products, crude oil, chemicals, fertilizers and other liquid products.[173]

Why was the company not included?
This company's main business segments are terminaling and storage. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

Valero Energy Partners, L.P.
Company Summary from Value Line:
Company is no longer publicly traded.

Additional Company Information from Website:
Valero Energy Corporation and Valero Energy Partners LP announced January 10, 2019 the completion of the previously announced merger between the partnership and a wholly owned subsidiary of Valero, pursuant to which Valero acquired all of the outstanding common units of the Partnership not already owned by Valero and its subsidiaries. Effective January 10, 2019, the Partnership's common units will no longer be publicly traded on the New York Stock Exchange.[174]

[173] http://www.transmontaignepartners.com/about-us/company-overview/, accessed 3/11/2019
[174] https://www.valero.com/en-us/Documents/Newsroom/Valero%20Energy%20Corporation%20and%20Valero%20Energy%20Partners%20LP%20Announce%20Completion%20of%20Merger.pdf, accessed 3/11/2019

Why was the company not included?
Company is no longer publicly traded.

Western Midstream Operating, LP (Formerly known as Western Gas Equity Partners, L.P.)
Company Summary from Value Line:
Western Gas Equity Partners, LP (WGP) is a Delaware master limited partnership formed in September 2012 to own three types of partnership interests in Western Gas Partners, LP (WES), which includes the general partner interest in WES, held through WES GP; 100% of the incentive distribution rights in WES, which entitle WGP to receive increasing percentages, up to the maximum level of 48% of any incremental cash distributed by WES as certain target distribution levels are reached in any quarter; and a significant limited partner interest in WES. WES was formed by Anadarko Petroleum Corp. in 2007 to acquire, own, develop, and operate midstream energy assets. In November 2018, WGP entered into a merger agreement with WES in which it will acquire all of the publicly held common units of WES in a tax-free unit-for-unit exchange. Each WES unitholder will receive 1.525 units of WGP for each WES unit held. The merger is expected to close in the first quarter of 2019.

Additional Company Information from Website:
Western Midstream Partners, LP is a growth-oriented Delaware master limited partnership formed by Anadarko Petroleum Corporation to acquire, own, develop and operate midstream energy assets. With midstream assets located in the Rocky Mountains, North-central Pennsylvania and Texas, WES is engaged in the business of gathering, compressing, treating, processing, and transporting natural gas; gathering, stabilizing and transporting condensate, natural gas liquids and crude oil; and gathering and disposing of produced water for Anadarko, as well as for other customers.[175]

Western Gas Equity Partners, LP and Western Gas Partners, LP announced February 28, 2019 the completion of their previously announced merger of a wholly owned subsidiary of WGP with and into WES, with WES continuing as the surviving entity and a subsidiary of WEGP. At the effective time of the merger, each WES common unit converted into the right to receive 1.525 WGP common units. Based on the WES units outstanding, WGP issued approximately 234 million WGP common units to WES unit holders in connection with the merger. Immediately following the Merger, WGP changed its name to "Western Midstream Partners, LP", and its common units will begin trading on the New York Stock Exchange ("NYSE") under the ticker symbol "WES" when the market opens today. In addition, Western Gas Partners, LP has changed its name to "Western Midstream Operating, LP", and its common units will no longer trade on the NYSE. "With the closing of these transformational transactions, Western Midstream has a simple, clean capital structure and offers its customers a uniquely scalable and integrated, multi-commodity solution," said Robin Fielder, Western Midstream's Chief Executive Officer. "As a result of our organic growth opportunities and the accretive acquisition of midstream assets completed today, our portfolio is projected to deliver more than 50% Adjusted EBITDA growth year-over-year and generate healthy distribution per unit growth and coverage through 2021 without the need for equity financing."[176]

[175] http://www.westernmidstream.com/About/, accessed 3/11/2019
[176] http://investors.westernmidstream.com/2019-02-28-Western-Gas-Completes-Simplification-and-Acquisition-Transactions, accessed 3/11/2019

Why was the company not included?
This company's main business segments include gathering and treating. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing. Also, recently involved in a merger with a related company.

Western Gas Partners, L.P.
Company Summary from Value Line:
No longer publicly traded.

Additional Company Information from Website:
Western Gas Equity Partners, LP and Western Gas Partners, LP announced February 28, 2019 the completion of their previously announced merger of a wholly owned subsidiary of WGP with and into WES, with WES continuing as the surviving entity and a subsidiary of WEGP. At the effective time of the merger, each WES common unit converted into the right to receive 1.525 WGP common units. Based on the WES units outstanding, WGP issued approximately 234 million WGP common units to WES unit holders in connection with the merger. Immediately following the Merger, WGP changed its name to "Western Midstream Partners, LP", and its common units will begin trading on the New York Stock Exchange ("NYSE") under the ticker symbol "WES" when the market opens today. In addition, Western Gas Partners, LP has changed its name to "Western Midstream Operating, LP", and its common units will no longer trade on the NYSE. "With the closing of these transformational transactions, Western Midstream has a simple, clean capital structure and offers its customers a uniquely scalable and integrated, multi-commodity solution," said Robin Fielder, Western Midstream's Chief Executive Officer. "As a result of our organic growth opportunities and the accretive acquisition of midstream assets completed today, our portfolio is projected to deliver more than 50% Adjusted EBITDA growth year-over-year and generate healthy distribution per unit growth and coverage through 2021 without the need for equity financing."[177]

Why was the company not included?
No longer publicly traded.

Williams Partners, L.P.
Company Summary from Value Line:
No Longer Publicly Traded.

Additional Company Information from Website:
The Williams Companies, Inc. and Williams Partners, L.P. announced on August 10, 2018 the closing of the merger of Williams partners with a subsidiary of Williams. Pursuant to the merger, Williams acquired all of the outstanding common units of Williams Partners it did not previously own. Williams Partners is no longer publicly traded.[178]

Why was the company not included?
Company is no longer publicly traded.

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[177] http://investors.westernmidstream.com/2019-02-28-Western-Gas-Completes-Simplification-and-Acquisition-Transactions, accessed 3/11/2019
[178] https://investor.williams.com/press-release/williams/williams-completes-acquisition-williams-partners, accessed 2/26/2019

World Fuel Services Corp.

Company Summary from Value Line:

World Fuel Services Corp., a leading global fuel logistics company, is engaged in the worldwide marketing and sale of marine, aviation, and land fuel products and related services. Its Marine segment offers fuel and related services to maritime customers, including international container and tanker fleets among others. The Aviation segment provides aviation fuel to commercial airlines, and others. The Land segment provides fuel and related services to petroleum distributors among others. Has more than 5,000 employees. Officers/Directors own 2.2% of shares (4/18 proxy).

Additional Company Information from Website:

World Fuel Services (NYSE: INT) is 91 on the Fortune 500* list. We provide energy procurement advisory services, supply fulfillment, and transaction and payment management solutions to commercial and industrial customers, principally in the aviation, marine and land transportation industries.[179]

Why was the company not included?

This company is a global fuel distributor. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

WPX Energy, Inc.

Company Summary from Value Line:

WPX Energy, Inc. is an independent natural gas and oil exploration and production company. It predominately operates in the Piceance Basin of the Rocky Mountain region. It also possesses interests in New Mexico, Texas, and N. Dakota. Principal operations are in the Delaware, Williston, and San Juan Basins. At Dec. 31, 2017, WPX's proven reserves amounted to 436 MMboe (bcfe) 23% of the reserves were natural gas, 60% crude oil, and 17% natural gas liquids. Spun off from The Williams Co. in 12/11. Sold Apco 10/14. Off./Dir. own 1.5% of shs.; Vanguard, 8.5%; and BlackRock, 8.8% (3/18 proxy).

Additional Company Information from Website:

WPX had 87 completions in the Permian during 2018, including 14 in the fourth quarter. We're focusing on the Wolfcamp A and Third Bone Spring formations. WPX completed 60 new wells in the Williston Basin during 2018, including 18 in the fourth quarter. We're focusing on the Bakken and Three Forks formations. WPX's joint venture gas plant in the Permian exceeded 85% utilization of the first 200 MMcf/d processing train & produced approximately 19,000 bbl/d of NGL in late 2018.[180]

Why was the company not included?

WPX Energy, Inc.'s main business segments include natural gas and oil exploration and production. These business segments are not similar to the main business segments of the companies the State Assessed Section is responsible for valuing.

[179] https://www.wfscorp.com/about-wfs, accessed 3/11/2019
[180] https://www.wpxenergy.com/about/, accessed 3/11/2019

Market Segment: Railroad, Class I and Other Railroads

Companies Included in the Railroad Market Segment

Canadian National Railway Company

Company Summary from Value Line:

Canadian National Railway operates Canada's largest railroad system with 20,000 route miles spanning East-West across Canada and North-South to the Gulf of Mexico through the U.S. Midwest. Acquired BC Rail and GLT mid-'04; EJ&E 1/09. Petroleum & Chemicals, 17% of '17 revenues; Metals & Minerals, 12%; Forest Products, 13%; Intermodal, 25%; Coal, 4%; Grain & Fertilizer, 17%; Automotive, 6%; Other, 6%. 2017 labor costs: 16% of revenue. 2017 operating ratio: 57.4%. Has about 24,000 employees.

Additional Company Information from Website:

CN is engaged in the rail and related transportation business. CN's network of approximately 20,000 route miles of track spans Canada and mid-America, from the Atlantic and Pacific oceans to the Gulf of Mexico, serving the cities and ports of Vancouver, Prince Rupert (British Columbia), Montreal, Halifax, New Orleans and Mobile (Alabama), and the metropolitan areas of Toronto, Edmonton, Winnipeg, Calgary, Chicago, Memphis, Detroit, Duluth (Minnesota)/Superior (Wisconsin) and Jackson (Mississippi), with connections to all points in North America. CN's extensive network and efficient connections to all Class I railroads provide CN customers access to Canada, the U.S. and Mexico. A true backbone of the economy, CN handles over $250 billion worth of goods annually and carries over 300 million tons of cargo, serving exporters, importers, retailers, farmers and manufacturers.[181]

Why was the company included?

This company is similar to (and is the parent of) the railroad companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Canadian Pacific Railway Limited

Company Summary from Value Line:

Canadian Pacific Railway Limited provides rail and intermodal freight transportation services over a 12,500-mile network from Montreal to Vancouver. It extends into the U.S. midwest and northeast via Soo Line, Delaware & Hudson, and DM&E (purchased 10/4/07) subsidiaries. Alliances with other carriers extend market reach beyond its owned network. Grain shipments 24%, of 2017 freight revenue; intermodal, 21%; chemicals/plastics, 14%; coal, 10%; other, 31%. Operating ratio in 2017: 57.4%. Employs 12,163 as of 12/31/17.

Additional Company Information from Website:

Canadian Pacific Railway Limited ("CPRL"), together with its subsidiaries ("CP" or the "Company"), owns and operates a transcontinental freight railway in Canada and the United States ("U.S."). CP's diverse business mix includes bulk commodities, merchandise freight and intermodal traffic over a network of approximately 12,500 miles, serving the principal business centres of Canada from Montreal, Quebec, to Vancouver, British Columbia ("B.C."), and the U.S. Northeast and Midwest regions.

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[181] https://www.cn.ca/en/investors/regulatory-filings, accessed 2/26/2019, 2018 Annual Information Report, p. 11

Agreements with other carriers extend the Company's market reach east of Montreal in Canada, through the U.S. and into Mexico.[182]

Why was the company included?
This company is similar to (and is the parent of) the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

CSX Corporation
Company Summary from Value Line:
CSX Corporation provides rail, intermodal transportation, and rail-to-truck transload services. Has about 21,000 route miles in 23 states and two Canadian provinces, with links to more than 240 short-line railroads. Connects the Northeast, Midwest, and Canada with the Southeast. Principal freight: coal, fertilizer, chemicals, automobiles & parts, agricultural products, and intermodal cargo. Sold CSX World Terminals 2/05. 2017 rail operating ratio: 70.4%. Had about 27,000 employees, as of 12/31/17.

Additional Company Information from Website:
CSX Corporation, together with its subsidiaries based in Jacksonville, Fla., is one of the nation's leading transportation suppliers. The company's rail and intermodal businesses provide rail-based transportation services including traditional rail service and the transport of intermodal containers and trailers. Overall, the CSX Transportation network encompasses about 21,000 route miles of track in 23 states, the District of Columbia and the Canadian provinces of Ontario and Quebec. Our transportation network serves some of the largest population centers in the nation. Nearly two-thirds of Americans live within CSX's service territory. Our transportation network serves some of the largest population centers in the nation. Nearly two-thirds of Americans live within CSX's service territory. CSX serves major markets in the eastern United States and has access to over 70 ocean, river and lake port terminals along the Atlantic and Gulf Coasts, the Mississippi River, the Great Lakes and the St. Lawrence Seaway. The company also has access to Pacific ports through alliances with western railroads. CSX moves a broad portfolio of products across the country in a way that minimizes the effect on the environment, takes traffic off an already congested highway system, and minimizes fuel consumption and transportation costs.[183]

Why was the company included?
This company is similar to the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Genesee & Wyoming, Inc.
Company Summary from Value Line:
Genesee & Wyoming owns and operates 122 short line and regional freight railroads. Also performs contract coal loading and railcar switching for industrial customers. Has operations in North America (58% of '17 revenue), Australia (14%), and U.K./Europe/ (28%). '17 freight revenue mix: Pulp & Paper, 11%; Coal, 8%; Minerals & Stone, 14%; Metals, 11%; Other, 56%. Has 7,300 employees. '17 operating ratio: 82.0%.

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[182] https://s21.q4cdn.com/736796105/files/doc_financials/Annual-Report/2017/CPAR2017.pdf, accessed 2/26/2019, p. 27

[183] https://www.csx.com/index.cfm/about-us/company-overview/, accessed 2/26/2019

Additional Company Information from Website:
Genesee & Wyoming Inc. owns or leases 120 freight railroads worldwide (collectively "G&W" or the "company")* organized in nine locally managed operating regions with 8,000 employees serving 3,000 customers. G&W's seven North American regions serve 41 U.S. states and four Canadian provinces and include 114 short line and regional freight railroads with more than 13,000 track-miles. G&W's Australia Region serves New South Wales, the Northern Territory and South Australia and operates the 1,400-mile Tarcoola-to-Darwin rail line. The Australia Region is 51.1% owned by G&W and 48.9% owned by a consortium of funds and clients managed by Macquarie Infrastructure and Real Assets. G&W's UK/Europe Region includes the U.K.'s largest rail maritime intermodal operator and second-largest freight rail provider, as well as regional rail services in Continental Europe. G&W subsidiaries and joint ventures also provide rail service at more than 40 major ports, rail-ferry service between the U.S. Southeast and Mexico, transload services, contract coal loading and railcar switching and repair.[184]

Why was the company included?
This company is similar to (and is the parent of) the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Kansas City Southern
Company Summary from Value Line:
Kansas City Southern, Inc. is a holding company that has railroad investments in the U.S., Mexico, and Panama. Kansas City Southern, its primary holding, serves the central and south central U.S. Kansas City Southern de Mexico serves northeastern and central Mexico, as well as the port cities of Lazaro Cardenas, Tampico, and Veracruz. Panama Canal Railway (50% stake) provides ocean-to-ocean service along the Panama Canal. 2017 rail operating ratio: 65.0%. Has 6,820 employees.

Additional Company Information from Website:
KCS is a complete network of capabilities, possibilities and advantages for businesses and shippers of all sizes. You produce it or need it and we can ship it. From accordions to zippers, KCS can ship your cargo. We are a full-service railroad capable of shipping anything from the tiniest plastic pieces to the largest machinery. Liquid or metal. Large or small. Finished or Unfinished. We've got your shipment needs covered.[185]

Why was the company included?
This company is similar to the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Norfolk Southern Corporation
Company Summary from Value Line:
Norfolk Southern Corp. is the holding company formed by the merger of Norfolk & Western Railway and Southern Railway on 6/1/82. Its Norfolk Southern Railway subsidiary operates approximately 19,500 route miles of track in 22 eastern and southern states, plus the District of Columbia. Also owns a 58% stake in Conrail. '17 freight revenue mix: coal, 15%; intermodal, 22%; agriculture/consumer

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[184] https://www.gwrr.com/about_us, accessed 2/26/2019
[185] http://www.kcsouthern.com/en-us/why-choose-kcs/what-we-ship, accessed 2/26/2019

prod./gov't, 16%; metals/construction, 13%; other, 34%. '16 labor costs: about 28% of revenue. '17 operating ratio: 68.9%. Has 28,044 employees.

Additional Company Information from Website:
Norfolk Southern Corporation (NYSE: NSC) is one of the nation's premier transportation companies. Its Norfolk Southern Railway Company subsidiary operates approximately 19,500 route miles in 22 states and the District of Columbia, serves every major container port in the eastern United States, and provides efficient connections to other rail carriers. Norfolk Southern is a major transporter of industrial products, including chemicals, agriculture, and metals and construction materials. In addition, the railroad operates the most extensive intermodal network in the East and is a principal carrier of coal, automobiles, and automotive parts.[186]

Why was the company included?
This company is similar to the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Union Pacific Corporation
Company Summary from Value Line:
Union Pacific Corporation owns Union Pacific Railroad, the largest railroad in the United States in both track miles and total revenues, with nearly 32,122 route miles serving the western two-thirds of the United States. '17 railroad revenue mix: Coal, 13%; Intermodal, 19%; Agricultural, 19%; Industrial, 21%; Chemicals, 18%; Automotive, 10%. About 10% of its sales from Mexico. Divested Overnite Transportation in 11/03. '16 RR operating ratio: 63.5%. Has about 42,900 employees.

Additional Company Information from Website:
At Union Pacific Railroad, we're prepared to ship just about anything: food, forest products, automobiles, agricultural products, coal and chemicals – safely and on time. No rail? No problem. Our shipping capabilities are not limited to our extensive system map. We will coordinate your shipment through our network, through other railroads and over the road, providing complete, door-to-door service. We offer our customers the most efficient, environmentally friendly transportation solutions available today.[187]

Why was the company included?
This company is one of the Railroad Companies that the State Assessed Section is responsible for valuing. The company engages in railroad transportation services.

Companies Not Included in the Railroad Market Segment

American Railcar Industries, Inc.
Company Summary from Value Line:
Company is no longer publicly traded.

[186] http://www.nscorp.com/content/nscorp/en/about-ns/corporate-profile.html, accessed 2/26/2019
[187] http://www.up.com/aboutup/index.htm, accessed 2/26/2019

Additional Company Information from Website:
ITE Management LP announced 12/5/2018 that it has closed its acquisition of American Railcar Industries, Inc.[188]

Why was the company not included?
Company is no longer publicly traded.

Berkshire Hathaway, Inc.
Company Summary from Value Line:
Berkshire Hathaway Inc. is a holding company owning subsidiaries engaged in property and casualty insurance on a direct and reinsurance basis through GEICO, General Re and Berkshire Reinsurance. Other business activities include electric utilities, railroads, flight training services, candy manufacturing, ice cream, building products, newspapers, retailing, fine jewelry, etc. Also, fractional ownership programs for general aviation (NetJets), energy (Mid-American Energy). Has approximately 377,291 employees.

Additional Company Information from Website:
Berkshire Hathaway Inc. ("Berkshire," "Company" or "Registrant") is a holding company owning subsidiaries engaged in a number of diverse business activities. The most important of these are insurance businesses conducted on both a primary basis and a reinsurance basis, a freight rail transportation business and a group of utility and energy generation and distribution businesses. Berkshire also owns and operates a large number of other businesses engaged in a variety of activities, as identified herein. Berkshire is domiciled in the state of Delaware, and its corporate headquarters are located in Omaha, Nebraska. Berkshire's operating businesses are managed on an unusually decentralized basis. There are essentially no centralized or integrated business functions (such as sales, marketing, purchasing, legal or human resources) and there is minimal involvement by Berkshire's corporate headquarters in the day-to-day business activities of the operating businesses. Berkshire's corporate senior management team participates in and is ultimately responsible for significant capital allocation decisions, investment activities and the selection of the Chief Executive to head each of the operating businesses. It also is responsible for establishing and monitoring Berkshire's corporate governance practices, including, but not limited to, communicating the appropriate "tone at the top" messages to its employees and associates, monitoring governance efforts, including those at the operating businesses, and participating in the resolution of governance-related issues as needed. Berkshire and its consolidated subsidiaries employ approximately 389,000 people worldwide.[189]

Why was the company not included?
We reviewed Berkshire Hathaway, Inc. because the company is the parent of BNSF Railway, which operates in Minnesota. However, BNSF Railway is not the majority business segment of Berkshire Hathaway, Inc.

GATX Corporation
Company Summary from Value Line:
GATX Corp. specializes in tank car, freight car, and locomotive leasing. The company owns or has an interest in 148,941 railcars, and manages 425 railcars for third-party owners. Specialty unit finances marine

188 https://www.sec.gov/Archives/edgar/data/1344596/000114036118044598/ex99_1.htm, accessed 2/26/2019
189 http://www.berkshirehathaway.com/2018ar/2018ar.pdf, accessed 2/26/2019, p. K-1

and industrial equipment. American Steamship unit operates a fleet of vessels on the Great Lakes, providing waterborne transportation of dry bulk commodities. Invests in joint ventures that complement existing businesses. Has about 2,260 employees.

Additional Company Information from Website:
GATX Corporation, founded in 1898, is the leading global railcar lessor. We strive to be recognized as the finest railcar leasing company in the world by our customers, our shareholders, our employees, and the communities where we operate. We own railcar fleets in North America, Europe, and Asia. In addition, we operate the largest fleet of US-flagged vessels on the Great Lakes and own and manage other long-lived, widely-used assets. We operate through four business segments: Rail North America, Rail International, Portfolio Management, and American Steamship Company ("ASC").[190]

Why was the company not included?
This company's business segments include substantial non railroad investments, including financing marine and industrial equipment.

Greenbrier Companies, Inc.
Company Summary from Value Line:
The Greenbrier Companies, Inc. designs, manufactures, repairs, and markets railroad freight cars and related equipment in North America and Europe. It also manufactures oceangoing marine barges. The company operates in three business segments: Manufacturing (81% of 2017 revenues); Wheel Services, Refurbishment & Parts (14%); Leasing & Services (5%). Inc.: OR. At 8/31/18, its backlog consisted of 27,400 railcars. Has about 13,400 employees.

Additional Company Information from Website:
We are one of the leading designers, manufacturers and marketers of railroad freight car equipment in North America and Europe. We manufacture railcars in Brazil and are a manufacturer and marketer of marine barges in North America. Through our European manufacturing operations, we also deliver railcars for the Saudi Arabian market. We are a leading provider of wheel services, parts, leasing and other services to the railroad and related transportation industries in North America and a provider of railcar repair, refurbishment and retrofitting services in North America through an unconsolidated joint venture. Through other unconsolidated affiliates we produce rail and industrial castings, tank heads and other components. We operate an integrated business model in North America that combines freight car manufacturing, wheel services, repair, refurbishment, retrofitting, component parts, leasing and fleet management services. Our model is designed to provide customers with a comprehensive set of freight car solutions utilizing our substantial engineering, mechanical and technical capabilities as well as our experienced commercial personnel. We believe our integrated model is difficult to duplicate and provides greater value for our customers.[191]

Why was the company not included?
This company designs, manufactures, repairs, and markets railroad freight cars and related equipment.

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[190] http://www.gatx.com/wps/wcm/connect/GATX/GATX_SITE/Home/About/, accessed 2/26/2019
[191] http://www.gbrx.com/about-us/, accessed 2/26/2019

Packaging Corporation of America

Company Summary from Value Line:

Packaging Corporation of America is the ~~fourth-largest producer of containerboard and corrugated products in the United States in terms of production capacity. Revenue breakdown; Packaging (82% of 2017 sales), Paper (16%), and Corporate and Other and Eliminations (2%). In 2017, it produced 3.9 million tons of containerboard at its mills. Corrugated products manufacturing plants sold about 55.7 billion square feet. Has 14,600 employees. Acquired Boise (10/13).

Additional Company Information from Website:

At PCA, we think of ourselves as more than a box manufacturer. We are an ideas and solutions company. We seek to be the leader in helping our customers — large and small — package, transport and display products of all kinds. It just happens to be that corrugated products are our area of expertise. So a partnership with PCA isn't just about buying boxes. It's about building a relationship with a knowledgeable, trusted, committed source; adding value to your business; and actively contributing to your success in the marketplace. Whether you are looking for conventional shipping containers, custom-printed corrugated boxes, custom packaging or eye-catching retail visual displays, PCA is here to deliver the right packaging solution on time and on budget.[192]

Why was the company not included?

We reviewed Packaging Corporation of America because the company is the parent of Boise Paper, which is the parent of Minnesota, Dakota & Western Railroad. Minnesota, Dakota & Western Railroad operates in Minnesota. However, Minnesota, Dakota & Western Railroad is not the majority business segment Packaging Corporation of America.

Trinity Industries, Inc.

Company Summary from Value Line:

Trinity Industries, Inc. manufactures a variety of metal products for many industries. Its five principal operating segments are: Rail (railcars and component parts), Construction Products (highway safety products, concrete, and aggregate), Inland Barge (barges and related products), Energy Equipment (wind towers), and Railcar Leasing and Management. Acquired Thrall 10/01. '17 depr. rate: 3.4%.

Additional Company Information from Website:

Trinity Industries, Inc. owns businesses that are leading providers of rail transportation products and services in North America. We also own businesses engaged in the manufacture of products used on the nation's roadways and in traffic control. While our portfolio of businesses has evolved, our culture and commitment to excellence remain the same. Our accomplishments throughout the years are attributable to: the skills, talents, and integrity of our people, the synergies within our integrated platform of products and services, the depth of our operational capabilities, and our commitment to excellence and continuous improvement. Our continuing vision is to be the premier provider of railcar products and services in North America while generating high quality earnings and returns for shareholders. Our highway businesses strive to be the premier provider of highway products in the United States.[193]

Why was the company not included?

This company manufactures metal products for many industries.

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[192] https://www.packagingcorp.com/our-company, accessed 2/26/2019

[193] http://www.trin.net/about-us, accessed 2/26/2019

Appendix I - Summary of Data Points from Other Studies

The Minnesota Department of Revenue compiled information available in other capitalization rate studies to include in this appendix.

If a study includes flotation costs (^{FC}) or an after-tax adjustment(^{AT}) we list the selected rate with those impacts. We calculate the composite rate without flotation cost or after-tax adjustments.

Other Information:

We were able to include 13 studies from other states, 1 professor, 4 industries, Minnesota Department of Commerce, and Surface Transportation Board

4 states have provided that they complete a study, but that it is not public (Arkansas, Iowa, Michigan, and Nebraska).

12 states have provided that they do not complete a study for various reasons including: agreements with companies, the assessments are not completed at the state level, they use other studies (several states mentioned they may utilize Minnesota's study in some capacity; including Wisconsin), or they do not use an income approach.

9 studies are available to the public, but were not published at the time of compiling this study.

We are still reaching out to 11 other states about their process and if their study is public.

Electric - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**7.20%**	**4.59%**	**8.54%**	**34.00%**	**66.00%**	**7.20%**	
California State Board of Equalization	N/A	4.6 - 5.0%	10.6 - 14.1%	43 - 47%	48 - 55%	8.55%	Avg. Basic Rate
Center for Energy and Environment	7.30%	N/A	N/A	N/A	N/A	7.30%	
Colorado Division of Property Taxation	7.27%	4.80%	8.66%	36.00%	64.00%	7.27%	Electric
Damodaran WACC	4.49% [AT]	3.58%	5.92%	44.26%	55.74%	4.88%	Power
Idaho State Tax Commission [FC]	7.24%	4.76%	8.44%	38.00%	62.00%	7.04%	FC per statute
Kansas Department of Revenue [FC]	8.24%	4.92%	9.65%	35.00%	65.00%	7.99%	Investor
Louisiana Tax Commission	9.50%						Electric, adj. for size
Missouri State Tax Commission	8.00%	5.00%	9.75%	35.00%	65.00%	8.09%	Electric Utilities - Central
Montana Department of Revenue	6.10%	5.13%	7.50%	40.00%	60.00%	6.55%	Electric Utilities
Oklahoma Tax Commission	8.12%	4.67%	10.00%	35.29%	64.71%	8.12%	Electric
Oregon Department of Revenue [AT]	6.80%	4.90%	8.50%	35.00%	65.00%	7.25%	Mid-Cap Size Adj.
South Dakota Department of Revenue [FC]	8.90%	4.80%	11.00%	38.00%	62.00%	8.64%	Electric
Utah State Tax Commission	N/A	5.13%	7.04%	35.00%	65.00%	6.38%	Estimated
Washington Department of Revenue [AT]	6.92%	5.00%	9.00%	40.00%	60.00%	7.40%	
Wyoming Department of Revenue	8.40%	4.80%	10.66%	38.00%	62.00%	8.43%	
Xcel Energy	8.20%	4.75%	9.60%	36.00%	64.00%	7.85%	

Electric - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**4.73%**	**4.59%**	**4.80%**	**34.00%**	**66.00%**	**4.73%**	
Missouri State Tax Commission	4.75%	4.45%	4.91%	35.00%	65.00%	4.75%	Electric Utilities - Central
Montana Department of Revenue [AT]	5.00%	4.45%	5.35%	40.00%	60.00%	4.99%	Electric Utilities
Oregon Department of Revenue [AT]	4.40%	4.45%	5.00%	35.00%	65.00%	4.81%	

Gas Distribution - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**7.34%**	**4.59%**	**8.36%**	**27.00%**	**73.00%**	**7.34%**	
California State Board of Equalization[FC]	N/A	4.5 - 6.3%	10.5 - 15.1%	40 - 46%	52 - 60%	10.09%	Avg. Basic Rate
Colorado Division of Property Taxation	8.24%	4.34%	9.76%	28.00%	72.00%	8.25%	Distribution Pipelines
Damodaran WACC [AT]	3.61% [AT]	3.58%	5.21%	30.07%	69.93%	4.72%	Utility (General)
Idaho State Tax Commission	7.27%	4.45%	8.21%	25.00%	75.00%	7.27%	
Kansas Department of Revenue[FC]	9.41%	4.92%	11.10%	68.00%	32.00%	6.90%	Mid-Cap
Louisiana State Tax Commission	8.50%						Gas Distribution
Oklahoma Tax Commission	8.40%	4.67%	10.00%	29.93%	70.07%	8.41%	Gas Distribution
Oregon Department of Revenue [AT]	6.60%	4.45%	8.00%	30.00%	70.00%	6.94%	
South Dakota Department of Revenue[FC]	9.44%	4.80%	11.02%	30.00%	70.00%	9.15%	Natural Gas Distribution
Utah State Tax Commission	N/A	5.13%	7.42%	35.00%	65.00%	6.62%	Estimated
Washington Department of Revenue[AT]	6.74%	5.00%	8.00%	30.00%	70.00%	7.10%	
Wyoming Department of Revenue	10.20%	4.64%	12.31%	27.00%	73.00%	10.24%	

Gas Distribution - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**4.35%**	**4.59%**	**4.26%**	**27.00%**	**73.00%**	**4.35%**	
Oregon Department of Revenue [AT]	4.50%	4.32%	5.00%	30.00%	70.00%	4.80%	

Gas Transmission - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**12.14%**	**5.29%**	**15.50%**	**33.00%**	**67.00%**	**12.14%**	
California State Board of Equalization [FC]	N/A	4.94%	14.58%	40.00%	60.00%	10.73%	Avg. Basic Rate
Colorado Division of Property Taxation	11.77%	4.80%	16.65%	40.00%	60.00%	11.91%	Pipelines (Non-MLP)
Colorado Division of Property Taxation	11.70%	5.81%	16.41%	35.00%	65.00%	12.70%	Pipelines (MLP)
Damodaran WACC [AT]	6.08% [AT]	4.18%	14.88%	50.32%	49.68%	9.49%	Oil/Gas Distribution
Kansas Department of Revenue [FC]	11.00%	4.92%	14.50%	40.00%	60.00%	10.67%	
Louisiana State Tax Commission	12.10%						Pipelines - Gas
Missouri State Tax Commission	11.50%	7.00%	13.75%	35.00%	65.00%	11.39%	Natural Gas Pipeline
Montana Department of Revenue [AT]	8.90%	7.16%	11.70%	45.00%	55.00%	9.66%	Gas Pipelines
Montana Department of Revenue [AT] - Corp.	8.10%	5.13%	12.15%	45.00%	55.00%	8.99%	Incorporated Pipelines
Oklahoma Tax Commission	10.53%	4.93%	14.00%	38.26%	61.74%	10.53%	Gas Transmission
Oklahoma Tax Commission	10.54%	4.92%	15.10%	44.79%	55.21%	10.54%	Oil/Gas Distribution
Oregon Department of Revenue [AT]	9.80%	5.15%	13.00%	35.00%	65.00%	10.25%	
Tegarden & Associates [FC]	10.66%	6.15%	13.30%	37.00%	63.00%	10.31%	
Utah State Tax Commission	N/A	5.13%	12.06%	45.00%	55.00%	8.94%	Estimated
Washington Department of Revenue [AT]	8.48%	5.50%	12.00%	45.00%	55.00%	9.08%	Pipeline Industry
Wyoming Department of Revenue	13.10%	5.29%	18.60%	41.00%	59.00%	13.14%	

Gas Transmission - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**5.20%**	**5.29%**	**5.15%**	**33.00%**	**67.00%**	**5.20%**	
Missouri State Tax Commission	5.50%	5.00%	5.71%	35.00%	65.00%	5.46%	Natural Gas Pipeline
Montana Department of Revenue [AT]	6.20%	4.90%	8.10%	45.00%	55.00%	6.66%	Gas Pipelines
Montana Department of Revenue [AT] - Corp.	4.60%	5.00%	5.30%	50.00%	50.00%	5.15%	Incorporated Pipelines
Oregon Department of Revenue [AT]	5.20%	4.80%	6.00%	35.00%	65.00%	5.58%	

Fluid Transportation - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	12.45%	5.64%	15.80%	33.00%	67.00%	**12.45%**	
California State Board of Equalization[FC]	N/A	5.2 - 6.2%	15.1 - 16.7%	35.00%	65.00%	12.03%	Avg. Basic Rate
Colorado Division of Property Taxation	11.77%	4.80%	16.65%	40.00%	60.00%	11.91%	Pipelines (Non-MLP)
Colorado Division of Property Taxation	11.70%	5.81%	16.41%	35.00%	65.00%	12.70%	Pipelines (MLP)
Enterprise Products Partners - Corp. [FC]	13.30%	5.50%	15.80%	30.00%	70.00%	12.71%	
Enterprise Products Partners - MLP [FC]	14.00%	5.50%	17.20%	32.00%	68.00%	13.46%	
Idaho State Tax Commission	10.04%	5.85%	12.20%	34.00%	66.00%	10.04%	
Kansas Department of Revenue[FC]	11.82%	4.92%	14.25%	30.00%	70.00%	11.46%	Above $2,996.003 mil
Louisiana State Tax Commission	12.40%						Pipelines - Fluid
Missouri State Tax Commission	11.50%	5.50%	13.75%	27.00%	73.00%	11.53%	Product Pipeline
Montana Department of Revenue [AT]	8.80%	6.15%	11.50%	40.00%	60.00%	9.36%	Liquid Pipelines
Oklahoma Tax Commission	11.94%	4.93%	13.10%	14.16%	85.84%	11.95%	Fluid Pipeline
Oregon Department of Revenue [AT]	9.80%	5.15%	13.00%	35.00%	65.00%	10.25%	
Utah State Tax Commission	N/A	5.13%	12.41%	40.00%	60.00%	9.50%	Estimated
Washington Department of Revenue[AT]	8.48%	5.50%	12.00%	45.00%	55.00%	9.08%	Pipeline Industry
Wyoming Department of Revenue	14.10%	5.40%	18.39%	33.00%	67.00%	14.10%	

Fluid Transportation - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**7.71%**	**5.64%**	**8.73%**	**33.00%**	**67.00%**	**7.71%**	
Missouri State Tax Commission	6.75%	4.82%	7.55%	27.00%	73.00%	6.81%	Liquid Pipelines
Montana Department of Revenue [AT]	7.10%	4.90%	9.25%	40.00%	60.00%	7.51%	Liquid Pipelines
Oregon Department of Revenue [AT]	5.20%	4.80%	6.00%	35.00%	65.00%	5.58%	

Class I Railroads - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**10.73%**	**4.60%**	**12.17%**	**19.00%**	**81.00%**	**10.73%**	
California State Board of Equalization[FC]	N/A	5.2 - 6.7%	14.1 - 16.2%	15 - 35%	65 - 85%	12.82%	Avg. Basic Rate
Colorado Division of Property Taxation	11.74%	4.80%	13.10%	15.00%	85.00%	11.86%	Railroads
Damodaran WACC[AT]	14.27%[AT]	3.58%	17.39%	21.22%	78.78%	14.46%	Transportation (Railroads)
Idaho State Tax Commission	10.02%	4.92%	11.30%	20.00%	80.00%	10.02%	Class I Railroads
Kansas Department of Revenue[FC]	12.65%	5.34%	13.75%	18.00%	82.00%	12.24%	Class I Railroads
Louisiana State Tax Commission	12.20%						
Missouri State Tax Commission	12.00%	5.00%	13.75%	20.00%	80.00%	12.00%	Railroad Class I
Montana Department of Revenue[AT]	8.80%	5.13%	10.25%	23.00%	77.00%	9.07%	Railroads
Oklahoma Tax Commission	12.17%	4.93%	13.55%	16.04%	83.96%	12.17%	Railroad
Oregon Department of Revenue[AT]	5.00%	4.50%	5.40%	20.00%	80.00%	5.22%	
Surface Transportation Board	10.04%	3.57%	11.46%	17.99%	82.01%	10.04%	Railroad Cost of Capital - 2017
Union Pacific Railroad Company[FC]	12.70%	4.80%	14.15%	20.00%	80.00%	12.28%	
Utah State Tax Commission	N/A	5.13%	10.65%	20.00%	80.00%	9.55%	Estimated
Washington Department of Revenue[AT]	10.20%	5.00%	12.00%	22.00%	78.00%	10.46%	
Wyoming Department of Revenue	11.95%	4.99%	13.68%	20.00%	80.00%	11.94%	

Class I Railroads - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**5.49%**	**4.60%**	**5.71%**	**20.00%**	**80.00%**	**5.49%**	
Missouri State tax Commission	6.25%	4.10%	6.69%	20.00%	80.00%	6.17%	Railroad Class I
Montana Department of Revenue[AT]	5.90%	4.50%	6.60%	23.00%	77.00%	6.12%	Railroads
Oregon Department of Revenue[AT]	5.00%	4.50%	5.40%	20.00%	80.00%	5.22%	

Other Railroads - Yield Rates

Author	Selected Yield Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**10.77%**	**4.77%**	**13.34%**	**30.00%**	**70.00%**	**10.77%**	
California State Board of Equalization [FC]	N/A	7.73%	16.41%	35.00%	65.00%	13.38%	Avg. Basic Rate
Colorado Division of Property Taxation	11.74%	4.80%	13.10%	15.00%	85.00%	11.86%	Railroads
Damodaran WACC [AT]	14.27% [AT]	3.58%	17.39%	21.22%	78.78%	14.46%	Transportation (Railroads)
Idaho State Tax Commission	11.59%	6.33%	13.64%	28.00%	72.00%	11.59%	Class III Shortline Railroads
Kansas Department of Revenue [FC]	14.58%	5.34%	18.85%	35.00%	65.00%	14.12%	Small Railroads
Louisiana State Tax Commission	12.00%						Adjusted for smaller size co.
Missouri State Tax Commission	12.50%	5.00%	14.50%	20.00%	80.00%	12.60%	Railroad non Class I
Montana Department of Revenue [AT]	8.80%	5.13%	10.25%	23.00%	77.00%	9.07%	Railroads
Oklahoma Tax Commission	12.17%	4.93%	13.55%	16.04%	83.96%	12.17%	Railroad
Oregon Department of Revenue [AT]	12.00%	5.33%	14.00%	20.00%	80.00%	12.27%	
Utah State Tax Commission	N/A	5.13%	10.86%	25.00%	75.00%	9.43%	Estimated
Wyoming Department of Revenue	11.95%	4.99%	13.68%	20.00%	80.00%	11.94%	

Other Railroads - Direct Rates

Author	Selected Direct Rate	Cost of Debt	Cost of Equity	Capital Structure (Debt)	Capital Structure (Equity)	Composite Rate	Comments
MN Department of Revenue	**5.32%**	**4.77%**	**5.56%**	**30.00%**	**70.00%**	**5.32%**	
Montana Department of Revenue [AT]	5.90%	4.50%	6.60%	23.00%	77.00%	6.12%	Railroads
Oregon Department of Revenue [AT]	5.00%	4.50%	5.40%	20.00%	80.00%	5.22%	

References

Center for Energy and Environment, Optimal Energy and Seventhwave. Prepared for Minnesota Department of Commerce, Division of Energy Resources. Minnesota Energy Efficiency Potential Study: 2020-2029.
http://mn.gov/commerce-stat/pdfs/mn-energy-efficiency-potential-study.pdf

California State Board of Equalization, State Assessed Properties Division.
California's Study does not state a selected rate per industry. Showing the range provided in their study for each market segment.
The composite rate in this section is an average of the basic cap rates listed for each company, by market segment in California's Study.
2019. http://www.boe.ca.gov/proptaxes/sappcont.htm#Resources

Colorado Division of Property Taxation.
April 22, 2019. https://www.colorado.gov/pacific/dola/cost-capital-studies

Damodaran. 2019 Cost of Capital US Companies.
The cost of equity and capital data published by Dr. Damodaran does not include any of the guideline companies in the department's fluid transportation pipeline market segment.
http://www.stern.nyu.edu/~adamodar/New_Home_Page/data.html

Idaho State Tax Commission
Includes a flotation costs adjustment per statutory requirements in the electric market segment.
April 3 & April 5, 2019. Provided by email.

Kansas Department of Revenue. Division of Property Valuation
Some market segments included multiple tiers based on size.
Provided by email on April 4, 2019 from KDOR_PVD.Utilities@KS.GOV

Louisiana Tax Commission
Includes the final rate only, not the component parts.
Received by email on May 6, 2019

Missouri State Tax Commission. Draft.
April 30, 2019. https://stc.mo.gov/railroads/cost-of-capital-study/

Montana Department of Revenue.
Showing before-tax cost of debt to compare composite rate to the Department's selected rate.
WACC - Yield Rate. NOI After-Tax Direct Rate.
Montana Department of Revenue does not publish a gas distribution segment.
April 22, 2019. https://mtrevenue.gov/publications/cap-rate-studies/

Oklahoma Tax Commission.
April 22, 2019. https://www.ok.gov/tax/All_Taxes/Ad_Valorem/

Oregon Department of Revenue. Central Assessment Appraisal Program
2019. Provided by email.

South Dakota Capitalization Rate Study.
No Date. Provided by Northern States Power Company
Electric and Natural Gas Distribution Industries only.

Surface Transportation Board. Railroad Cost of Capital - 2017
December 4, 2018. https://www.stb.gov/Decisions/readingroom.nsf/UNID/C63B2937334D916E8525835B0070C132/$file/46712.pdf

Tegarden & Associates, Inc. Cost of Capital Study - Interstate Natural Gas Pipeline Industry
March 7, 2019. Provided to the department by Northern Natural Gas Company.

Union Pacific Railroad Company Cost of Capital Study
2019. Provided to the department by Union Pacific Railroad Company.

Utah State Tax Commission, Property Tax Division.
Utah does not calculate a combined rate. Using the Corporate Bond Baa (5.13%) average to estimate a combined rate.
April 1, 2019. https://propertytax.utah.gov/centrally-assessed/rate-studies

Washington State Department of Revenue.
After-tax cost of debt for all industries. There are no master limited pipelines operating in Washington State.
April 2019. https://dor.wa.gov/find-taxes-rates/property-tax/utility-cost-capital-studies#2019

Wyoming Department of Revenue.
For the electric market segment, the rate shown is for Investor Owned, Generation, Transmission, and Municipal. Wyoming completes a rural distribution rate separately, finding an overall rate of 5.63%.
March 29, 2019. http://wyo-prop-div.wyo.gov/public-utilities/capitalization-rates-pub