STATE TAX COMMISSION OF MISSOURI
P.O. BOX 146
JEFFERSON CITY, MO 65102-0146
P: 573.751.2414 E: OriginalAssessment@stc.mo.gov

Cost of Capital Study
January 1, 2023
Staff Recommendation

Electric Industry (SIC 4911)			Reference
Equity:			
Risk Adjusted Models			
	CAPM	8.94%	Page 5
Dividend Growth Models			
	DGM or DCF Model (Dividend Growth)	8.75%	
	DGM or DCF Model (Earnings Growth)	9.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	7.50%	Page 7
	Multi Stage DCF	7.75%	Page 7
			Page 8
Esimated Cost of Equity Capital		**8.00%**	
Debt:			
Estimated Cost of Debt Capital		**5.57%**	Page 3

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	40.00%	5.57%	2.23%
Equity	60.00%	8.00%	4.80%
Total	**100.00%**		**7.03%**
		Rounded	**7.00%**

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Cost of Capital Study
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Staff Recommendation

Electric Industry (SIC 4911)

	Direct Rate	Reference
Equity:		
Estimated Cost of Equity Capital	**5.13%**	Page 9
Debt:		
Estimated Cost of Debt Capital	**3.54%**	Page 10

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	40.00%	3.54%	1.42%
Equity	60.00%	5.13%	3.08%
Total	**100.00%**		**4.50%**
		Rounded	**4.50%**

Cost of Capital Study
January 1, 2023
Analysis of Debt Capital

Electric Industry (SIC 4911)				
			Ratings	
Company	**Ticker**		**Moody's**	**S&P**
ALLETE	ALE		Baa1	BBB
Alliant Energy	LNT		Baa2	A-
American Electric Power	AEP		Baa2	A-
Ameren Corp.	AEE		Baa1	BBB+
Centerpoint	CNP		Baa2	BBB+
CMS Energy Corp.	CMS		Baa2	BBB+
DTE Energy	DTE		Baa2	BBB+
Entergy Corp.	ETR		Baa2	BBB+
Evergy Inc.	EVRG		Baa2	A-
Fortis Inc.	FTS.TO		Baa3	A-
OGE Energy	OGE		Baa1	BBB+
Otter Tail Corp.	OTTR		Baa2	BBB
WEC Energy Group	WEC		Baa1	A-
		Average Rating	**Baa**	**BBB**
NR = Not Rated				
RW = Rating Withdrawn				

Mergent Bond Record, January 2023				
Corporate	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.40%	5.74%	6.26%
November	4.90%	5.23%	5.58%	6.07%
December	4.43%	4.77%	5.12%	5.59%
Average	**4.81%**	**5.13%**	**5.48%**	**5.97%**
Public Utilities	**Aaa**	**Aa**	**A**	**Baa**
October	-	5.68%	5.88%	6.18%
November	-	5.54%	5.75%	6.05%
December	-	5.06%	5.28%	5.57%
Average	**-**	**5.43%**	**5.64%**	**5.93%**
Industrials	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.11%	5.59%	6.33%
November	4.90%	4.92%	5.40%	6.08%
December	4.43%	4.48%	4.94%	5.61%
Average	**4.81%**	**4.84%**	**5.31%**	**6.01%**
Debt Yield Rate Estimate				**5.57%**

Data Source:
https://www.moodys.com
https://standardandpoors.com
Mergent Bond Record, January 2023

Ratings				
Dispersions & Averages Number of Companies				
Agency				
S&P				
AAA	1			
AA	2			
A	3	5	15	
BBB	4	8	32	
BB	5			
B	6			
CCC	7			
C	9			
D	10			
Total		13	47	
Average Rating:				**3.62**
Agency				
Moody's				
Aaa	1			
Aa	2			
A	3		0	
Baa	4	13	52	
Ba	5			
B	6			
Caa	7			
Ca	8			
C	9			
Total		13	52	
Average Rating:				**4.00**

Cost of Capital Study
January 1, 2023
Analysis of the Market Capital Structure

Electric Industry (SIC 4911)								
		(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)**
ALLETE	ALE	1,870	33.62%	64.51	57.23	3,692	66.38%	5,562
Alliant Energy	LNT	8,718	38.60%	55.21	251.14	13,865	61.40%	22,583
American Electric Power	AEP	39,735	45.35%	94.95	504.21	47,875	54.65%	87,610
Ameren Corp.	AEE	15,095	39.32%	88.92	262.02	23,299	60.68%	38,394
Centerpoint	CNP	16,338	46.38%	29.99	629.79	18,887	53.62%	35,225
CMS Energy Corp.	CMS	14,289	43.65%	63.33	291.27	18,446	56.35%	32,735
DTE Energy	DTE	17,997	42.68%	117.53	205.69	24,175	57.32%	42,172
Entergy Corp.	ETR	26,759	52.94%	112.50	211.40	23,783	47.06%	50,542
Evergy Inc.	EVRG	10,345	41.73%	62.93	229.57	14,447	58.27%	24,792
Fortis Inc.	FTS.TO	28,665	52.32%	54.18	482.15	26,123	47.68%	54,788
OGE Energy	OGE	4,549	36.49%	39.55	200.23	7,919	63.51%	12,468
Otter Tail Corp.	OTTR	824	25.21%	58.71	41.63	2,444	74.79%	3,268
WEC Energy Group	WEC	17,295	36.90%	93.76	315.43	29,575	63.10%	46,870
Mean:		**15,575**	**41.17%**			**19,579**	**58.83%**	**35,155**
Median:		**15,095**	**41.73%**			**18,887**	**58.27%**	**35,225**
Market Capital Structure Estimate:		**Debt:**	**40.00%**			**Equity:**	**60.00%**	

Data Source:
Columns (1) & (4), Value Line Industry Summary & Index, 03-10-2023
Column (2) = Column (1) / Column (7)
Column (3), Yahoo Finance, 12-30-2022
Column (5) = Column (3) * Column (4)
Column (7) = Column (1) + Column (5)

Cost of Capital Study
January 1, 2023
Capital Asset Pricing Model (CAPM)

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

Electric Industry (SIC 4911)	
Risk-Free Rate	3.66%
Beta (β)	0.88
Equity Risk Premium (ERP): $(R_m - R_f)$*	6.00%
Adjusted Equity Risk Premium: (β * ERP)	5.28%
Cost of Equity Capital - CAPM	**8.94%**
U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields	
U.S. Treasury Securities:	
2022 December - 30 Day	3.66%
2022 November - 60 Day	3.83%
2022 October - 90 Day	3.90%
Risk-Free Rate of Return R_f, 30-year Treasury Rate	**3.66%**
* 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, 2023
Beta (β) Analysis

Electric Industry (SIC 4911)			
Company Name	**Stock Symbol**		**Beta "β"**
ALLETE	ALE		0.90
Alliant Energy	LNT		0.85
American Electric Power	AEP		0.75
Ameren Corp.	AEE		0.85
Centerpoint	CNP		1.10
CMS Energy Corp.	CMS		0.80
DTE Energy	DTE		0.95
Entergy Corp.	ETR		0.95
Evergy Inc.	EVRG		0.90
Fortis Inc.	FTS.TO		0.70
OGE Energy	OGE		1.00
Otter Tail Corp.	OTTR		0.90
WEC Energy Group	WEC		0.80
		Mean:	0.88
		Median:	0.90
		Beta (β) Estimate:	**0.88**

Data Source:
Value Line Industry Summary & Index, 03-10-2023

Cost of Capital Study
January 1, 2023
Dividend Growth Model (DGM or DCF)

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

where

Ke = 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	**Stock Symbol**	**Stock Price P_0**	**Expected Dividend D_1**	**Dividend Yield (D_1 / P_0)**	**Dividend Growth g**	**Earnings Growth g**	**b**	**ROE**	**g=(b * ROE)**	**(Dividends) K_e**	**(Earnings) K_e**	**g=(b * ROE) K_e**
ALLETE	ALE	64.51	2.71	4.20%	3.50%	6.00%	24.00%	7.50%	1.80%	7.70%	10.20%	6.00%
Alliant Energy	LNT	55.21	1.81	3.28%	6.00%	6.50%	38.00%	10.90%	4.14%	9.28%	9.78%	7.42%
American Electric Power	AEP	94.95	3.35	3.53%	5.50%	6.00%	30.00%	9.70%	2.91%	9.03%	9.53%	6.44%
Ameren Corp.	AEE	88.92	2.52	2.83%	6.50%	6.50%	43.00%	10.40%	4.47%	9.33%	9.33%	7.30%
Centerpoint	CNP	29.99	0.77	2.57%	2.50%	6.50%	47.00%	8.50%	4.00%	5.07%	9.07%	6.57%
CMS Energy Corp.	CMS	63.33	1.95	3.08%	6.00%	6.50%	35.00%	11.50%	4.03%	9.08%	9.58%	7.11%
DTE Energy	DTE	117.53	3.81	3.24%	3.00%	4.50%	24.00%	13.00%	3.12%	6.24%	7.74%	6.36%
Entergy Corp.	ETR	112.50	4.30	3.82%	4.00%	0.50%	22.00%	8.40%	1.85%	7.82%	4.32%	5.67%
Evergy Inc.	EVRG	62.93	2.53	4.02%	7.00%	7.50%	27.00%	8.10%	2.19%	11.02%	11.52%	6.21%
Fortis Inc.	FTS.TO	54.18	2.29	4.23%	6.00%	5.00%	22.00%	4.40%	0.97%	10.23%	9.23%	5.20%
OGE Energy	OGE	39.55	1.70	4.30%	3.00%	6.50%	27.00%	11.00%	2.97%	7.30%	10.80%	7.27%
Otter Tail Corp.	OTTR	58.71	1.76	3.00%	7.00%	4.50%	76.00%	18.00%	13.68%	10.00%	7.50%	16.68%
WEC Energy Group	WEC	93.76	3.12	3.33%	7.00%	6.00%	35.00%	12.50%	4.38%	10.33%	9.33%	7.71%
			Mean:	**3.49%**	**5.15%**	**5.58%**	**34.62%**	**10.30%**	**3.89%**	**8.65%**	**9.07%**	**7.38%**
			Median:	**3.33%**	**6.00%**	**6.00%**	**30.00%**	**10.40%**	**3.12%**	**9.08%**	**9.33%**	**6.57%**
									Cost of Equity Capital - DCF K_e Estimate:	**8.75%**	**9.00%**	**7.50%**

b = (1 - payout ratio) = Retention Ratio
ROE = Return on Book Equity
Data Source:
Column (1), Yahoo Finance, 12-30-2022
Columns (2) - (6), Value Line Industry Summary & Index, 03-10-2023

Cost of Capital Study
January 1, 2023
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	$2.71	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	8.08%
Alliant Energy	$1.81	6.00%	5.63%	5.26%	4.89%	4.52%	4.15%	3.80%	7.71%
American Electric Power	$3.35	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	7.88%
Ameren Corp.	$2.52	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	7.30%
Centerpoint	$0.77	2.50%	2.72%	2.94%	3.16%	3.38%	3.60%	3.80%	6.22%
CMS Energy Corp.	$1.95	6.00%	5.63%	5.26%	4.89%	4.52%	4.15%	3.80%	7.48%
DTE Energy	$3.81	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	6.98%
Entergy Corp.	$4.30	4.00%	3.97%	3.94%	3.91%	3.88%	3.85%	3.80%	7.82%
Evergy Inc.	$2.53	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	8.88%
Fortis Inc.	$2.29	6.00%	5.63%	5.26%	4.89%	4.52%	4.15%	3.80%	8.82%
OGE Energy	$1.70	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	8.04%
Otter Tail Corp.	$1.76	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	7.61%
WEC Energy Group	$3.12	7.00%	6.47%	5.94%	5.41%	4.88%	4.35%	3.80%	8.02%
								Average:	**7.76%**
								Median:	**7.82%**
Cost of Equity Capital - DCF Ke Estimate:									**7.75%**

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, 2023
Support for Market Multiples

Electric Industry (SIC 4911)				
		(1)	(2)	
Company Name	Ticker	Stock Price	Earnings	P/E Multiple
ALLETE	ALE	64.51	3.38	19.09
Alliant Energy	LNT	55.21	2.73	20.22
American Electric Powe	AEP	94.95	4.51	21.05
Ameren Corp.	AEE	88.92	4.14	21.48
Centerpoint	CNP	29.99	1.38	21.73
CMS Energy Corp.	CMS	63.33	2.84	22.30
DTE Energy	DTE	117.53	5.52	21.29
Entergy Corp.	ETR	112.50	5.37	20.95
Evergy Inc.	EVRG	62.93	3.26	19.30
Fortis Inc.	FTS.TO	54.18	2.78	19.49
OGE Energy	OGE	39.55	2.25	17.58
Otter Tail Corp.	OTTR	58.71	6.78	8.66
WEC Energy Group	WEC	93.76	4.46	21.02
			Mean	**19.55**
			Median	**20.95**
			P/E Estimate	**19.50**
			Equity Rate	**5.13%**

Data Source:
Column (1) Yahoo Finance, 12-30-2022
Coulmn (2) Value Line Industry Summay & Index, 03-10-2023

Cost of Capital Study
January 1, 2023
Direct Debt Rate Calculation

Electric Industry (SIC 4911)	
Direct Capitalization Debt Rate	
Interest Expense ($ mil)	6,451
Total Value of LT-Debt (TVD) ($ mil)	182,284
Current Yield = Interest Expense/TVD	**3.54%**
Data Source: Value Line Investment Survey, 03-10-2023	

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Cost of Capital Study

January 1, 2023

Staff Recommendation

Telecommunications Industry (SIC 4813)			Reference
Equity:			
Risk Adjusted Models			
	CAPM	8.94%	Page 5
Dividend Growth Models			
	DGM or DCF Model (Dividend Growth)	7.00%	Page 7
	DGM or DCF Model (Earnings Growth)	9.25%	Page 7
	DGM or DCF Model (b * ROE = Growth)	16.75%	Page 7
	Multi Stage DCF	7.50%	Page 8
Esimated Cost of Equity Capital		**11.50%**	
Debt:			
Estimated Cost of Debt Capital		**5.59%**	Page 3

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	50.00%	5.59%	2.80%
Equity	50.00%	11.50%	5.75%
Total	**100.00%**		**8.55%**
		Rounded	**8.50%**

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Cost of Capital Study
January 1, 2023
Staff Recommendation

Telecommunications Industry (SIC 4813)

Direct Rate

		Reference
Equity:		
Estimated Cost of Equity Capital	**6.90%**	Page 9
Debt:		
Estimated Cost of Debt Capital	**3.85%**	Page 10

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	50.00%	3.85%	1.93%
Equity	50.00%	6.90%	3.45%
Total	**100.00%**		**5.38%**
		Rounded	**5.50%**

Cost of Capital Study

January 1, 2023

Analysis of Debt Capital

Telecommunications Industry (SIC: 4813)				
			Ratings	
Company	**Ticker**		**Moody's**	**S&P**
AT&T Inc.	T		Baa2	BBB
Lumen Technologies, Inc.	LUMN		Ba3	BB-
Shenandoah Telecommunication Company	SHEN		NR	NR
Telephone and Data Systems, Inc.	TDS		Ba1	BB
T-Mobile US, Inc.	TMUS		NR	BBB-
Verizon Communications Inc.	VZ		Baa1	BBB+
Cable One, Inc.	CABO		Ba3	BB
Comcast Corporation	CMCSA		A3	A-
		Average Rating	**Baa**	**BBB**
NR = Not Rated				
RW = Rating Withdrawn				

Mergent Bond Record, January 2023				
Corporate	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.40%	5.74%	6.26%
November	4.90%	5.23%	5.58%	5.07%
December	4.43%	4.77%	5.12%	5.59%
Average	**4.81%**	**5.13%**	**5.48%**	**5.64%**
Public Utilities	**Aaa**	**Aa**	**A**	**Baa**
October	-	5.68%	5.88%	6.18%
November	-	5.54%	5.75%	6.05%
December	-	5.06%	5.28%	5.57%
Average	-	**5.43%**	**5.64%**	**5.93%**
Industrials	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.11%	5.59%	6.33%
November	4.90%	4.92%	5.40%	6.08%
December	4.43%	4.48%	4.94%	5.61%
Average	**4.81%**	**4.84%**	**5.31%**	**6.01%**
Debt Yield Rate Estimate				**5.59%**

Data Source:
https://www.moodys.com
https://standardandpoors.com
Mergent Bond Record, January 2023

Ratings				
Dispersions & Averages Number of Companies				
Agency				
S&P				
AAA	1			
AA	2			
A	3	1	3	
BBB	4	3	12	
BB	5	3	15	
B	6			
CCC	7			
CC	8			
C	9			
D	10			
Total		7	30	
Average Rating:				**4.29**
Agency				
Moody's				
Aaa	1			
Aa	2			
A	3	1	3	
Baa	4	2	8	
Ba	5	3	15	
B	6			
Caa	7			
Ca	8			
C	9			
Total		6	26	
Average Rating:				**4.33**

Cost of Capital Study
January 1, 2023
Analysis of the Market Capital Structure

Telecommunications Industry (SIC 4813)		(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)**
AT&T Inc.	T	136,020	50.89%	18.41	7,129	131,245	49.11%	267,265
Lumen Technologies, Inc.	LUMN	20,572	79.63%	5.22	1,008	5,262	20.37%	25,834
Shenandoah Telecommunication Company	SHEN	74	8.53%	15.88	50	794	91.47%	868
Telephone and Data Systems, Inc.	TDS	3,750	76.06%	10.49	112.46	1,180	23.94%	4,930
T-Mobile US, Inc.	TMUS	78,425	31.49%	140.00	1,219	170,660	68.51%	249,085
Verizon Communications Inc.	VZ	150,639	47.65%	39.40	4,200	165,480	52.35%	316,119
Cable One, Inc.	CABO	3,809	48.16%	715.60	5.73	4,100	51.84%	7,909
Comcast Corporation	CMCSA	99,001	38.26%	37.89	4,216	159,744	61.74%	258,745
	Mean:	**61,536**	**47.58%**			**79,808**	**52.42%**	**141,344**
	Median:	**49,499**	**47.91%**			**68,254**	**52.10%**	**137,460**
	Market Capital Structure Estimate:	**Debt:**	**50.00%**			**Equity:**	**50.00%**	

Data Source:
Columns (1) & (4), Value Line Industry Summary & Index, 03-10-2023
Column (2) = Column (1) / Column (7)
Column (3), Yahoo Finance, 12-30-2022
Column (5) = Column (3) * Column (4)
Column (7) = Column (1) + Column (5)

Cost of Capital Study
January 1, 2023
Capital Asset Pricing Model (CAPM)

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

Telecommunications Industry (SIC 4813)	
Risk-Free Rate (R_f)	3.66%
Beta (β)	0.88
Equity Risk Premium (ERP): (R_m - R_f)	6.00%
Adjusted Equity Risk Premium: (β * ERP)	5.28%
Cost of Equity Capital - CAPM	**8.94%**
U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields	
U.S. Treasury Securities:	
2022 December - 30 Day	3.66%
2022 November - 60 Day	3.83%
2022 October - 90 Day	3.90%
Risk-Free Rate of Return R_f, 30-year Treasury Rate	**3.66%**
* 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, 2023
Beta (β) Analysis

Telecommunications Industry (SIC 4813)		
Company Name	**Stock Symbol**	**Beta "β"**
AT&T Inc.	T	NMF
Lumen Technologies, Inc.	LUMN	1.00
Shenandoah Telecommunication Company	SHEN	NMF
Telephone and Data Systems, Inc.	TDS	0.95
T-Mobile US, Inc.	TMUS	0.80
Verizon Communications Inc.	VZ	0.60
Cable One, Inc.	CABO	0.95
Comcast Corporation	CMCSA	0.80
	Mean:	0.85
	Median:	0.88
	Beta (β) Estimate:	**0.88**

Data Source:
Value Line Industry Summary & Index, 03-10-2023

Cost of Capital Study

January 1, 2023

Dividend Growth Model (DGM or DCF)

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

where

K_e = Cost of Equity

D_1 = Expected Dividends

P_0 = Current Price

g = Sustainable Growth

Telecommunications Industry (SIC 4813)

Company Name	Stock Symbol	(1) Stock Price P_0	(2) Expected Dividend D_1	Dividend Yield (D_1 / P_0)	(3) Dividend Growth g	(4) EPS Growth g	(5) b	(6) ROE	g=(b * ROE)	(Dividends) K_e	(Earnings) K_e	g=(b * ROE) K_e
AT&T Inc.	T	18.41	1.11	6.03%	-4.50%	1.00%	50.00%	21.20%	10.60%	1.53%	7.03%	16.63%
Lumen Technologies, Inc.	LUMN	5.22	-	0.00%	3.00%	1.50%	47.00%	17.20%	8.08%	3.00%	1.50%	8.08%
Shenandoah Telecommunication Company	SHEN	15.88	0.09	0.57%	-1.50%	44.00%	NMF	NMF	NMF	-0.93%	44.57%	NMF
Telephone and Data Systems, Inc.	TDS	10.49	0.74	7.05%	3.00%	3.50%	NMF	NMF	NMF	10.05%	10.55%	NMF
T-Mobile US, Inc.	TMUS	140.00	NMF	NMF	NMF	16.00%	NMF	11.20%	NMF	NMF	NMF	NMF
Verizon Communications Inc.	VZ	39.40	2.64	6.70%	2.50%	2.50%	51.00%	37.00%	18.87%	9.20%	9.20%	25.57%
Cable One, Inc.	CABO	715.60	11.50	1.61%	5.50%	7.00%	71.00%	13.50%	9.59%	7.11%	8.61%	11.20%
Comcast Corporation	CMCSA	37.89	1.14	3.01%	7.50%	8.50%	71.00%	19.90%	14.13%	10.51%	11.51%	17.14%
			Mean:	**2.59%**	**2.21%**	**10.50%**	**58.00%**	**20.00%**	**12.25%**	**5.78%**	**13.28%**	**15.72%**
			Median:	**3.01%**	**3.00%**	**5.25%**	**51.00%**	**18.55%**	**10.60%**	**7.11%**	**9.20%**	**16.63%**
						Cost of Equity Capital - DCF K_e Estimate:				**7.00%**	**9.25%**	**16.75%**

Notes:

b = (1 - payout ratio) = Retention Ratio

ROE = Return on Book Equity

Not Meaningful (NMF)

Data Source:

Column (1), Yahoo Finance, 12-30-2022

Columns (2) - (6), Value Line Industry Summary & Index, 03-10-2023

Cost of Capital Study

January 1, 2023

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	-4.50%	-3.12%	-1.74%	-0.36%	1.02%	2.40%	3.80%	7.44%
Lumen Technologies	0.00	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	NMF
Telephone & Data	0.09	-1.50%	-0.62%	0.26%	1.14%	2.02%	2.90%	3.80%	0.13%
Shenandoah Telecommunication Company	0.74	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	10.70%
T-Mobile US	NMF	NMF	NMF	NMF	NMF	NMF	NMF	3.80%	NMF
Verizon	2.64	2.50%	2.72%	2.94%	3.16%	3.38%	3.60%	3.80%	10.24%
Cable One, Inc.	11.5	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	5.61%
Comcast Corporation	1.14	7.50%	6.88%	6.26%	5.64%	5.02%	4.40%	3.80%	7.74%
								Average:	**6.98%**
								Median:	**7.59%**
Cost of Equity Capital - DCF Ke Estimate:									**7.50%**

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, 2023
Market Multiples

Telecommunications Industry (SIC 4813)				
		(1)	(2)	
Company Name	**Ticker**	**Stock Price**	**EPS**	**P/E Multiple**
AT&T Inc.	T	18.41	2.64	6.97
Lumen Technologies, Inc.	LUMN	5.22	1.58	3.30
Shenandoah Telecommunication Company	SHEN	15.88	0.11	144.36
Telephone and Data Systems, Inc.	TDS	10.49	0.07	149.86
T-Mobile US, Inc.	TMUS	140.00	6.19	22.62
Verizon Communications Inc.	VZ	39.40	5.18	7.61
Cable One, Inc.	CABO	715.60	38.06	18.80
Comcast Corporation	CMCSA	37.89	3.64	10.41
			Mean:	**45.49**
			Median:	**14.61**
			P/E Estimate:	**14.50**
			Equity Rate:	**6.90%**

Data Source:
Column (1) Yahoo Finance, 12-30-2022
Coulmn (2) Value Line Industry Summay & Index, 03-10-2023

Cost of Capital Study
January 1, 2023
Direct Debt Rate Calculation

Telecommunications Industry (SIC 4813)	
Direct Capitalization Debt Rate	
Interest Expense ($ mil)	$ 17,995
Total Value of Debt (TVD) ($ mil)	$ 467,176
Current Yield = Interest Expense/TVD	**3.85%**
Data Source: Value Line Investment Survey, 03-10-2023	

STATE TAX COMMISSION OF MISSOURI
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Cost of Capital Study
January 1, 2023
Staff Recommendation

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)

				Reference
Equity:				
	Risk Adjusted Models			Page 5
		CAPM	10.56%	
	Dividend Growth Models			Page 7
		DGM or DCF Model (Dividend Growth)	10.50%	Page 7
		DGM or DCF Model (Earnings Growth)	21.00%	Page 7
		DGM or DCF Model (b * ROE = Growth)	17.75%	Page 8
		Multi Stage DCF	9.75%	
	Esimated Cost of Equity Capital		**12.25%**	
Debt:				Page 3
	Estimated Cost of Debt Capital		**5.61%**	

Cost of Capital Summary

Capital Component	**Market Capital Structure**	**Cost of Capital**	**Before-Tax Weighted Average Cost of Capital**
Debt	30.00%	5.61%	1.68%
Equity	70.00%	12.25%	8.58%
TOTAL	**100.00%**		**10.26%**
		Rounded	**10.25%**

COC Page 1 Summary Yield

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Cost of Capital Study
January 1, 2023
Staff Recommendation

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)

Direct Rate		Reference
Equity:		
Estimated Cost of Equity Capital	**9.52%**	Page 9
Debt:		
Estimated Cost of Debt Capital	**4.51%**	Page 10

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	30.00%	4.51%	1.35%
Equity	70.00%	9.52%	6.66%
Total	**100.00%**		**8.01%**
		Rounded	**8.00%**

Cost of Capital Study
January 1, 2023
Analysis of Debt Capital

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)				
			Ratings	
Company	**Ticker**		**Moody's**	**S&P**
Chevron Corp.	CVX		Aa2	AA-
Devon Energy	DVN		Baa2	BBB
Enbridge, Inc.	ENB.TO		Baa1	BBB+
Enterprise Products	EPD		NR	BBB+
EOG Resources	EOG		A3	A-
Hess Midstream	HESM		Ba1	BB+
Kinder Morgan, Inc.	KMI		Baa2	BBB
Magellan Midstream Partners	MMP		Baa1	BBB+
National Fuel Gas	NFG		Baa3	BBB-
Oneok, Inc.	OKE		Baa3	BBB
Ovintiv	OVV		Baa3	BBB-
Phillips 66	PSX		A3	BBB+
TC Energy, Corp.	TRP		Baa2	BBB+
Valero Energy	VLO		Baa2	BBB
Williams Co, Inc.	WMB		Baa2	BBB
		Average Rating	**Baa**	**BBB**

NR = Not Rated
RW = Rating Withdrawn

Mergent Bond Record, January 2023

Corporate	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.40%	5.74%	6.26%
November	4.90%	5.23%	5.58%	6.07%
December	4.43%	4.77%	5.12%	5.59%
Average	**4.81%**	**5.13%**	**5.48%**	**5.97%**

Public Utilities	**Aaa**	**Aa**	**A**	**Baa**
October	-	5.68%	5.88%	6.18%
November	-	5.54%	5.75%	6.05%
December	-	5.06%	5.28%	5.57%
Average	**-**	**5.43%**	**5.64%**	**5.93%**

Industrials	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.11%	5.59%	6.33%
November	4.90%	4.92%	5.40%	6.08%
December	4.43%	4.48%	4.94%	5.61%
Average	**4.81%**	**4.84%**	**5.31%**	**6.01%**

Debt Yield Rate Estimate	**5.61%**

Data Source:
https://www.moodys.com
https://standardandpoors.com
Mergent Bond Record, January 2023

Ratings

Dispersions & Averages Number of Companies

Agency				
S&P				
AAA	1			
AA	2	1	2	
A	3	1	3	
BBB	4	12	48	
BB	5	1	5	
B	6			
CCC	7			
C	9			
D	10			
Total		15	58	
Average Rating:			**3.87**	

Agency				
Moody's				
Aaa	1			
Aa	2	1	2	
A	3	2	6	
Baa	4	10	40	
Ba	5	1		
B	6			
Caa	7			
Ca	8			
C	9			
Total		14	48	
Average Rating:			**3.43**	

Cost of Capital Study

January 1, 2023

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)**
Chevron Corp.	CVX	23,641	6.38%	179.49	1,934	347,134	93.62%	370,775
Devon Energy	DVN	6,450	13.82%	61.51	654	40,228	86.18%	46,678
Enbridge, Inc.	ENB.TO	81,000	43.05%	52.92	2,025	107,163	56.95%	188,163
Enterprise Products	EPD	29,202	35.75%	24.12	2,176	52,485	64.25%	81,687
EOG Resources	EOG	5,084	6.27%	129.52	587	76,028	93.73%	81,112
Hess Midstream	HESM	2,909	28.83%	29.92	240	7,181	71.17%	10,090
Kinder Morgan, Inc.	KMI	31,800	43.90%	18.08	2,248	40,644	56.10%	72,444
Magellan Midstream Partners	MMP	5,012	32.75%	50.21	205	10,293	67.25%	15,305
National Fuel Gas	NFG	2,733	31.94%	63.30	92	5,824	68.06%	8,557
Oneok, Inc.	OKE	13,777	31.93%	65.70	447	29,368	68.07%	43,145
Ovintiv	OVV	3,618	22.27%	50.71	249	12,627	77.73%	16,245
Phillips 66	PSX	17,657	26.40%	104.08	473	49,230	73.60%	66,887
TC Energy, Corp.	TRP	42,959	51.57%	39.86	1,012	40,338	48.43%	83,297
Valero Energy	VLO	11,576	19.12%	126.86	386	48,968	80.88%	60,544
Williams Co, Inc.	WMB	23,407	36.87%	32.90	1,218	40,072	63.13%	63,479
Mean:		**20,055**	**28.72%**			**60,506**	**71.28%**	**80,561**
Median:		**13,777**	**31.93%**			**40,338**	**68.07%**	**63,479**
Market Capital Structure Estimate:		**Debt:**	**30.00%**			**Equity:**	**70.00%**	

Data Source:

Columns (1) & (4), Value Line Industry Summary & Index, 02-24-2023

Column (2) = Column (1) / Column (7)

Column (3), Yahoo Finance, 12-30-2022

Column (5) = Column (3) * Column (4)

Column (7) = Column (1) + Column (5)

Cost of Capital Study
January 1, 2023
Capital Asset Pricing Model (CAPM)

CAPM ==> K_e = R_f + β (ERP)

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)	
Risk-Free Rate	3.66%
Beta (β)	1.15
Equity Risk Premium (ERP): (R_m - R_f)*	6.00%
Adjusted Equity Risk Premium: (β * ERP)	6.90%
Cost of Equity Capital - CAPM	**10.56%**
U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields	
U.S. Treasury Securities:	
2022 December - 30 Day	3.66%
2022 November - 60 Day	3.83%
2022 October - 90 Day	3.90%
Risk-Free Rate of Return R_f, 30-year Treasury Rate	**3.66%**
* 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, 2023
Beta (β) Analysis

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)			
Company Name	**Stock Symbol**		**Beta "β"**
Chevron Corp.	CVX		1.20
Devon Energy	DVN		1.50
Enbridge, Inc.	ENB.TO		0.85
Enterprise Products	EPD		1.05
EOG Resources	EOG		1.20
Hess Midstream	HESM		1.05
Kinder Morgan, Inc.	KMI		1.10
Magellan Midstream Partners	MMP		1.10
National Fuel Gas	NFG		0.85
Oneok, Inc.	OKE		1.45
Ovintiv	OVV		1.60
Phillips 66	PSX		1.30
TC Energy, Corp.	TRP		1.05
Valero Energy	VLO		1.45
Williams Co, Inc.	WMB		1.15
		Mean:	**1.19**
		Median:	**1.15**
		Beta (β) Estimate:	**1.15**

Data Source:
Value Line Industry Summary & Index, 02-24-2023

Cost of Capital Study
January 1, 2023
Dividend Growth Model (DGM or DCF)

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

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) Stock Price P_0	(2) Expected Dividend D_1	Dividend Yield (D_1 / P_0)	(3) Dividend Growth g	(4) Earnings Growth g	(5) b	(6) ROE	g=(b * ROE)	(Dividends) K_e	(Earnings) K_e	g=(b * ROE) K_e
Chevron Corp.	CVX	179.49	6.04	3.37%	5.50%	41.00%	69.00%	21.00%	14.49%	8.87%	44.37%	17.86%
Devon Energy	DVN	61.51	0.80	1.30%	12.00%	27.50%	92.00%	48.80%	44.90%	13.30%	28.80%	46.20%
Enbridge, Inc.	ENB.TO	52.92	3.55	6.71%	3.00%	10.00%	-22.00%	9.50%	NMF	9.71%	16.71%	NMF
Enterprise Products	EPD	24.12	2.00	8.29%	8.50%	7.00%	23.00%	20.00%	4.60%	16.79%	15.29%	12.89%
EOG Resources	EOG	129.52	3.40	2.63%	18.50%	24.00%	79.00%	32.50%	25.68%	21.13%	26.63%	28.31%
Hess Midstream	HESM	29.92	2.40	8.02%	9.50%	13.00%	-8.00%	NMF	NMF	17.52%	21.02%	NMF
Kinder Morgan, Inc.	KMI	18.08	1.15	6.36%	6.50%	18.50%	2.00%	8.30%	NMF	12.86%	24.86%	NMF
Magellan Midstream Partners	MMP	50.21	4.22	8.40%	6.50%	6.50%	-1.00%	55.00%	-0.55%	14.90%	14.90%	7.85%
National Fuel Gas	NFG	63.30	1.94	3.06%	3.50%	18.00%	70.00%	27.20%	19.04%	6.56%	21.06%	22.10%
Oneok, Inc.	OKE	65.70	3.82	5.81%	3.50%	11.50%	1.00%	26.50%	0.27%	9.31%	17.31%	6.08%
Ovintiv	OVV	50.71	1.02	2.01%	18.50%	22.50%	81.00%	18.50%	14.99%	20.51%	24.51%	17.00%
Phillips 66	PSX	104.08	4.20	4.04%	5.50%	NMF	79.00%	31.50%	24.89%	9.54%	NMF	28.93%
TC Energy, Corp.	TRP	39.86	2.80	7.02%	3.50%	7.00%	NMF	9.50%	NMF	10.52%	14.02%	NMF
Valero Energy	VLO	126.86	3.92	3.09%	2.50%	29.50%	87.00%	48.90%	42.54%	5.59%	32.59%	45.63%
Williams Co, Inc.	WMB	32.90	1.79	5.44%	4.00%	11.00%	0.00%	15.50%	0.00%	9.44%	16.44%	5.44%
			Mean:	**5.04%**	**7.40%**	**17.64%**	**39.43%**	**26.62%**	**17.35%**	**12.44%**	**22.75%**	**21.66%**
			Median:	**5.44%**	**5.50%**	**15.50%**	**46.00%**	**23.75%**	**14.99%**	**10.52%**	**21.04%**	**17.86%**
									Cost of Equity Capital - DCF K_e Estimate:	**10.50%**	**21.00%**	**17.75%**

Notes:
b = (1 - payout ratio) = Retention Ratio
ROE = Return on Book Equity
Not Meaningful (NMF)
Data Source:
Column (1), Yahoo Finance, 12-30-2022
Columns (2) - (6), Value Line Industry Summary & Index, 02-24-2023

Cost of Capital Study

January 1, 2023

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		
Chevron Corp.	6.04	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	7.69%
Devon Energy	0.80	12.00%	10.63%	9.26%	7.89%	6.52%	5.15%	3.80%	6.11%
Enbridge, Inc.	3.55	3.00%	3.13%	3.26%	3.39%	3.52%	3.65%	3.80%	10.45%
Enterprise Products	2.00	8.50%	7.72%	6.94%	6.16%	5.38%	4.60%	3.80%	14.82%
EOG Resources	3.40	18.50%	16.05%	13.60%	11.15%	8.70%	6.25%	3.80%	10.23%
Hess Midstream	2.40	9.50%	8.55%	7.60%	6.65%	5.70%	4.75%	3.80%	15.03%
Kinder Morgan, Inc.	1.15	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	11.47%
Magellan Midstream Partners	4.22	6.50%	6.05%	5.60%	5.15%	4.70%	4.25%	3.80%	13.86%
National Fuel Gas	1.94	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	6.92%
Oneok, Inc.	3.82	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	9.73%
Ovintiv	1.02	18.50%	16.05%	13.60%	11.15%	8.70%	6.25%	3.80%	8.83%
Phillips 66	4.20	5.50%	5.22%	4.94%	4.66%	4.38%	4.10%	3.80%	8.46%
TC Energy, Corp.	2.80	3.50%	3.55%	3.60%	3.65%	3.70%	3.75%	3.80%	10.98%
Valero Energy	3.92	2.50%	2.72%	2.94%	3.16%	3.38%	3.60%	3.80%	6.74%
Williams Co, Inc.	1.79	4.00%	3.97%	3.94%	3.91%	3.88%	3.85%	3.80%	9.51%
								Average:	**10.06%**
								Median:	**9.73%**
								Cost of Equity Capital - DCF Ke Estimate:	**9.75%**

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, 2023
Support for Market Multiples

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)				
		(1)	(2)	
Company Name	**Ticker**	**Stock Price**	**Earnings**	**P/E Multiple**
Chevron Corp.	CVX	179.49	18.28	9.82
Devon Energy	DVN	61.51	8.85	6.95
Enbridge, Inc.	ENB.TO	52.92	2.81	18.83
Enterprise Products	EPD	24.12	2.50	9.65
EOG Resources	EOG	129.52	14.50	8.93
Hess Midstream	HESM	29.92	2.01	14.89
Kinder Morgan, Inc.	KMI	18.08	1.12	16.14
Magellan Midstream Partners	MMP	50.21	4.10	12.25
National Fuel Gas	NFG	63.30	6.15	10.29
Oneok, Inc.	OKE	65.70	3.80	17.29
Ovintiv	OVV	50.71	4.80	10.56
Phillips 66	PSX	104.08	18.25	5.70
TC Energy, Corp.	TRP	39.86	2.44	16.34
Valero Energy	VLO	126.86	29.04	4.37
Williams Co, Inc.	WMB	32.90	1.70	19.35
			Mean:	**12.09**
			Median:	**10.56**
			P/E Estimate:	**10.50**
			Equity Rate:	**9.52%**

Data Source:
(1) Yahoo Finance, 12-30-2022
(2) Value Line Industry Summay & Index, 02-24-2023

Cost of Capital Study
January 1, 2023
Direct Debt Rate Calculation

Fluid/Natural Gas Pipeline Industries (SIC 4612/4922)	
Direct Capitalization Debt Rate	
Interest Expense ($ mil)	$ 12,257
Total Value of Debt (TVD) ($ mil)	$ 271,735
Current Yield = Interest Expense/TVD	**4.51%**
Data Source: Value Line Investment Survey, 02-24-2023	

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Cost of Capital Study
January 1, 2023
Staff Recommendation

Railroad Class I Industry (SIC 4011)			Reference
Equity:			
Risk Adjusted Models			
	CAPM	9.72%	Page 5
Dividend Growth Models			
	DGM or DCF Model (Dividend Growth)	10.50%	Page 7
	DGM or DCF Model (Earnings Growth)	11.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	21.00%	Page 7
	Multi Stage DCF	6.50%	Page 8
Esimated Cost of Equity Capital		**11.75%**	
Debt:			
Estimated Cost of Debt Capital		**5.61%**	Page 3

Cost of Capital Summary

Capital Component	Market Capital Structure	Cost of Capital	Before-Tax Weighted Average Cost of Capital
Debt	20.00%	5.61%	1.12%
Equity	80.00%	11.75%	9.40%
Total	**100.00%**		**10.52%**
		Rounded	**10.50%**

COC Page 1 Summary Yield

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Cost of Capital Study
January 1, 2023
Staff Recommendation

Railroad Non-Class I Industry (SIC 4013)			Reference
Equity:			
Risk Adjusted Models			
	CAPM	9.72%	Page 5
Dividend Growth Models			
	DGM or DCF Model (Dividend Growth)	10.50%	Page 7
	DGM or DCF Model (Earnings Growth)	11.00%	Page 7
	DGM or DCF Model (b * ROE = Growth)	21.00%	Page 7
	Multi Stage DCF	6.50%	Page 8
Esimated Cost of Equity Capital		**12.50%**	
Debt:			
Estimated Cost of Debt Capital		**5.61%**	Page 3

Cost of Capital Summary

Capital Component	**Market Capital Structure**	**Cost of Capital**	**Before-Tax Weighted Average Cost of Capital**
Debt	20.00%	5.61%	1.12%
Equity	80.00%	12.50%	10.00%
Total	**100.00%**		**11.12%**
		Rounded	**11.00%**

COC Page 1 Summary Yld Non C I

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Cost of Capital Study
January 1, 2023
Staff Recommendation

Railroad Class I Industry (SIC 4011)

	Direct Rate		Reference
Equity:			
Estimated Cost of Equity Capital		**5.00%**	Page 9
Debt:			
Estimated Cost of Debt Capital		**2.44%**	Page 10

Cost of Capital Summary

Capital Component	**Market Capital Structure**	**Cost of Capital**	**Before-Tax Weighted Average Cost of Capital**
Debt	20.00%	2.44%	0.49%
Equity	80.00%	5.00%	4.00%
Total	**100.00%**		**4.49%**
		Rounded	**4.50%**

Cost of Capital Study
January 1, 2023
Analysis of Debt Capital

Railroad Class I Industry (SIC 4011)							
				Ratings			
Company		**Ticker**		**Moody's**		**S&P**	
Canadian National Railway		CNI		A2		A	
Canadian Pacific Railway		CP		Baa2		BBB+	
CSX Corp.		CSX		Baa1		BBB+	
Norfolk Southern Corp.		NSC		Baa1		BBB+	
Union Pacific Corp.		UNP		A3		A-	
			Average Rating	**Baa**		**BBB**	
NR = Not Rated							
RW = Rating Withdrawn							

Mergent Bond Record, January 2023				
Corporate	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.40%	5.74%	6.26%
November	4.90%	5.23%	5.58%	5.07%
December	4.43%	4.77%	5.12%	5.59%
Average	**4.81%**	**5.13%**	**5.48%**	**5.64%**
Public Utilities	**Aaa**	**Aa**	**A**	**Baa**
October	-	5.68%	5.88%	6.18%
November	-	5.54%	5.75%	6.05%
December	-	5.06%	5.28%	5.57%
Average	**-**	**5.43%**	**5.64%**	**5.93%**
Industrials	**Aaa**	**Aa**	**A**	**Baa**
October	5.10%	5.11%	5.59%	6.33%
November	4.90%	4.92%	5.40%	6.08%
December	4.43%	4.48%	4.94%	5.61%
Average	**4.81%**	**4.84%**	**5.31%**	**6.01%**
Debt Yield Rate Estimate				**5.61%**

Data Sources:
https://www.moodys.com
https://standardandpoors.com
Mergent Bond Record, January 2023

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

Cost of Capital Study

January 1, 2023

Analysis of the Market Capital Structure

Railroad Class I Industry (SIC 4011)									
		(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)**
Canadian National Railway	CNI	11,417	12.52%	118.88	671.00	79,769	87.48%	91,186
Canadian Pacific Railway	CP	14,876	17.66%	74.59	929.70	69,346	82.34%	84,222
CSX Corp.	CSX	18,050	21.72%	30.98	2,100.00	65,058	78.28%	83,108
Norfolk Southern Corp.	NSC	15,068	20.89%	246.42	231.51	57,049	79.11%	72,117
Union Pacific Corp.	UNP	33,422	20.79%	207.07	614.80	127,307	79.21%	160,729
Mean:		**18,567**	**18.72%**			**79,705.80**	**81.28%**	**98,272**
Median:		**15,068**	**20.79%**			**69,346.00**	**79.21%**	**84,222**
Market Capital Structure Estimate:		**Debt:**	**20.00%**			**Equity:**	**80.00%**	

Data Source:
Columns (1) & (4), Value Line Industry Summary & Index, 02-17-2023
Column (2) = Column (1) / Column (7)
Column (3), Yahoo Finance, 12-30-2022
Column (5) = Column (3) * Column (4)
Column (7) = Column (1) + Column (5)

Cost of Capital Study

January 1, 2023

Capital Asset Pricing Model (CAPM)

CAPM ==> K_e = R_f + β (ERP)

Railroad Class I Industry (SIC 4011)	
Risk-Free Rate	3.66%
Beta (β)	1.01
Equity Risk Premium (ERP): $(R_m - R_f)$*	6.00%
Adjusted Equity Risk Premium: (β * ERP)	6.06%
Cost of Equity Capital - CAPM	**9.72%**
U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, Selected Yields	
U.S. Treasury Securities:	
2022 December - 30 Day	3.66%
2022 November - 60 Day	3.83%
2022 October - 90 Day	3.90%
Risk-Free Rate of Return R_f, 30-year Treasury Rate	**3.66%**
* 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, 2023
Beta (β) Analysis

Railroad Class I Industry (SIC 4011)			
Company Name	**Stock Symbol**		**Beta "β"**
Canadian National Railway	CNI		0.90
Canadian Pacific Railway	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 (β) Estimate:	**1.01**
Data Source: Value Line Industry Summary & Index, 02-17-2023			

Cost of Capital Study

January 1, 2023

Dividend Growth Model (DGM or DCF)

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

where

K_e =	**Cost of Equity**
D_1 =	**Expected Dividend**
P_0 =	**Current Price**
g =	**Sustainable Growt**

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**	**b**	**ROE**	**g=(b * ROE)**	**(Dividends) K_e**	**(Earnings) K_e**	**g=(b * ROE) K_e**
Canadian National Railway	CNI	118.88	2.50	2.10%	9.50%	9.50%	59.00%	24.60%	14.51%	11.60%	11.60%	16.61%
Canadian Pacific Railway	CP	74.59	0.72	0.97%	8.50%	10.50%	80.00%	9.00%	7.20%	9.47%	11.47%	8.17%
CSX Corp.	CSX	30.98	0.44	1.42%	9.00%	9.00%	79.00%	32.40%	25.60%	10.42%	10.42%	27.02%
Norfolk Southern Corp.	NSC	246.42	5.40	2.19%	8.00%	9.50%	64.00%	25.70%	16.45%	10.19%	11.69%	18.64%
Union Pacific Corp.	UNP	207.07	5.60	2.70%	7.50%	7.50%	55.00%	58.20%	32.01%	10.20%	10.20%	34.71%
			Mean:	**1.88%**	**8.50%**	**9.20%**	**67.40%**	**29.98%**	**19.15%**	**10.38%**	**11.08%**	**21.03%**
			Median:	**2.10%**	**8.50%**	**9.50%**	**64.00%**	**25.70%**	**16.45%**	**10.20%**	**11.47%**	**18.64%**
							Cost of Equity Capital - DCF K_e Estimate:			**10.50%**	**11.00%**	**21.00%**

Notes:

b = (1 - payout ratio) = Retention Ratio

ROE = Return on Book Equity

Not Meaningful (NMF)

Data Source:

Column (1), Yahoo Finance, 12-30-2022

Columns (2) - (6), Value Line Industry Summary & Index, 02-17-2023

Cost of Capital Study

January 1, 2023

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
Company Name	Dividend	1-5	6	7	8	9	10		
Canadian National Railway	$2.50	9.50%	8.55%	7.60%	6.65%	5.70%	4.75%	3.80%	6.95%
Canadian Pacific Railway	$0.72	8.50%	7.72%	6.94%	6.16%	5.38%	4.60%	3.80%	5.06%
CSX Corp.	$0.44	9.00%	8.13%	7.26%	6.39%	5.52%	4.65%	3.80%	5.84%
Norfolk Southern Corp.	$5.40	8.00%	7.30%	6.60%	5.90%	5.20%	4.50%	3.80%	6.78%
Union Pacific Corp.	$5.60	7.50%	6.88%	6.26%	5.64%	5.02%	4.40%	3.80%	7.35%
								Average:	**6.40%**
								Median:	**6.78%**
Cost of Equity Capital - DCF Estimates:									**6.50%**

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, 2023
Support for Market Multiples

Railroad Class I Industry (SIC 4011)				
		(1)	(2)	
Company Name	**Ticker**	**Stock Price**	**Earnings**	**P/E Multiple**
Canadian National Railway	CNI	118.88	5.69	20.89
Canadian Pacific Railway	CP	74.59	2.84	26.26
CSX Corp.	CSX	30.98	1.91	16.22
Norfolk Southern Corp.	NSC	246.42	13.90	17.73
Union Pacific Corp.	UNP	207.07	11.36	18.23
			Mean	**19.87**
			Median	**18.23**
			P/E Estimate	**20.00**
			Equity Rate	**5.00%**

<u>Data Source:</u>
Column (1) Yahoo Finance, 12-30-2022
Coulmn (2) Value Line Industry Summay & Index, 02-17-2023

Cost of Capital Study
January 1, 2023
Direct Debt Rate Calculation

Railroad Class I (SIC 4011)		
Direct Capitalization Debt Rate		
Interest Expense ($ mil)	$	2,160
Total Value of Debt (TVD) ($ mil)	$	88,661
Current Yield = Interest Expense/TVD		**2.44%**
Data Source:		
Value Line Investment Survey, 02-17-2023		