



STATE TAX COMMISSION OF MISSOURI  
 P.O. BOX 146  
 JEFFERSON CITY, MO 65102-0146  
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## Cost of Capital Study January 1, 2024 Staff Recommendation

Electric Industry (SIC 4911)			Reference
<b>Equity:</b>			
<b>Risk Adjusted Models</b>			
	CAPM	9.86%	Page 5
<b>Dividend Growth Models</b>			
	DGM or DCF Model (Dividend Growth)	9.25%	
	DGM or DCF Model (Earnings Growth)	10.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	7.75%	Page 7
	Multi Stage DCF	8.50%	Page 7
	<b>Average</b>	<b>9.07%</b>	
	<b>Range</b>	<b>8.50% - 10.00%</b>	Page 8
<b>Estimated Cost of Equity Capital</b>		<b>9.25%</b>	
<b>Debt:</b>			
<b>Estimated Cost of Debt Capital</b>		<b>6.00%</b>	Page 3
<b>Cost of Capital Summary</b>			
<b>Capital Component</b>	<b>Market Capital Structure</b>	<b>Cost of Capital</b>	<b>Before-Tax Weighted Average Cost of Capital</b>
Debt	45.00%	6.00%	2.70%
Equity	55.00%	9.25%	5.09%
<b>Total</b>	<b>100.00%</b>		<b>7.79%</b>
		Rounded	<b>7.75%</b>



## Cost of Capital Study January 1, 2024 Staff Recommendation

Electric Industry (SIC 4911)				Reference
<b>Direct Rate</b>				
<b>Equity:</b>				
<u>Estimated Cost of Equity Capital</u>			<b>5.80%</b>	Page 9
<b>Debt:</b>				
<u>Estimated Cost of Debt Capital</u>			<b>3.79%</b>	Page 10
<b>Cost of Capital Summary</b>				
<u>Capital Component</u>	<u>Market Capital Structure</u>	<u>Cost of Capital</u>	<u>Before-Tax Weighted Average Cost of Capital</u>	
Debt	45.00%	3.79%	1.71%	
Equity	<u>55.00%</u>	5.80%	<u>3.19%</u>	
<b>Total</b>	<u><b>100.00%</b></u>		<u><b>4.90%</b></u>	
		Rounded	<u><b>5.00%</b></u>	

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of Debt Capital**

Electric Industry (SIC 4911)				
Ratings				
Company	Ticker		Moody's	S&P
ALLETE, Inc.	ALE		Baa1	BBB
Alliant Energy Corporation	LNT		Baa2	A-
Ameren Corporation	AEE		Baa1	BBB+
American Electric Power Company, Inc.	AEP		Baa2	A-
CenterPoint Energy, Inc.	CNP		Baa2	BBB+
CMS Energy Corporation	CMS		Baa2	BBB+
Entergy Corporation	ETR		Baa2	BBB+
Evergy, Inc.	EVRG		Baa2	BBB+
Fortis, Inc.	FTS.TO		Baa3	A-
MGE Energy, Inc.	MGEE		NR	NR
OGE Energy Corporation	OGE		Baa1	BBB+
Otter Tail Corporation	OTTR		A3	BBB
WEC Energy Group, Inc.	WEC		Baa1	A-
<b>Average Rating</b>			<b>Baa</b>	<b>BBB</b>
NR = Not Rated				
RW = Rating Withdrawn				
Mergent Bond Record, January 2024				
<b>Corporate</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	5.61%	5.97%	6.18%	6.63%
November	5.61%	5.57%	5.78%	6.19%
December	4.74%	5.05%	5.25%	5.64%
<b>Average</b>	<b>5.32%</b>	<b>5.53%</b>	<b>5.74%</b>	<b>6.15%</b>
<b>Public Utilities</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	-	6.19%	6.34%	6.61%
November	-	5.82%	5.96%	6.20%
December	-	5.27%	5.42%	5.68%
<b>Average</b>	<b>-</b>	<b>5.76%</b>	<b>5.91%</b>	<b>6.16%</b>
<b>Industrials</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	5.61%	5.76%	6.02%	6.64%
November	5.20%	5.32%	5.59%	6.18%
December	4.74%	4.82%	5.07%	5.60%
<b>Average</b>	<b>5.18%</b>	<b>5.30%</b>	<b>5.56%</b>	<b>6.14%</b>
<b>Debt Yield Rate Estimate</b>				<b>6.00%</b>
<b>Data Source:</b>				
<a href="https://www.moodys.com">https://www.moodys.com</a>				
<a href="https://standardandpoors.com">https://standardandpoors.com</a>				
Mergent Bond Record, January 2024				

Ratings				
Dispersions & Averages Number of Companies				
Agency				
S&P				
AAA	1			
AA	2			
A	3	4	12	
BBB	4	8	32	
BB	5			
B	6			
CCC	7			
C	9			
D	10			
<b>Total</b>		<b>12</b>	<b>44</b>	
<b>Average Rating:</b>				<b>3.67</b>
Agency				
Moody's				
Aaa	1			
Aa	2			
A	3	1	3	
Baa	4	11	44	
Ba	5			
B	6			
Caa	7			
Ca	8			
C	9			
<b>Total</b>		<b>12</b>	<b>47</b>	
<b>Average Rating:</b>				<b>3.92</b>

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of the Market Capital Structure**

Electric Industry (SIC 4911)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Company Name	Ticker Symbol	Debt (\$ mil)	Debt %	Stock Price	Shares (mil) Outstanding	Equity (\$ mil)	Equity %	Total Capital (\$ mil)
ALLETE, Inc.	ALE	1,799	34.03%	60.59	57.57	3,488	65.97%	5,287
Alliant Energy Corporation	LNT	9,509	41.97%	51.34	256.10	13,148	58.03%	22,657
Ameren Corporation	AEE	16,018	44.77%	75.15	262.94	19,760	55.23%	35,778
American Electric Power Company, Inc.	AEP	40,483	48.74%	80.92	526.18	42,579	51.26%	83,062
CenterPoint Energy, Inc.	CNP	18,431	50.33%	28.80	631.59	18,190	49.67%	36,621
CMS Energy Corporation	CMS	15,550	47.68%	57.96	294.44	17,066	52.32%	32,616
Entergy Corporation	ETR	26,246	54.83%	101.40	213.23	21,622	45.17%	47,868
Evergy, Inc.	EVRG	10,187	46.14%	51.76	229.72	11,890	53.86%	22,077
Fortis, Inc.	FTS.TO	29,703	52.74%	54.74	486.30	26,620	47.26%	56,323
MGE Energy, Inc.	MGEE	724	21.55%	72.90	36.16	2,636	78.45%	3,360
OGE Energy Corporation	OGE	4,840	40.58%	35.37	200.33	7,086	59.42%	11,926
Otter Tail Corporation	OTTR	906	21.18%	80.83	41.71	3,371	78.82%	4,277
WEC Energy Group, Inc.	WEC	18,798	41.54%	83.85	315.56	26,460	58.46%	45,258
<b>Mean:</b>		<b>14,861</b>	<b>42.01%</b>			<b>16,455</b>	<b>57.99%</b>	<b>31,316</b>
<b>Median:</b>		<b>15,550</b>	<b>44.77%</b>			<b>17,066</b>	<b>55.23%</b>	<b>32,616</b>
<b>Market Capital Structure Estimate:</b>		<b>Debt:</b>	<b>45.00%</b>			<b>Equity:</b>	<b>55.00%</b>	
<b>Data Source:</b>								
Columns (1) & (4), Value Line Industry Summary & Index, 03-08-2024								
Column (2) = Column (1) / Column (7)								
Column (3), Yahoo Finance, 12-29-2023								
Column (5) = Column (3) * Column (4)								
Column (7) = Column (1) + Column (5)								

**Cost of Capital Study**  
**January 1, 2024**  
**Capital Asset Pricing Model (CAPM)**

CAPM ==>  $K_e = R_f + (\beta * ERP)$

<b>Electric Industry (SIC 4911)</b>	
Risk-Free Rate	4.14%
Beta ( $\beta$ )	0.90
Equity Risk Premium (ERP): $(R_m - R_f)^*$	6.35%
Adjusted Equity Risk Premium: $(\beta * ERP)$	5.72%
<b>Cost of Equity Capital - CAPM</b>	<b>9.86%</b>
<b>U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields</b>	
<b>U.S. Treasury Securities:</b>	
2023 December - 30 Day	4.14%
2023 November - 60 Day	4.40%
2023 October - 90 Day	4.58%
<b>Risk-Free Rate of Return <math>R_f</math>, 30-year Treasury Rate. 2023 December - 30 Day Average.</b>	<b>4.14%</b>
* The equity risk premium for U.S. common stock was based on STC staff review of articles, studies, and surveys.	

## Cost of Capital Study

January 1, 2024

Beta ( $\beta$ ) Analysis

<b>Electric Industry (SIC 4911)</b>			
<b>Company Name</b>	<b>Ticker Symbol</b>		<b>Beta "<math>\beta</math>"</b>
ALLETE, Inc.	ALE		0.95
Alliant Energy Corporation	LNT		0.90
Ameren Corporation	AEE		0.90
American Electric Power Co	AEP		0.80
CenterPoint Energy, Inc.	CNP		1.15
CMS Energy Corporation	CMS		0.85
Entergy Corporation	ETR		0.95
Evergy, Inc.	EVRG		0.95
Fortis, Inc.	FTS.TO		0.70
MGE Energy, Inc.	MGEE		0.80
OGE Energy Corporation	OGE		1.05
Otter Tail Corporation	OTTR		0.95
WEC Energy Group, Inc.	WEC		0.85
<b>Mean:</b>			0.91
<b>Median:</b>			0.90
<b>Beta (<math>\beta</math>) Estimate:</b>			<b>0.90</b>
<b>Data Source:</b>			
Value Line Industry Summary & Index, 03-08-2024			

**Cost of Capital Study**  
**January 1, 2024**  
**Dividend Growth Model (DGM or DCF)**

DGM or DCF Model ==>  $K_e = \frac{D_1}{P_0} + g$  where

$K_e$  = Cost of Equity  
 $D_1$  = Expected Dividends  
 $P_0$  = Current Price  
 $g$  = Sustainable Growth

Electric Industry (SIC 4911)												
		(1)	(2)		(3)	(4)		(5)	(6)			
Company Name	Ticker Symbol	Stock Price $P_0$	Expected Dividend $D_1$	Dividend Yield $(D_1 / P_0)$	Dividend Growth $g$	Earnings Growth $g$				(Dividends) $K_e$	(Earnings) $K_e$	$g=(b * ROE)$ $K_e$
							b	ROE	$g=(b * ROE)$			
ALLETE, Inc.	ALE	60.59	2.82	4.65%	3.50%	6.00%	30.00%	8.80%	2.64%	8.15%	10.65%	7.29%
Alliant Energy Corporation	LNT	51.34	1.92	3.74%	6.00%	6.50%	35.00%	10.40%	3.64%	9.74%	10.24%	7.38%
Ameren Corporation	AEE	75.15	2.68	3.57%	6.50%	6.50%	43.00%	11.00%	4.73%	10.07%	10.07%	8.30%
American Electric Power Co	AEP	80.92	3.60	4.45%	5.50%	6.50%	37.00%	10.00%	3.70%	9.95%	10.95%	8.15%
CenterPoint Energy, Inc.	CNP	28.80	0.83	2.88%	3.00%	6.00%	42.00%	9.00%	3.78%	5.88%	8.88%	6.66%
CMS Energy Corporation	CMS	57.96	2.06	3.55%	4.00%	5.00%	35.00%	12.00%	4.20%	7.55%	8.55%	7.75%
Entergy Corporation	ETR	101.40	4.56	4.50%	3.50%	0.50%	60.00%	16.00%	9.60%	8.00%	5.00%	14.10%
Eversource Energy	ES	51.76	2.61	5.04%	7.00%	7.50%	31.00%	9.00%	2.79%	12.04%	12.54%	7.83%
Fortis, Inc.	FTS.TO	54.74	2.38	4.35%	6.00%	5.00%	19.00%	7.00%	1.33%	10.35%	9.35%	5.68%
MGE Energy, Inc.	MGEE	72.90	1.71	2.35%	3.50%	6.00%	49.00%	10.50%	5.15%	5.85%	8.35%	7.50%
OGE Energy Corporation	OGE	35.37	1.69	4.78%	3.00%	6.50%	19.00%	12.00%	2.28%	7.78%	11.28%	7.06%
Otter Tail Corporation	OTTR	80.83	1.87	2.31%	7.00%	4.50%	56.00%	13.50%	7.56%	9.31%	6.81%	9.87%
WEC Energy Group, Inc.	WEC	83.85	3.34	3.98%	7.00%	6.00%	32.00%	12.50%	4.00%	10.98%	9.98%	7.98%
<b>Mean:</b>				<b>3.86%</b>	<b>5.04%</b>	<b>5.58%</b>	<b>37.54%</b>	<b>10.90%</b>	<b>4.26%</b>	<b>8.90%</b>	<b>9.43%</b>	<b>8.12%</b>
<b>Median:</b>				<b>3.98%</b>	<b>5.50%</b>	<b>6.00%</b>	<b>35.00%</b>	<b>10.50%</b>	<b>3.78%</b>	<b>9.31%</b>	<b>9.98%</b>	<b>7.75%</b>
<b>Cost of Equity Capital - DCF <math>K_e</math> Estimate:</b>										<b>9.25%</b>	<b>10.00%</b>	<b>7.75%</b>
b = (1 - payout ratio) = Retention Ratio ROE = Return on Book Equity <b>Data Source:</b> Column (1), Yahoo Finance, 12-29-2023 Columns (2) - (6), Value Line Industry Summary & Index, 03-08-2024												

### Cost of Capital Study

January 1, 2024

#### Multiple-Stage Discounted Cash Flow (DCF) Estimated Costs of Common Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Expected Annualized Quarterly	Growth Years	Growth Year	Growth Year	Growth Year	Growth Year	Growth Year	Growth in Perpetuity	Cost of Equity
Company Name	Dividend	1-5	6	7	8	9	10		
ALLETE, Inc.	\$2.82	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	8.54%
Alliant Energy Corporation	\$1.92	6.00%	5.63%	5.26%	4.89%	4.52%	4.15%	3.80%	8.25%
Ameren Corporation	\$2.68	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	8.18%
American Electric Power Comp	\$3.60	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	8.93%
CenterPoint Energy, Inc.	\$0.83	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	6.62%
CMS Energy Corporation	\$2.06	4.00%	3.97%	3.94%	3.91%	3.88%	3.85%	3.80%	7.53%
Entergy Corporation	\$4.56	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	8.38%
Evergy, Inc.	\$2.61	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	10.13%
Fortis, Inc.	\$2.38	6.00%	5.63%	5.26%	4.89%	4.52%	4.15%	3.80%	8.96%
MGE Energy, Inc.	\$1.71	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	6.16%
OGE Energy Corporation	\$1.69	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	8.52%
Otter Tail Corporation	\$1.87	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	6.75%
WEC Energy Group, Inc.	\$3.34	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	8.83%
								<b>Average:</b>	<b>8.14%</b>
								<b>Median:</b>	<b>8.38%</b>
<b>Cost of Equity Capital - DCF Ke Estimate:</b>									<b>8.50%</b>

**Data Source:**

Column (1) = Value Line

Column (2) = Value Line average estimated growth rates.

Columns (3) - (7) = Linear reduction of short-term growth rate projections to sustainable level.

Column (8) = Long Term Projected GDP Growth Rate Projections from U.S. Federal Reserve.



**Cost of Capital Study**  
**January 1, 2024**  
**Support for Market Multiples**

<b>Electric Industry (SIC 4911)</b>				
		<b>(1)</b>	<b>(2)</b>	
<b>Company Name</b>	<b>Ticker Symbol</b>	<b>Stock Price</b>	<b>Earnings</b>	<b>P/E Multiple</b>
ALLETE, Inc.	ALE	60.59	4.30	14.09
Alliant Energy Corporation	LNT	51.34	2.78	18.47
Ameren Corporation	AEE	75.15	4.37	17.20
American Electric Power Company, Inc.	AEP	80.92	5.24	15.44
CenterPoint Energy, Inc.	CNP	28.80	1.37	21.02
CMS Energy Corporation	CMS	57.96	3.01	19.26
Entergy Corporation	ETR	101.40	11.10	9.14
Evergy, Inc.	EVRG	51.76	3.60	14.38
Fortis, Inc.	FTS.TO	54.74	3.10	17.66
MGE Energy, Inc.	MGEE	72.90	3.25	22.43
OGE Energy Corporation	OGE	35.37	2.07	17.09
Otter Tail Corporation	OTTR	80.83	7.00	11.55
WEC Energy Group, Inc.	WEC	83.85	4.63	18.11
<b>Mean</b>				<b>16.60</b>
<b>Median</b>				<b>17.20</b>
<b>P/E Estimate</b>				<b>17.25</b>
<b>Equity Rate</b>				<b>5.80%</b>
<b>Data Source:</b>				
Column (1) Yahoo Finance, 12-29-2023				
Coulmn (2) Value Line Industry Summay & Index, 03-08-2024				

**Cost of Capital Study**  
**January 1, 2024**  
**Direct Debt Rate Calculation**

<b>Electric Industry (SIC 4911)</b>	
<b>Direct Capitalization Debt Rate</b>	
Interest Expense (\$ mil)	6,605
Total Value of LT Debt (TVLTD) (\$ mil)	174,454
<b>Current Yield = Interest Expense/TVLTD</b>	<b>3.79%</b>
<b>Data Source:</b> Value Line Investment Survey, 03-08-2024	



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**Cost of Capital Study**  
**January 1, 2024**  
**Staff Recommendation**

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)			Reference
<b>Equity:</b>			
<b>Risk Adjusted Models</b>			Page 5
	CAPM	11.76%	
<b>Dividend Growth Models</b>			Page 7
	DGM or DCF Model (Dividend Growth)	11.25%	Page 7
	DGM or DCF Model (Earnings Growth)	17.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	15.00%	Page 8
	Multi Stage DCF	9.60%	
	<b>Average</b>	<b>12.92%</b>	
	<b>Range</b>	<b>9.60% - 17.00%</b>	
<b>Estimated Cost of Equity Capital</b>		<b>13.50%</b>	
<b>Debt:</b>			Page 3
<b>Estimated Cost of Debt Capital</b>		<b>6.13%</b>	
<b>Cost of Capital Summary</b>			
<u>Capital Component</u>	<u>Market Capital Structure</u>	<u>Cost of Capital</u>	<u>Before-Tax Weighted Average Cost of Capital</u>
Debt	30.00%	6.13%	1.84%
Equity	70.00%	13.50%	9.45%
<b>TOTAL</b>	<b>100.00%</b>		<b>11.29%</b>
		Rounded	<b>11.25%</b>



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## Cost of Capital Study January 1, 2024 Staff Recommendation

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)				Reference
<b>Direct Rate</b>				
<b>Equity:</b>				
	<u>Estimated Cost of Equity Capital</u>		<b>9.52%</b>	Page 9
<b>Debt:</b>				
	<u>Estimated Cost of Debt Capital</u>		<b>4.87%</b>	Page 10
<b>Cost of Capital Summary</b>				
<u>Capital Component</u>	<u>Market Capital Structure</u>	<u>Cost of Capital</u>	<u>Before-Tax Weighted Average Cost of Capital</u>	
Debt	35.00%	4.87%	1.70%	
Equity	<u>65.00%</u>	9.52%	<u>6.19%</u>	
<b>Total</b>	<u><b>100.00%</b></u>		<u><b>7.89%</b></u>	
		Rounded	<u><b>8.00%</b></u>	

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of Debt Capital**

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)				
Ratings				
Company	Ticker		Moody's	S&P
Cheniere Energy PTRS	CQP		Ba1	BBB
Chevron Corp.	CVX		Aa2	AA-
Devon Energy	DVN		Baa2	BBB
Enbridge, Inc.	ENB.TO		Baa1	BBB+
Enterprise Products	EPD		A3	BBB+
EOG Resources	EOG		A3	A-
Exxon Mobil Corp.	XOM		Aa2	AA-
Hess Corp.	HES		Baa3	BBB-
Hess Midstream	HESM		NPS	BB+
Kinder Morgan, Inc.	KMI		Baa2	BBB
Marathon Petroleum	MPC		Baa2	BBB
National Fuel Gas	NFG		Baa3	BBB-
Oneok, Inc	OKE		Baa2	BBB
Ovintiv	OVV		Baa3	BBB-
Phillips 66	PSX		A3	BBB+
Valero Energy	VLO		Baa2	BBB
Western Midstream	WES		Baa3	BBB-
Williams Co, Inc.	WMB		Baa2	BBB
Average Rating			Baa	BBB
NR = Not Rated				
RW = Rating Withdrawn				
Mergent Bond Record, January 2024				
Corporate	Aaa	Aa	A	Baa
October	5.61%	5.97%	6.18%	6.63%
November	5.61%	5.57%	5.78%	6.19%
December	4.74%	5.05%	5.25%	5.64%
<b>Average</b>	<b>5.32%</b>	<b>5.53%</b>	<b>5.74%</b>	<b>6.15%</b>
Public Utilities	Aaa	Aa	A	Baa
October	-	6.19%	6.34%	6.61%
November	-	5.82%	5.96%	6.20%
December	-	5.27%	5.42%	5.68%
<b>Average</b>	<b>-</b>	<b>5.76%</b>	<b>5.91%</b>	<b>6.16%</b>
Industrials	Aaa	Aa	A	Baa
October	5.61%	5.76%	6.02%	6.64%
November	5.20%	5.32%	5.59%	6.18%
December	4.74%	4.82%	5.07%	5.60%
<b>Average</b>	<b>5.18%</b>	<b>5.30%</b>	<b>5.56%</b>	<b>6.14%</b>
<b>Debt Yield Rate Estimate</b>				<b>6.13%</b>
Data Source:				
<a href="https://www.moody.com">https://www.moody.com</a>				
<a href="https://standardandpoors.com">https://standardandpoors.com</a>				
Mergent Bond Record, January 2024				

Ratings				
Dispersions & Averages Number of Companies				
Agency				
S&P				
AAA	1			
AA	2	2	4	
A	3	1	3	
BBB	4	13	52	
BB	5	1	5	
B	6			
CCC	7			
C	9			
D	10			
<b>Total</b>		<b>17</b>	<b>64</b>	
Average Rating: 3.76				
Agency				
Moody's				
Aaa	1			
Aa	2	2	2	
A	3	3	9	
Baa	4	11	44	
Ba	5	1	5	
B	6			
Caa	7			
Ca	8			
C	9			
<b>Total</b>		<b>17</b>	<b>60</b>	
Average Rating: 3.53				

<sup>1</sup> - Public Utilities Debt. Debt Cost lies between 'A' (5.91%) and 'Baa' (6.16%) Ratings. 6.16% - 5.91% = 0.25%. 3.24 (average rating)/4 (next whole rating) = .81. 0.25%\*.81 =

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of the Market Capital Structure**

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Company Name	Stock Symbol	Debt (\$ mil)	Debt %	Stock Price	Shares (mil) Outstanding	Equity (\$ mil)	Equity %	Total Capital (\$ mil)
Cheniere Energy PTRS	CQP	15,949	37.59%	54.71	484.03	26,481	62.41%	42,430
Chevron Corp.	CVX	20,559	6.88%	147.46	1,887.75	278,368	93.12%	298,927
Devon Energy	DVN	6,162	17.64%	44.91	640.70	28,774	82.36%	34,936
Enbridge, Inc.	ENB.TO	81,200	44.53%	47.58	2,125.58	101,135	55.47%	182,335
Enterprise Products	EPD	28,916	33.59%	26.32	2,171.88	57,164	66.41%	86,080
EOG Resources	EOG	3,806	5.12%	121.07	583.15	70,602	94.88%	74,408
Exxon Mobil Corp.	XOM	41,573	9.43%	100.78	3,962.92	399,383	90.57%	440,956
Hess Corp.	HES	9,303	17.60%	141.85	307.15	43,569	82.40%	52,872
Hess Midstream	HESM	3,148	59.43%	31.43	68.36	2,149	40.57%	5,297
Kinder Morgan, Inc.	KMI	31,000	44.20%	17.61	2,222.77	39,143	55.80%	70,143
Marathon Petroleum	MPC	27,282	32.59%	148.63	379.69	56,433	67.41%	83,715
National Fuel Gas	NFG	2,686	36.54%	50.63	92.13	4,665	63.46%	7,351
Oneok, Inc	OKE	21,950	35.34%	68.94	582.55	40,161	64.66%	62,111
Ovintiv	OVV	6,163	34.36%	43.14	272.90	11,773	65.64%	17,936
Phillips 66	PSX	19,444	25.35%	130.17	439.95	57,268	74.65%	76,712
Valero Energy	VLO	11,441	20.79%	128.01	340.45	43,581	79.21%	55,022
Western Midstream	WES	7,262	40.34%	28.30	379.52	10,740	59.66%	18,002
Williams Co, Inc.	WMB	2,571	5.66%	35.23	1,216.49	42,857	94.34%	45,428
<b>Mean:</b>		<b>18,912</b>	<b>28.17%</b>			<b>73,014</b>	<b>71.83%</b>	<b>91,926</b>
<b>Median:</b>		<b>13,695</b>	<b>33.09%</b>			<b>43,213</b>	<b>66.91%</b>	<b>58,567</b>
<b>Market Capital Structure Estimate:</b>		<b>Debt:</b>	<b>35.00%</b>			<b>Equity:</b>	<b>65.00%</b>	

**Data Source:**

Columns (1) & (4), Value Line Industry Summary & Index, 11-24-2023  
Column (2) = Column (1) / Column (7)  
Column (3), Yahoo Finance, 12-29-2023  
Column (5) = Column (3) \* Column (4)  
Column (7) = Column (1) + Column (5)

**Cost of Capital Study**  
**January 1, 2024**  
**Capital Asset Pricing Model (CAPM)**

CAPM ==>  $K_e = R_f + \beta (ERP)$

<b>Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)</b>	
Risk-Free Rate	4.14%
Beta ( $\beta$ )	1.20
Equity Risk Premium (ERP): $(R_m - R_f)^*$	6.35%
Adjusted Equity Risk Premium: $(\beta * ERP)$	7.62%
<b>Cost of Equity Capital - CAPM</b>	<b>11.76%</b>
<b>U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields</b>	
<b>U.S. Treasury Securities:</b>	
2023 December - 30 Day	4.14%
2023 November - 60 Day	4.40%
2023 October - 90 Day	4.58%
<b>Risk-Free Rate of Return <math>R_f</math>, 30-year Treasury Rate. 2023 December - 30 Day Average.</b>	<b>4.14%</b>
* The equity risk premium for U.S. common stock was based on STC staff review of articles, studies, and surveys.	

## Cost of Capital Study

January 1, 2024

### Beta ( $\beta$ ) Analysis

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)			
Company Name	Stock Symbol		Beta " $\beta$ "
Cheniere Energy PTRS	CQP		0.95
Chevron Corp.	CVX		1.15
Devon Energy	DVN		1.50
Enbridge, Inc.	ENB.TO		0.85
Enterprise Products	EPD		1.00
EOG Resources	EOG		1.20
Exxon Mobil Corp.	XOM		1.10
Hess Corp.	HES		1.30
Hess Midstream	HESM		1.05
Kinder Morgan, Inc.	KMI		1.10
Marathon Petroleum	MPC		1.55
National Fuel Gas	NFG		0.85
Oneok, Inc	OKE		1.50
Ovintiv	OVV		1.55
Phillips 66	PSX		1.25
Valero Energy	VLO		1.45
Western Midstream	WES		1.35
Williams Co, Inc.	WMB		1.10
<b>Mean:</b>			<b>1.21</b>
<b>Median:</b>			<b>1.18</b>
<b>Beta (<math>\beta</math>) Estimate:</b>			<b>1.15</b>
<b>Data Source:</b>			
Value Line Industry Summary & Index, 11-24-2023			



**Cost of Capital Study**  
**January 1, 2024**  
**Dividend Growth Model (DGM or DCF)**

DGM or DCF Model  $\implies K_e = \frac{D_1}{P_0} + g$  where  
 $K_e =$  Cost of Equity  
 $D_1 =$  Expected Dividends  
 $P_0 =$  Current Price  
 $g =$  Sustainable Growth

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)													
Company Name	Stock Symbol	(1)	(2)	Dividend Yield ( $D_1 / P_0$ )	(3)	(4)	(5)			(6)	(Dividends) $K_e$	(Earnings) $K_e$	$g=(b * ROE)$ $K_e$
		Stock Price $P_0$	Expected Dividend $D_1$		Dividend Growth $g$	Earnings Growth $g$	b	ROE	$g=(b * ROE)$				
Cheniere Energy PTRS	CQP	54.71	3.28	6.00%	5.00%	11.50%	54.00%	NMF	NMF	11.00%	17.50%	NMF	
Chevron Corp.	CVX	147.46	6.52	4.42%	6.50%	16.50%	55.00%	15.60%	8.58%	10.92%	20.92%	13.00%	
Devon Energy	DVN	44.91	0.88	1.96%	11.50%	9.50%	86.00%	29.00%	24.94%	13.46%	11.46%	26.90%	
Enbridge, Inc.	ENB.TO	47.58	3.65	7.67%	2.50%	5.00%	NMF	8.50%	NMF	10.17%	12.67%	NMF	
Enterprise Products	EPD	26.32	2.12	8.05%	9.00%	7.00%	21.00%	18.00%	3.78%	17.05%	15.05%	11.83%	
EOG Resources	EOG	121.07	3.72	3.07%	14.00%	15.00%	72.00%	24.00%	17.28%	17.07%	18.07%	20.35%	
Exxon Mobil Corp.	XOM	100.78	3.80	3.77%	2.00%	7.00%	59.00%	17.00%	10.03%	5.77%	10.77%	13.80%	
Hess Corp.	HES	141.85	1.75	1.23%	8.50%	19.50%	65.00%	17.50%	11.38%	9.73%	20.73%	12.61%	
Hess Midstream	HESM	31.43	2.70	8.59%	9.00%	11.50%	-13.00%	37.00%	-4.81%	17.59%	20.09%	3.78%	
Kinder Morgan, Inc.	KMI	17.61	1.15	6.53%	3.50%	15.00%	-7.00%	7.50%	-0.53%	10.03%	21.53%	6.00%	
Marathon Petroleum	MPC	148.63	3.35	2.25%	6.50%	14.50%	87.00%	31.00%	26.97%	8.75%	16.75%	29.22%	
National Fuel Gas	NFG	50.63	2.00	3.95%	3.00%	5.50%	63.00%	16.10%	10.14%	6.95%	9.45%	14.09%	
Oneok, Inc	OKE	68.94	3.96	5.74%	3.50%	13.50%	8.00%	15.50%	1.24%	9.24%	19.24%	6.98%	
Ovintiv	OVV	43.14	1.25	2.90%	17.00%	15.00%	82.00%	17.50%	14.35%	19.90%	17.90%	17.25%	
Phillips 66	PSX	130.17	4.40	3.38%	5.50%	17.50%	73.00%	23.00%	16.79%	8.88%	20.88%	20.17%	
Valero Energy	VLO	128.01	4.08	3.19%	2.00%	9.50%	84.00%	33.50%	28.14%	5.19%	12.69%	31.33%	
Western Midstream	WES	28.30	2.35	8.30%	11.50%	7.50%	19.00%	35.50%	6.75%	19.80%	15.80%	15.05%	
Williams Co, Inc.	WMB	35.23	1.90	5.39%	3.50%	10.00%	6.00%	18.90%	1.13%	8.89%	15.39%	6.52%	
<b>Mean:</b>				<b>4.80%</b>	<b>6.89%</b>	<b>11.69%</b>	<b>47.88%</b>	<b>21.48%</b>	<b>11.01%</b>	<b>11.69%</b>	<b>16.49%</b>	<b>15.56%</b>	
<b>Median:</b>				<b>4.19%</b>	<b>6.00%</b>	<b>11.50%</b>	<b>59.00%</b>	<b>18.00%</b>	<b>10.09%</b>	<b>10.10%</b>	<b>17.13%</b>	<b>13.95%</b>	
<b>Cost of Equity Capital - DCF <math>K_e</math> Estimate:</b>										<b>11.25%</b>	<b>17.00%</b>	<b>15.50%</b>	

**Notes:**  
b = (1 - payout ratio) = Retention Ratio  
ROE = Return on Book Equity  
Not Meaningful (NMF)  
**Data Source:**  
Column (1), Yahoo Finance, 12-29-2023  
Columns (2) - (6), Value Line Industry Summary & Index, 11-24-2023

## Cost of Capital Study

January 1, 2024

### Multiple-Stage Discounted Cash Flow (DCF) Estimated Costs of Common Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Expected Annualized Quarterly	Growth Years	Growth Year	Growth Year	Growth Year	Growth Year	Growth Year	Growth in Perpetuity	Cost of Equity
Company Name	Dividend	1-5	6	7	8	9	10		
Cheniere Energy PTRS	3.28	5.00%	4.80%	4.60%	4.40%	4.20%	4.00%	3.80%	10.47%
Chevron Corp.	6.52	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	9.21%
Devon Energy	0.88	11.50%	10.22%	8.94%	7.66%	6.38%	5.93%	3.80%	7.15%
Enbridge, Inc.	3.65	2.50%	2.72%	2.94%	3.16%	3.38%	3.60%	3.80%	11.18%
Enterprise Products	2.12	9.00%	8.13%	7.26%	6.39%	5.52%	4.65%	3.80%	14.83%
EOG Resources	3.72	14.00%	12.30%	10.60%	8.90%	7.20%	5.50%	3.80%	9.65%
Exxon Mobil Corp.	3.80	2.00%	2.30%	2.60%	2.90%	3.20%	3.50%	3.80%	7.28%
Hess Corp.	1.75	8.50%	7.72%	6.94%	6.16%	5.38%	4.60%	3.80%	5.50%
Hess Midstream	2.70	9.00%	8.13%	7.26%	6.39%	5.52%	4.65%	3.80%	15.45%
Kinder Morgan, Inc.	1.15	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	10.43%
Marathon Petroleum	3.35	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	6.57%
National Fuel Gas	2.00	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	7.70%
Oneok, Inc	3.96	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	9.65%
Ovintiv	1.25	17.00%	14.80%	12.60%	10.40%	8.20%	6.00%	3.80%	10.30%
Phillips 66	4.40	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	7.71%
Valero Energy	4.08	2.00%	2.30%	2.60%	2.90%	3.20%	3.50%	3.80%	6.73%
Western Midstream	2.35	11.50%	10.22%	8.94%	7.66%	6.38%	5.10%	3.80%	16.52%
Williams Co, Inc.	1.90	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	9.29%
								<b>Average:</b>	<b>9.54%</b>
								<b>Median:</b>	<b>9.65%</b>
								<b>Cost of Equity Capital - DCF Ke Estimate:</b>	<b>9.60%</b>

**Data Source:**

Column (1) = Value Line

Column (2) = Value Line average estimated growth rates.

Columns (3) - (7) = Linear reduction of short-term growth rate projections to sustainable level.

Column (8) = Long Term Projected GDP Growth Rate and PCE Inflation Projections from U.S. Federal Reserve.

**Cost of Capital Study**  
**January 1, 2024**  
**Support for Market Multiples**

<b>Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)</b>				
	(1)	(2)		
<b>Company Name</b>	<b>Ticker</b>	<b>Stock Price</b>	<b>Earnings</b>	<b>P/E Multiple</b>
Cheniere Energy PTRS	CQP	54.71	6.80	8.05
Chevron Corp.	CVX	147.46	13.34	11.05
Devon Energy	DVN	44.91	5.70	7.88
Enbridge, Inc.	ENB.TO	47.58	2.49	19.11
Enterprise Products	EPD	26.32	2.52	10.44
EOG Resources	EOG	121.07	11.90	10.17
Exxon Mobil Corp.	XOM	100.78	8.89	11.34
Hess Corp.	HES	141.85	5.05	28.09
Hess Midstream	HESM	31.43	2.09	15.04
Kinder Morgan, Inc.	KMI	17.61	1.06	16.61
Marathon Petroleum	MPC	148.63	23.53	6.32
National Fuel Gas	NFG	50.63	5.17	9.79
Oneok, Inc	OKE	68.94	4.75	14.51
Ovintiv	OVV	43.14	6.40	6.74
Phillips 66	PSX	130.17	15.48	8.41
Valero Energy	VLO	128.01	24.92	5.14
Western Midstream	WES	28.30	2.65	10.68
Williams Co, Inc.	WMB	35.23	1.91	18.45
<b>Mean:</b>				<b>12.10</b>
<b>Median:</b>				<b>10.56</b>
<b>P/E Estimate:</b>				<b>10.50</b>
<b>Equity Rate:</b>				<b>9.52%</b>
<b>Data Source:</b>				
(1) Yahoo Finance, 12-29-2023				
(2) Value Line Industry Summary & Index, 11-24-2023				

**Cost of Capital Study**  
**January 1, 2024**  
**Direct Debt Rate Calculation**

<b>Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)</b>	
<b>Direct Capitalization Debt Rate</b>	
Interest Expense (\$ mil)	\$ 15,511
Total Value of Debt (TVD) (\$ mil)	\$ 318,617
<b>Current Yield = Interest Expense/TVD</b>	<b>4.87%</b>
<b>Data Source:</b>	
Value Line Investment Survey, 11-24-2023	



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**Cost of Capital Study**  
**January 1, 2024**  
**Staff Recommendation**

Railroad Class I Industry (SIC 4011)			Reference
<b>Equity:</b>			
<b>Risk Adjusted Models</b>			
	CAPM	10.81%	Page 5
<b>Dividend Growth Models</b>			
	DGM or DCF Model (Dividend Growth)	10.50%	Page 7
	DGM or DCF Model (Earnings Growth)	10.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	16.00%	Page 7
	Multi Stage DCF	7.00%	Page 8
	<b>Average</b>	<b>10.86%</b>	
	<b>Range</b>	<b>7.00% - 16.00%</b>	
<b>Estimated Cost of Equity Capital</b>		<b>12.50%</b>	
<b>Debt:</b>			
<b>Estimated Cost of Debt Capital</b>		<b>6.12%</b>	Page 3
<b>Cost of Capital Summary</b>			
<b>Capital Component</b>	<b>Market Capital Structure</b>	<b>Cost of Capital</b>	<b>Before-Tax Weighted Average Cost of Capital</b>
Debt	20.00%	6.12%	1.22%
Equity	80.00%	12.50%	10.00%
<b>Total</b>	<b>100.00%</b>		<b>11.22%</b>
		Rounded	<b>11.25%</b>



## Cost of Capital Study

### January 1, 2024

### Staff Recommendation

<b>Railroad Non-Class I Industry (SIC 4013)</b>				<b>Reference</b>
<b>Equity:</b>				
<b>Risk Adjusted Models</b>				
	CAPM		10.81%	Page 5
<b>Dividend Growth Models</b>				
	DGM or DCF Model (Dividend Growth)		10.50%	Page 7
	DGM or DCF Model (Earnings Growth)		10.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)		16.00%	Page 7
	Multi Stage DCF		7.00%	Page 8
	<b>Average</b>		<b>10.86%</b>	
	<b>Range</b>		<b>7.00% - 16.00%</b>	
<b>Estimated Cost of Equity Capital</b>			<b>12.75%</b>	
<b>Debt:</b>				
<b>Estimated Cost of Debt Capital</b>			<b>6.12%</b>	Page 3
<b>Cost of Capital Summary</b>				
<b>Capital Component</b>	<b>Market Capital Structure</b>	<b>Cost of Capital</b>	<b>Before-Tax Weighted Average Cost of Capital</b>	
Debt	20.00%	6.12%	1.22%	
Equity	80.00%	12.75%	10.20%	
<b>Total</b>	<b>100.00%</b>		<b>11.42%</b>	
		Rounded	<b>11.50%</b>	



## Cost of Capital Study January 1, 2024 Staff Recommendation

Railroad Class I Industry (SIC 4011)				Reference
<b>Direct Rate</b>				
<b>Equity:</b>				
<u>Estimated Cost of Equity Capital</u>			<b>4.40%</b>	Page 9
<b>Debt:</b>				
<u>Estimated Cost of Debt Capital</u>			<b>2.75%</b>	Page 10
<b>Cost of Capital Summary</b>				
<u>Capital Component</u>	<u>Market Capital Structure</u>	<u>Cost of Capital</u>	<u>Before-Tax Weighted Average Cost of Capital</u>	
Debt	20.00%	2.75%	0.55%	
Equity	80.00%	4.40%	3.52%	
<b>Total</b>	<u>100.00%</u>		<u>4.07%</u>	
		Rounded	<b><u>4.00%</u></b>	

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of Debt Capital**

<b>Railroad Class I Industry (SIC 4011)</b>				
			<b>Ratings</b>	
<b>Company</b>	<b>Ticker</b>		<b>Moody's</b>	<b>S&amp;P</b>
Canadian National Railway	CNI		A2	A-
Canadian Pacific Kansas City	CP		Baa2	BBB+
CSX Corp.	CSX		A3	BBB+
Norfolk Southern Corp.	NSC		Baa1	BBB+
Union Pacific Corp.	UNP		A3	A-
<b>Average Rating</b>			<b>A</b>	<b>BBB</b>
NR = Not Rated				
RW = Rating Withdrawn				
<b>Mergent Bond Record, January 2024</b>				
<b>Corporate</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	5.61%	5.97%	6.18%	6.63%
November	5.61%	5.57%	5.78%	6.19%
December	4.74%	5.05%	5.25%	5.64%
<b>Average</b>	<b>5.32%</b>	<b>5.53%</b>	<b>5.74%</b>	<b>6.15%</b>
<b>Public Utilities</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	-	6.19%	6.34%	6.61%
November	-	5.82%	5.96%	6.20%
December	-	5.27%	5.42%	5.68%
<b>Average</b>	<b>-</b>	<b>5.76%</b>	<b>5.91%</b>	<b>6.16%</b>
<b>Industrials</b>	<b>Aaa</b>	<b>Aa</b>	<b>A</b>	<b>Baa</b>
October	5.61%	5.76%	6.02%	6.64%
November	5.20%	5.32%	5.59%	6.18%
December	4.74%	4.82%	5.07%	5.60%
<b>Average</b>	<b>5.18%</b>	<b>5.30%</b>	<b>5.56%</b>	<b>6.14%</b>
<b>Debt Yield Rate Estimate</b>				<b>6.12%</b>
<b>Data Sources:</b>				
<a href="https://www.moodys.com">https://www.moodys.com</a>				
<a href="https://standardandpoors.com">https://standardandpoors.com</a>				
Mergent Bond Record, January 2024				

<b>Ratings</b>				
<u>Dispersions &amp; Averages Number of Companies</u>				
<b>Agency</b>				
<b>S&amp;P</b>				
AAA	1			
AA	2			
A	3	2	6	
BBB	4	3	12	
BB	5			
B	6			
CCC	7			
C	9			
D	10			
<b>Total</b>		<b>5</b>	<b>18</b>	
<b>Average Rating:</b>			<b>3.60</b>	
<b>Agency</b>				
<b>Moody's</b>				
Aaa	1			
Aa	2			
<b>A</b>	<b>3</b>	<b>3</b>	<b>9</b>	
<b>Baa</b>	<b>4</b>	<b>2</b>	<b>8</b>	
Ba	5			
B	6			
Caa	7			
Ca	8			
C	9			
<b>Total</b>		<b>5</b>	<b>17</b>	
<b>Average Rating:</b>			<b>3.40</b>	



**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of the Market Capital Structure**

<b>Railroad Class I Industry (SIC 4011)</b>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
<b>Company Name</b>	<b>Stock Symbol</b>	<b>Debt (\$ mil)</b>	<b>Debt %</b>	<b>Stock Price</b>	<b>Shares (mil) Outstanding</b>	<b>Equity (\$ mil)</b>	<b>Equity %</b>	<b>Total Capital (\$ mil)</b>
Canadian National Railway	CNI	13,536	14.55%	121.23	655.60	79,478	85.45%	93,014
Canadian Pacific Kansas City	CP	17,660	19.91%	76.24	931.79	71,040	80.09%	88,700
CSX Corp.	CSX	18,462	21.58%	33.96	1,976.13	67,109	78.42%	85,571
Norfolk Southern Corp.	NSC	16,179	23.72%	230.07	226.13	52,026	76.28%	68,205
Union Pacific Corp.	UNP	32,877	18.45%	238.41	609.59	145,332	81.55%	178,209
<b>Mean:</b>		<b>19,743</b>	<b>19.64%</b>			<b>82,997.00</b>	<b>80.36%</b>	<b>102,740</b>
<b>Median:</b>		<b>17,660</b>	<b>19.91%</b>			<b>71,040.00</b>	<b>80.09%</b>	<b>88,700</b>
<b>Market Capital Structure Estimate:</b>		<b>Debt:</b>	<b>20.00%</b>			<b>Equity:</b>	<b>80.00%</b>	
<b>Data Source:</b>								
Columns (1) & (4), Value Line Industry Summary & Index, 11-17-2023								
Column (2) = Column (1) / Column (7)								
Column (3), Yahoo Finance, 12-29-2023								
Column (5) = Column (3) * Column (4)								
Column (7) = Column (1) + Column (5)								

**Cost of Capital Study**  
**January 1, 2024**  
**Capital Asset Pricing Model (CAPM)**

CAPM ==>  $K_e = R_f + \beta (ERP)$

<b>Railroad Class I Industry (SIC 4011)</b>	
Risk-Free Rate	4.14%
Beta ( $\beta$ )	1.05
Equity Risk Premium (ERP): $(R_m - R_f)^*$	6.35%
Adjusted Equity Risk Premium: $(\beta * ERP)$	6.67%
<b>Cost of Equity Capital - CAPM</b>	<b>10.81%</b>
<b>U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields</b>	
<b>U.S. Treasury Securities:</b>	
2023 December - 30 Day	4.14%
2023 November - 60 Day	4.40%
2023 October - 90 Day	4.58%
<b>Risk-Free Rate of Return <math>R_f</math>, 30-year Treasury Rate. 2023 December - 30 Day Average.</b>	<b>4.14%</b>
* The equity risk premium for U.S. common stock was based on STC staff review of articles, studies, and surveys.	

## Cost of Capital Study

January 1, 2024

Beta ( $\beta$ ) Analysis

Railroad Class I Industry (SIC 4011)			
Company Name	Stock Symbol		Beta " $\beta$ "
Canadian National Railway	CNI		0.90
Canadian Pacific Kansas City	CP		1.00
CSX Corp.	CSX		1.05
Norfolk Southern Corp.	NSC		1.05
Union Pacific Corp.	UNP		1.05
Mean:			1.01
Median:			1.05
Beta ( $\beta$ ) Estimate:			1.05
<b>Data Source:</b> Value Line Industry Summary & Index, 11-17-2023			

**Cost of Capital Study**  
**January 1, 2024**  
**Dividend Growth Model (DGM or DCF)**

DGM or DCF Model ==>  $K_e = \frac{D_1}{P_0} + g$  where  
 $K_e$  = Cost of Equity  
 $D_1$  = Expected Dividends  
 $P_0$  = Current Price  
 $g$  = Sustainable Growth

Railroad Class I Industry (SIC 4011)												
	(1)	(2)		(3)	(4)		(5)	(6)				
Company Name	Stock Symbol	Stock Price $P_0$	Expected Dividend $D_1$	Dividend Yield $(D_1 / P_0)$	Dividend Growth $g$	Earnings Growth $g$				(Dividends) $K_e$	(Earnings) $K_e$	$g=(b * ROE)$ $K_e$
							b	ROE	$g=(b * ROE)$			
Canadian National Railway	CNI	121.23	2.60	2.14%	9.00%	10.50%	55.00%	21.50%	11.83%	11.14%	12.64%	13.97%
Canadian Pacific Kansas City	CP	76.24	0.68	0.89%	7.00%	6.00%	79.00%	8.50%	6.72%	7.89%	6.89%	7.61%
CSX Corp.	CSX	33.96	0.48	1.41%	9.50%	8.00%	75.00%	25.50%	19.13%	10.91%	9.41%	20.54%
Norfolk Southern Corp.	NSC	230.07	5.60	2.43%	7.00%	8.50%	54.00%	21.00%	11.34%	9.43%	10.93%	13.77%
Union Pacific Corp.	UNP	238.41	6.00	2.52%	8.00%	7.50%	50.00%	44.00%	22.00%	10.52%	10.02%	24.52%
<b>Mean:</b>				<b>1.88%</b>	<b>8.10%</b>	<b>8.10%</b>	<b>62.60%</b>	<b>24.10%</b>	<b>14.20%</b>	<b>9.98%</b>	<b>9.98%</b>	<b>16.08%</b>
<b>Median:</b>				<b>2.14%</b>	<b>8.00%</b>	<b>8.00%</b>	<b>55.00%</b>	<b>21.50%</b>	<b>11.83%</b>	<b>10.52%</b>	<b>10.02%</b>	<b>13.97%</b>
<b>Cost of Equity Capital - DCF <math>K_e</math> Estimate:</b>										<b>10.50%</b>	<b>10.00%</b>	<b>16.00%</b>
<b>Notes:</b> b = (1 - payout ratio) = Retention Ratio ROE = Return on Book Equity Not Meaningful (NMF) <b>Data Source:</b> Column (1), Yahoo Finance, December Closing Average Columns (2) - (6), Value Line Industry Summary & Index, 11-17-2023												

## Cost of Capital Study

January 1, 2024

### Multiple-Stage Discounted Cash Flow (DCF) Estimated Cost of Common Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Annualized Quarterly	Growth Years	Growth Year	Growth Year	Growth Year	Growth Year	Growth Year	Growth in Perpetuity	Cost of Equity
<b>Company Name</b>	Dividend	1-5	6	7	8	9	10		
Canadian National Railway	\$2.60	9.00%	8.13%	7.26%	6.39%	5.52%	4.65%	3.80%	6.90%
Canadian Pacific Railway	\$0.68	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	4.78%
CSX Corp.	\$0.48	9.50%	8.55%	7.60%	6.65%	5.70%	4.75%	3.80%	5.91%
Norfolk Southern Corp.	\$5.60	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	6.90%
Union Pacific Corp.	\$6.00	8.00%	7.30%	6.60%	5.90%	5.20%	4.50%	3.80%	7.22%
								<b>Average:</b>	<b>6.34%</b>
								<b>Median:</b>	<b>6.90%</b>
<b>Cost of Equity Capital - DCF Estimates:</b>									<b>7.00%</b>
<b>Data Source:</b>									
Column (1) = Value Line									
Column (2) = Value Line Average Estimated Growth Rates									
Columns (3) - (7) = Linear Reduction of Short-term Growth Rate Projections to Sustainable Level									
Column (8) = Long Term Projected GDP Growth Rate Projections from U.S. Federal Reserve									

**Cost of Capital Study**  
**January 1, 2024**  
**Support for Market Multiples**

<b>Railroad Class I Industry (SIC 4011)</b>				
		(1)	(2)	
<b>Company Name</b>	<b>Ticker</b>	<b>Stock Price</b>	<b>Earnings</b>	<b>P/E Multiple</b>
Canadian National Railway	CNI	121.23	5.30	22.87
Canadian Pacific Kansas City	CP	76.24	2.80	27.23
CSX Corp.	CSX	33.96	1.80	18.87
Norfolk Southern Corp.	NSC	230.07	11.80	19.50
Union Pacific Corp.	UNP	238.41	10.30	23.15
<b>Mean</b>				<b>22.32</b>
<b>Median</b>				<b>22.87</b>
<b>P/E Estimate</b>				<b>22.75</b>
<b>Equity Rate</b>				<b>4.40%</b>
<b>Data Source:</b>				
Column (1) Yahoo Finance, December Closing Average				
Column (2) Value Line Industry Summary & Index, 11-17-2023				

**Cost of Capital Study**  
**January 1, 2024**  
**Direct Debt Rate Calculation**

<b>Railroad Class I (SIC 4011)</b>	
<b>Direct Capitalization Debt Rate</b>	
Interest Expense (\$ mil)	\$ 2,565
Total Value of Debt (TVD) (\$ mil)	\$ 93,402
Current Yield = Interest Expense/TVD	<b>2.75%</b>
<b>Data Source:</b> Value Line Investment Survey, 11-17-2023	



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## Cost of Capital Study January 1, 2024 Staff Recommendation

Telecommunications Industry (SIC 4813)			Reference
<b>Equity:</b>			
<b>Risk Adjusted Models</b>	CAPM	9.54%	Page 5
<b>Dividend Growth Models</b>			
	DGM or DCF Model (Dividend Growth)	9.70%	Page 7
	DGM or DCF Model (Earnings Growth)	15.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	13.50%	Page 7
	Multi Stage DCF	8.00%	Page 8
	<b>Average</b>	<b>11.15%</b>	
	<b>Range</b>	<b>8.00% - 15.00%</b>	
<b>Estimated Cost of Equity Capital</b>		<b>14.75%</b>	
<b>Debt:</b>			
<b>Estimated Cost of Debt Capital</b>		<b>6.65%</b>	Page 3
<b>Cost of Capital Summary</b>			
Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	50.00%	6.65%	3.33%
Equity	50.00%	14.75%	7.38%
<b>Total</b>	<b>100.00%</b>		<b>10.71%</b>
		Rounded	<b>10.75%</b>





## Cost of Capital Study January 1, 2024 Staff Recommendation

Telecommunications Industry (SIC 4813)				Reference
<b>Direct Rate</b>				
<b>Equity:</b>				
<u>Estimated Cost of Equity Capital</u>			<b>8.89%</b>	Page 9
<b>Debt:</b>				
<u>Estimated Cost of Debt Capital</u>			<b>4.66%</b>	Page 10
<b>Cost of Capital Summary</b>				
<b>Capital Component</b>	<b>Market Capital Structure</b>	<b>Cost of Capital</b>	<b>Before-Tax Weighted Average Cost of Capital</b>	
Debt	50.00%	4.66%	2.33%	
Equity	50.00%	8.89%	4.45%	
<b>Total</b>	<b>100.00%</b>		<b>6.78%</b>	
		Rounded	<b>6.75%</b>	

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of Debt Capital**

Telecommunications Industry (SIC: 4813)				
Ratings				
Company	Ticker		Moody's	S&P
AT&T	T		Baa2	BBB
Cable One	CABO		Ba3	BB
Comcast Corporation	CMCSA		A3	A-
Deutsche Telekom	DTEGY		Baa1	BBB+
Lumen Technologies	LUMN		Caa2	CC
Shenandoah Telecommunications	SHEN		NPS	AA
Verizon Communications	VZ		Baa1	BBB+
<b>Average Rating</b>			<b>Baa</b>	<b>BBB</b>
NR = Not Rated				
RW = Rating Withdrawn				
<b>Mergent Bond Record, January 2024</b>				
Corporate	Aaa	Aa	A	Baa
October	5.61%	5.97%	6.18%	6.63%
November	5.61%	5.57%	5.78%	6.19%
December	4.74%	5.05%	5.25%	5.64%
<b>Average</b>	<b>5.32%</b>	<b>5.53%</b>	<b>5.74%</b>	<b>6.15%</b>
Public Utilities	Aaa	Aa	A	Baa
October	-	6.19%	6.34%	6.61%
November	-	5.82%	5.96%	6.20%
December	-	5.27%	5.42%	5.68%
<b>Average</b>	<b>-</b>	<b>5.76%</b>	<b>5.91%</b>	<b>6.16%</b>
Industrials	Aaa	Aa	A	Baa
October	5.61%	5.76%	6.02%	6.64%
November	5.20%	5.32%	5.59%	6.18%
December	4.74%	4.82%	5.07%	5.60%
<b>Average</b>	<b>5.18%</b>	<b>5.30%</b>	<b>5.56%</b>	<b>6.14%</b>
<b>Debt Yield Rate Estimate</b>				<b>6.65%</b>
Data Source: <a href="https://www.moodys.com">https://www.moodys.com</a> <a href="https://standardandpoors.com">https://standardandpoors.com</a> Mergent Bond Record, January 2024				

Ratings				
Dispersions & Averages Number of Companies				
Agency				
S&P				
AAA	1			
AA	2	1		
A	3	1	3	
BBB	4	3	12	
BB	5	1	5	
B	6			
CC	8	1	8	
C	9			
D	10			
<b>Total</b>		<b>7</b>	<b>28</b>	
<b>Average Rating:</b>			<b>4.00</b>	
Agency				
Moody's				
Aaa	1			
Aa	2			
A	3	1	3	
Baa	4	3	12	
Ba	5	1	5	
B	6			
Caa	7	1	7	
Ca	8			
C	9			
<b>Total</b>		<b>6</b>	<b>27</b>	
<b>Average Rating:</b>			<b>4.50</b>	

**Cost of Capital Study**  
**January 1, 2024**  
**Analysis of the Market Capital Structure**

Telecommunications Industry (SIC 4813)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Company Name	Ticker Symbol	Debt (\$ mil)	Debt %	Stock Price	Shares (mil) Outstanding	Equity (\$ mil)	Equity %	Total Capital (\$ mil)
AT&T	T	138,003	53.66%	16.67	7,150	119,191	46.34%	257,194
Cable One	CABO	3,699	54.92%	541.24	5.61	3,036	45.08%	6,735
Comcast Corporation	CMCSA	102,503	36.97%	43.42	4,025	174,766	63.03%	277,269
Deutsche Telekom	DTEGY	113,900	48.72%	24.09	4,976	119,872	51.28%	233,772
Lumen Technologies	LUMN	19,895	92.28%	1.65	1,009	1,665	7.72%	21,560
Shenandoah Telecommunications	SHEN	150.20	12.40%	21.22	50	1,061	87.61%	1,211
Verizon Communications	VZ	147,391	48.15%	37.75	4,204	158,701	51.85%	306,092
<b>Mean:</b>		<b>75,077</b>	<b>49.59%</b>			<b>82,613</b>	<b>50.42%</b>	<b>157,690</b>
<b>Median:</b>		<b>102,503</b>	<b>48.72%</b>			<b>119,191</b>	<b>51.28%</b>	<b>233,772</b>
<b>Market Capital Structure Estimate:</b>		<b>Debt:</b>	<b>50.00%</b>			<b>Equity:</b>	<b>50.00%</b>	
<b>Data Source:</b>								
Columns (1) & (4), Value Line Industry Summary & Index, 12-08-2023								
Column (2) = Column (1) / Column (7)								
Column (3), Yahoo Finance, 12-29-2023								
Column (5) = Column (3) * Column (4)								
Column (7) = Column (1) + Column (5)								

**Cost of Capital Study**  
**January 1, 2024**  
**Capital Asset Pricing Model (CAPM)**

CAPM ==>  $K_e = R_f + (\beta * ERP)$

<b>Telecommunications Industry (SIC 4813)</b>	
Risk-Free Rate ( $R_f$ )	4.14%
Beta ( $\beta$ )	0.85
Equity Risk Premium (ERP): ( $R_m - R_f$ )	6.35%
Adjusted Equity Risk Premium: ( $\beta * ERP$ )	5.40%
<b>Cost of Equity Capital - CAPM</b>	<b>9.54%</b>
<b>U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields</b>	
<b>U.S. Treasury Securities:</b>	
2023 December - 30 Day	4.14%
2023 November - 60 Day	4.40%
2023 October - 90 Day	4.58%
<b>Risk-Free Rate of Return <math>R_f</math>, 30-year Treasury Rate. 2023 December - 30 Day Average.</b>	<b>4.14%</b>
* The equity risk premium for U.S. common stock was based on STC staff review of articles, studies, and surveys.	

# Cost of Capital Study

January 1, 2024

Beta ( $\beta$ ) Analysis

Telecommunications Industry (SIC 4813)		
Company Name	Ticker Symbol	Beta " $\beta$ "
AT&T	T	0.80
Cable One	CABO	1.00
Comcast Corporation	CMCSA	0.85
Deutsche Telekom	DTEGY	0.80
Lumen Technologies	LUMN	1.05
Shenandoah Telecommunications	SHEN	0.95
Verizon Communications	VZ	0.65
	<b>Mean:</b>	0.88
	<b>Median:</b>	0.85
	<b>Beta (<math>\beta</math>) Estimate:</b>	<b>0.85</b>
<b>Data Source:</b> Value Line Industry Summary & Index, 12-08-2023		

**Cost of Capital Study**  
**January 1, 2024**  
**Dividend Growth Model (DGM or DCF)**

DGM or DCF Model ==>  $K_e =$

$$\frac{D_1}{P_0} + g$$

where

- $K_e =$  Cost of Equity
- $D_1 =$  Expected Dividends
- $P_0 =$  Current Price
- $g =$  Sustainable Growth

Telecommunications Industry (SIC 4813)												
Company Name	Ticker Symbol	(1)	(2)	Dividend Yield ( $D_1 / P_0$ )	(3)	(4)	(5)			(6)		
		Stock Price $P_0$	Expected Dividend $D_1$		Dividend Growth $g$	EPS Growth $g$	b	ROE	$g=(b * ROE)$	(Dividends) $K_e$	(Earnings) $K_e$	$g=(b * ROE)$ $K_e$
AT&T	T	16.67	1.11	6.66%	-6.50%	1.50%	58.00%	16.50%	9.57%	NMF	8.16%	16.23%
Cable One	CABO	541.24	12.00	2.22%	4.00%	1.50%	70.00%	11.50%	8.05%	6.22%	3.72%	10.27%
Comcast Corporation	CMCSA	43.42	1.23	2.83%	8.50%	9.00%	70.00%	19.00%	13.30%	11.33%	11.83%	16.13%
Deutsche Telekom	DTEGY	24.09	0.77	3.20%	6.50%	10.00%	50.00%	15.00%	7.50%	9.70%	13.20%	10.70%
Lumen Technologies	LUMN	1.65	NMF	NMF	NMF	-8.50%	NMF	5.00%	NMF	NMF	NMF	NMF
Shenandoah Telecommunications	SHEN	21.22	0.10	0.47%	-1.50%	44.00%	11.00%	1.00%	0.11%	NMF	44.47%	0.58%
Verizon Communications	VZ	37.75	2.70	7.15%	2.50%	1.50%	45.00%	20.00%	9.00%	9.65%	8.65%	16.15%
<b>Mean:</b>				<b>2.10%</b>	<b>2.25%</b>	<b>8.43%</b>	<b>50.67%</b>	<b>12.57%</b>	<b>7.92%</b>	<b>9.23%</b>	<b>15.01%</b>	<b>11.68%</b>
<b>Median:</b>				<b>3.02%</b>	<b>3.25%</b>	<b>1.50%</b>	<b>54.00%</b>	<b>15.00%</b>	<b>8.53%</b>	<b>9.68%</b>	<b>10.24%</b>	<b>13.42%</b>
<b>Cost of Equity Capital - DCF <math>K_e</math> Estimate:</b>										<b>9.70%</b>	<b>15.00%</b>	<b>13.50%</b>

**Notes:**  
b = (1 - payout ratio) = Retention Ratio  
ROE = Return on Book Equity  
Not Meaningful (NMF)  
**Data Source:**  
Column (1), Yahoo Finance, 12-29-2023  
Columns (2) - (6), Value Line Industry Summary & Index, 12-08-2023

## Cost of Capital Study

January 1, 2024

### Multiple-Stage Discounted Cash Flow (DCF) Estimated Costs of Common Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Expected Annualized Quarterly	Growth Years	Growth Year	Growth Year	Growth Year	Growth Year	Growth Year	Growth in Perpetuity	Cost of Equity
Company Name	Dividend	1-5	6	7	8	9	10		
AT&T	1.11	-6.50%	-4.78%	-3.06%	-1.34%	0.38%	2.10%	3.80%	NMF
Cable One	12	4.00%	3.97%	3.94%	3.91%	3.88%	3.85%	3.80%	6.11%
Comcast Corporation	1.23	8.50%	7.72%	6.94%	6.16%	5.38%	4.60%	3.80%	7.72%
Deutsche Telekom	0.77	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	7.69%
Lumen Technologies	NMF	NMF	NMF	NMF	NMF	NMF	NMF	3.80%	NMF
Shenandoah Telecommunications	0.1	-1.50%	-0.62%	0.26%	1.14%	2.02%	2.90%	3.80%	NMF
Verizon Communications	2.70	2.50%	2.72%	2.94%	3.16%	3.38%	3.60%	3.80%	10.66%
								<b>Mean:</b>	<b>8.05%</b>
								<b>Median:</b>	<b>7.71%</b>
								<b>Cost of Equity Capital - DCF Ke Estimate:</b>	<b>8.00%</b>

**Data Source:**

Column (1) = Value Line  
 Column (2) = Value Line average estimated growth rates.  
 Columns (3) - (7) = Linear reduction of short-term growth rate projections to sustainable level.  
 Column (8) = Long Term Projected GDP Growth Rate Projections from U.S. Federal Reserve.

## Cost of Capital Study

January 1, 2024

Market Multiples

<b>Telecommunications Industry (SIC 4813)</b>				
		(1)	(2)	
Company Name	Ticker	Stock Price	EPS	P/E Multiple
AT&T	T	16.67	2.45	6.80
Cable One	CABO	541.24	38.20	14.17
Comcast Corporation	CMCSA	43.42	3.90	11.13
Deutsche Telekom	DTEGY	24.09	1.55	15.54
Lumen Technologies	LUMN	1.65	0.45	3.67
Shenandoah Telecommunications	SHEN	21.22	0.10	212.20
Verizon Communications	VZ	37.75	4.80	7.86
<b>Mean:</b>				<b>38.77</b>
<b>Median:</b>				<b>11.13</b>
<b>P/E Estimate:</b>				<b>11.25</b>
<b>Equity Rate:</b>				<b>8.89%</b>
<b>Data Source:</b>				
Column (1) Yahoo Finance, 12-29-2023				
Column (2) Value Line Industry Summary & Index, 12-08-2023				



**Cost of Capital Study**  
**January 1, 2024**  
**Direct Debt Rate Calculation**

<b>Telecommunications Industry (SIC 4813)</b>	
<b>Direct Capitalization Debt Rate</b>	
Interest Expense (\$ mil)	\$ 22,557
Total Value of Debt (TVD) (\$ mil)	\$ 483,960
<b>Current Yield = Interest Expense/TVD</b>	<b>4.66%</b>
<b>Data Source:</b>	
Value Line Investment Survey, 12-08-2023	