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# CFA INSTITUTE RESEARCH CHALLENGE

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Hosted by Koppers Holdings, Inc., Pittsburgh PA



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# Koppers Holdings Inc.

## Recommendation:

/ **Buy** /

XNYS: KOP

Price Target: \$58.60

Upside: 11%

**Closing Stock Price:** \$50.60

As of January 7

## Monte Carlo Empirical

(10,000 Iterations):

Long Term VaR: 6.85% (\$3.46)

Long Term CVaR: 9.53% (\$4.82)

Short Term VaR: 6.97% (\$3.53)

Short Term CVaR: 7.96% (\$4.03)

Figure 5 and 6

## Stop Look Listen and Wait! Koppers to Weather Rocky Economy.

### Important Market and Valuation Metrics

**Market Cap:** 1.054B

**ROE:** 65.4%

**Dividend Yield:** 0.5%

**Dividend Payout:** 4%

**Diluted EPS:** \$5.91

**Earnings Retention:** 96%

**Sustainable Growth:** 8.65%

**PEG:** 0.1

**Price to Book:** 3.8

**EBIT:** \$203

**Adjusted EBITDA:** 260

**Equity Value:** \$1,078

**Enterprise Value:** \$2,059

**Financial Leverage:** 8.2

## Purpose and Scope

The purpose of this research report is to highlight the going-forward concern of Koppers Holdings Inc. and its industry's potential future performance. By analyzing its financial statements and conducting industry research only available in the public domain we have determined multiple terminal value estimates.

## Business Description

Koppers Holdings Inc., through its three business segments, is a global provider of treated wood products, wood preservation chemicals, and carbon compounds. It's Railroad and Utility Products and Services (RUPS) sells treated and untreated wood products, rail joint bars and services primarily to the railroad markets in the United States and Canada, and services to the utility markets. Its Carbon Materials and Chemicals (CMC) produces creosote (a wood preservative), is a leading supplier of carbon pitch to the aluminum industry and has potential upsides in the enhancement of lithium-ion batteries and eliminate the need for industrial solvents. Furthermore, CMC produces phthalic anhydride derived from coal tar with end-users being coating applications, dye intermediates, pigments, concrete, and drywall. Carbon black feedstock is also produced and widely used in the rubber and tire industry and sometimes as a fuel oil blending component. Its Performance Chemicals (PC) produces and markets wood preservation chemicals and wood treatment technologies. Their RUPS and PC operations are substantially vertically integrated and to a less extent their RUPS and PC businesses.

## Industry Overview & Competitive Positioning

### Railroad and Utility Products and Services (RUPS)

Most significant business segment that represents most of the total revenue (41%). 18 wood treating plants and one rail joint bar manufacturing facility across the United States, Canada, and Australia. Sales primarily driven by long-term contracts. The supply chain heavily relies on rail and truck transportation. 78% of cross ties are consumed by this segment and 74% of sales are on long term contracts. The market has been in a slight downtrend and the outlook looks flat. KOP is also the second largest producer and first largest producer of utility poles. Inputs that directly affect this segment are pine (U.S) and eucalyptus (Australia).

### Carbon Materials and Chemicals (CMC)

Operates primarily through three coal tar distillation facilities and five carbon materials terminals. Since 2014, the segment has seen a consolidation down from eleven facilities. Aluminum smelters in North America, Western Europe, and Australia were closed due to high energy costs and possess' challenges to the CMC business. Supply contracts last from 3 to 10 years.

### Performance Chemicals (PC)

PC has sales that take place across the United States, Canada, Europe, South America, Australia, and New Zealand. Segment provides copper-based wood preservatives and fire-retardant chemicals. PC is the leading supplier to nine out of the ten largest lumber treating companies in the United States and the three largest in Canada. Competitive advantage provided by strategic sourcing of scrap copper is a critical component to operations. Value added to customers through marketing, engineering, and technical support services. Global copper prices are a significant input.

**Wood Product Manufacturing (PC and RUPS) Figure 7, 8, and 9**

S	W	O	T
<ul style="list-style-type: none"> <li>• High Profit Margins Compared to Industry</li> <li>• Low Customer Concentration</li> <li>• Low Service Concentration</li> </ul>	<ul style="list-style-type: none"> <li>• Low Barriers to Entry</li> <li>• Competitive Market</li> <li>• High Capital Requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Strong Revenue Growth in Recent Years</li> <li>• Trade Weighted Index</li> <li>• AI for Cost Efficiency</li> <li>• Canadian Pacific</li> </ul>	<ul style="list-style-type: none"> <li>• Housing Starts</li> <li>• Slowing Economy</li> <li>• Interest Rates</li> </ul>

Canada has heavily subsidized logging making lumber products highly competitive. In recent trends, it's considered that up to 1 out of every 6 trees used to build infrastructure in the United States comes from Canada. Ever since 2020, due to the spark of the COVID-19 pandemic, lumber prices have been extremely volatile, which seems to have assisted in generating larger profit margins. Koppers has been halted here due to long term contract negotiations. The United States-Mexico-Canada agreement has also done a good job in lowering tariffs on goods across borders. Canadian Pacific, through its acquisition of now Canadian Pacific Kansas City, has connected the first and only railroad to connect Mexico, the United States, and Canada. It should be noted that back in 2022, Canada filed a complaint with the USMCA for the United States stronger tariffs on Canadian imports due to shipping being significantly cheaper.

**Organic Chemical Manufacturing (CMC and PC) Figure 7, 8, and 9**

S	W	O	T
<ul style="list-style-type: none"> <li>• Low Competition</li> <li>• Medium Barriers to Entry</li> <li>• Strong Outside Investors</li> <li>• Infrastructure Investment and Jobs Act</li> </ul>	<ul style="list-style-type: none"> <li>• High Capital Requirements</li> <li>• High Industry Volatility</li> <li>• Medium Imports</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Production Index</li> <li>• High Revenue Growth since 2019</li> <li>• Input Prices Falling</li> <li>• Green Energy</li> </ul>	<ul style="list-style-type: none"> <li>• Weakening Economy</li> <li>• Interest Rate Hikes Affect Downstream</li> <li>• Environmental Regulations</li> <li>• Shrinking Profit</li> </ul>

**Inorganic Chemical Manufacturing (CMC) Figure 7, 8, and 9**

S	W	O	T
<ul style="list-style-type: none"> <li>• High Profit Margins Compared to Industry</li> <li>• Strong Outside Investors</li> </ul>	<ul style="list-style-type: none"> <li>• Reliant on Imports</li> <li>• Limited Customer Base</li> <li>• High Capital Costs</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Production Index</li> <li>• Energy Transition</li> </ul>	<ul style="list-style-type: none"> <li>• Revenue Seems to have Stagnated</li> </ul>

# Koppers Holdings Inc.

## WACC Calculation

### Target Capital Structure

Debt-to-Total Capitalization	70.0%
Equity-to-Total Capitalization	30.0%

### Cost of Debt

Cost-of-Debt	3.2%
Tax Rate	25.0%
<b>After-tax Cost of Debt</b>	<b>2.4%</b>

### Cost of Equity

Risk-free Rate	4.30%
Market Risk Premium	4.6%
Levered Beta	1.53
Size Premium	1.0%
<b>Cost of Equity</b>	<b>12.3%</b>

WACC	5.4%
WACC Round	6.0%

Source: Company Data

## INPUTS

Current Annual EPS:	\$4.10
Current Dividend Yield	0.5%
Current Stock Price	\$50.60
Expected Long-Term Growth	3.0%
	4.69

## OUTPUTS

Graham Fair Value (Original Formula):	\$59.45
Graham Fair Value (Adjusted for Interest Rates):	\$0.56
Dividend-Adjusted P/E/G Ratio:	3.53

Since COVID-19, the industry has experienced significant volatility with climbing and now sinking input prices. It seems that most of the industry was able to pass on the costs to customers, causing an overall rise in revenues and gross margin. However, due to the extended period of input costs and high interest rates, consumer demand has been weakening. Deloitte expects the industry to rebound at grow at a 4% CAGR. Furthermore, record amounts of investments have been seen pouring into American infrastructure. Pairing this information with a trade-weighted index should increase international demand for American products. Revenue is still poised to shrink by a CAGR of 0.7%. A decrease, however, or flattening in the industrial production index would pose significant risk to Koppers CMC and PC business due to the innate correlation with industrials. Unlike trucking, railroad, or construction, which tends to be a leading indicator or growing performance of industrials, Koppers would begin to benefit from such signals.

## Investment Summary

We issue a BUY rating on KOP with a target price of \$58.60 offering a potential upside of 11%. Although 11% would not typically warrant a BUY rating from us, we believe that Koppers will outperform the coming rocky economy. Through its somewhat diverse operational segments, Koppers always manages to have a segment pick up when its other segments slow down. Furthermore, Koppers is highly related to the industrial sector. Considering market cycles, in which we are in a lagging phase 4 moving into phase 1, industrials and financials tend to be the leading performers. So far, industrials have faired well while financials lag. In the event of a sluggish economy, we believe catalysts such as the infrastructure bill, increase foreign funding into US industrials, and an increase in demand for industrial imports to propel Koppers to outperform the market.

## Valuation

Expected Growth Rate	7.9%	8.9%	9.9%
EPS0	\$ 5.91	\$ 5.91	\$ 5.91
EPS1	\$ 6.38	\$ 6.44	\$ 6.50
EPS2	\$ 6.88	\$ 7.01	\$ 7.14
Expected PE Ratio	7.88	8.88	9.88
P0 - Actual	\$ 50.95	\$ 50.95	\$ 50.95
P0 Expected	\$ 46.59	\$ 52.51	\$ 58.42
P1 Expected	\$ 50.26	\$ 57.17	\$ 64.19
P2 Expected	\$ 54.22	\$ 62.24	\$ 70.53
Expected ROI - excluding dividends	3.2%	10.5%	17.7%
Expected ROI - Including Dividends	3.6%	11.0%	18.1%
Recommendation	<b>Hold</b>	<b>Buy</b>	<b>Buy</b>

## Historical Analysis

Our historical analysis takes into account historical performance and aggregates multiple ratios and multiples such as sales, FCF, FCFE, FCFE, Sales, EBIT, EBITDA, Operating Cash Flows, recurring metrics, and sustainable growth rate. We have determined with this method that their implied future share price is between \$52.22 and \$70.53.

# Koppers Holdings Inc.

## Market Valuation & Trading Data

Current Price	\$	50.95
52 - Week High Price	\$	53.16
52 - Week Low Price	\$	28.45
% of 52 - Week High		95.85%
Starting YTD Price	\$	<b>50.47</b>
Performance YTD		1.0%
Shares Diluted		<b>21.3</b>
<b>Equity Value</b>	\$	1,085.24
Add: Total Debt		1,011
Add: Preferred Stock		-
Add: Noncontrolling Interest		4
Subtract: Cash & Cash Equivalents		(33)
<b>Enterprise Value</b>	\$	2,066.14

Normalized Tax Rate	25%
Interest Rate (Fixed)	8.34%
Interest Rate (Floating)	7.58%
SOFR Goal	2.50%
Lender Spread	2.28%

## DCF Assumptions

Terminal Methodology	Terminal Value: Perpetual Growth
Terminal EBITDA Multiple	12.5
Long-Term Growth Rate	8.88%
WACC	6%

## WACC Assumptions

	Low	High
Risk Free Rate	4.10%	4.30%
Equity Risk Premium	4.60%	4.60%
Country Risk Premium	0.00%	0.00%
Size Premium	0.00%	0.00%
Company Specific Risk Premium	1.00%	2.00%

## Balance Sheet Items as a Percent of \_\_\_\_\_

GEOMEAN

Accounts Receivable as % of Revenue	11.05%
Cash on Hand (Average Always on Hand)	2.45%
Accounts Payable as % COGS	12.91%
Inventory as % COGS	22.67%
Other Current Assets	2.42%
Accrued Liabilities % Total Expense	6.02%
Annual Growth in Marketable Securities	0.00%

## Implied Share Price

		Exit Multiple				
		9.0x	9.5x	10.0x	10.5x	11.0x
5.0%		\$71.3	\$76.7	\$82.2	\$87.7	\$93.2
5.5%		\$68.9	\$74.3	\$79.7	\$85.0	\$90.4
6.0%		\$66.7	\$71.9	\$77.2	\$82.4	\$87.6
6.5%		\$64.5	\$69.6	\$74.7	\$79.8	\$85.0
7.0%		\$62.4	\$67.3	\$72.3	\$77.3	\$82.3

Figure 1: Source: Group Analysis. Terminal Year 2027

Our EBITDA DCF Model estimates our terminal year value in 2027 to be between \$66.70 and \$87.60. Assumptions include an exit multiple of 10, fully diluted shares of 21. Our range also includes our base, bear, and bull case scenario.

As for our Lynch-Graham model, we assumed a 10% bear and bull case as a simple estimate.

Our EV/EBITDA model assumes a base, bear, bull case with a target multiple between 7 and 8.5. Fully diluted shares 21. Our P/E models assume a target multiple between 8 and 12.

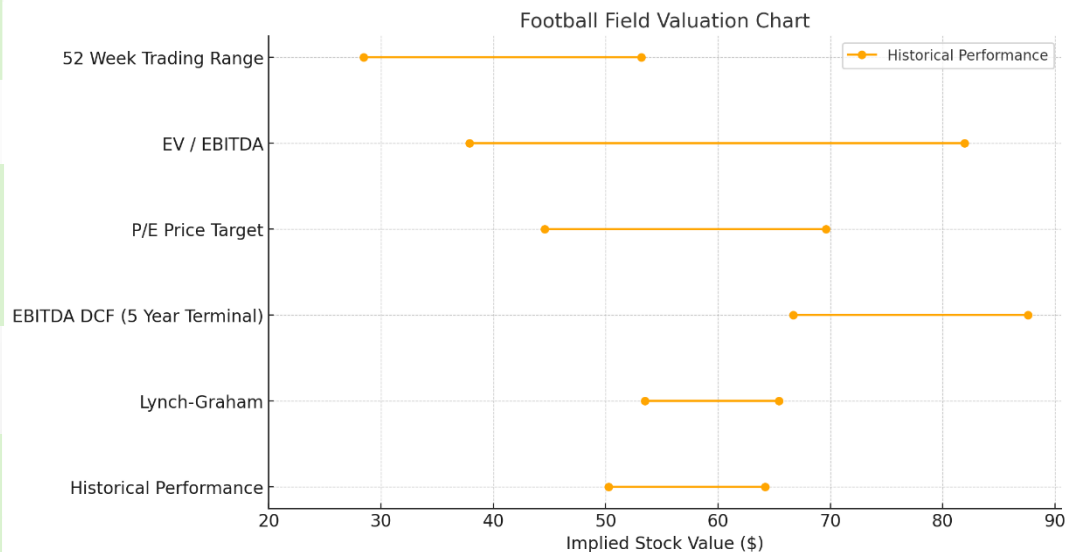


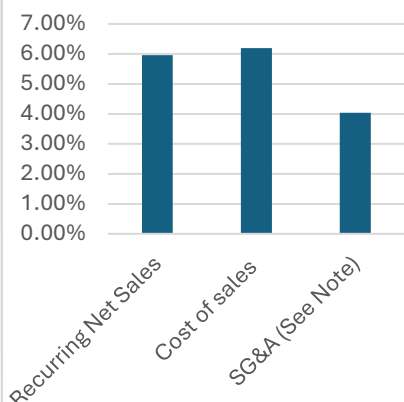
Figure 2: Source: Group Analysis.

Our top line growth assumes a blended CAGR of historical performance, industry expected performance, and tapers annually at 20% with a growth floor of 0.9% and represents the average CAGR of Koppers 3 business segments.

Finally, our blended price target of \$58.60 is achieved and we believe our estimates to remain on the conservative side as Koppers has a few potential upside catalysts. Figures: 20 - 23

# Koppers Holdings Inc.

## Blended CAGR



Figures 11 – 16 contain historical performance and ratios.

### Source: Company Data

#### Liquidity 2016 - TTM (Recurring)

Working Capital	~
Net Operating Working Capital	~
Current Ratio	~
Quick Ratio	~
Cash Ratio	~

#### Capital Structure 2016 - TTM

Operating Liabilities	~
Total Debt	~
Total Liabilities	~
Common Equity	~
Totally Equity	~
Total Assets	~

#### Invested Capital - Market Value

Financing Liabilities	~
Market Value of Equity	~
Total Invested Capital	~

#### As Percent of Total Invested Capital

Financing Liabilities	~
Market Value of Equity	~

#### Cash Flow and Credit Rating 2016 - TTM

Defensive Interval Turnover	~
Debt Coverage	~
Reinvestment	~
Debt Payment	~
Debt Payment (Net of Borrowing)	~
Dividend Payment	~
Investing and Financing	~
Cash Flow to Revenue	~
Cash Return on Assets	~
Cash Return on Equity	~
Cash to Income	~
Cash Flow Per Share	~
Interest Coverage	~

#### Cash Flow and Credit Rating 2016 - TTM

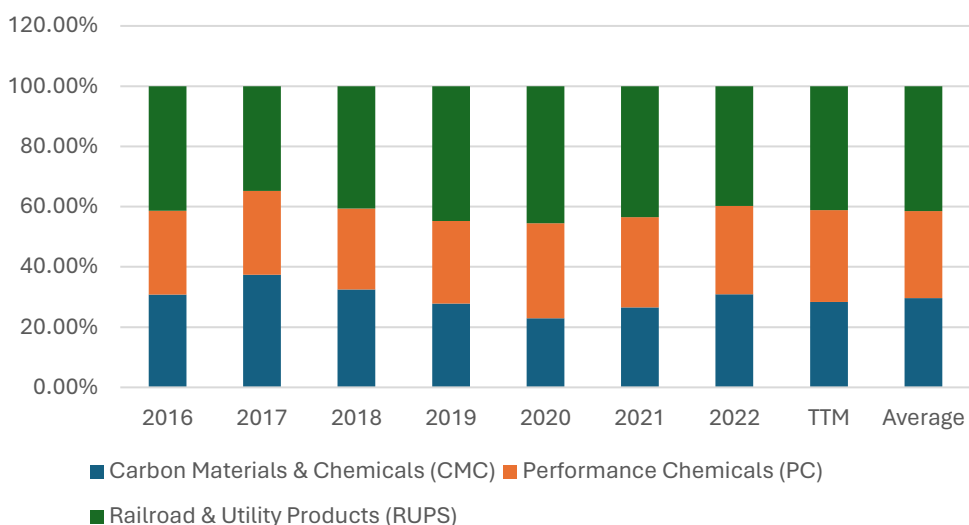
EBIT Interest Coverage	~
EBITDA Interest Coverage	~
Funds from Operations (FFO)	~
FFO Interest Coverage	~
FFO to Debt	~
Return on Capital	~
Free Operating Cash Flow to Debt	~
Discretionary Cash Flow to Debt	~
Net Cash Flow to CapEx	~
Debt to EBITDA	~
Debt to Capital	~

## Financial Statement Analysis of Recurring Data

### Top Line and Value Added

Recurring net sales have grown steadily at an average blended CAGR of 6.2% and have been outpaced by its growing cost of sales, especially more recently in today's high inflationary, high interest rate environment. KOPs RUPS segment has continually dominated its segmented revenues but has faced recent challenges with its negotiation in supply of all North American Class 1 railroads which makes up approximately 74% of its RUPS sales. Historically, however, RUPS is performing right on average despite management seeking price increases. PC, in response to the evolving utility pole preservatives regulations, and has worked in favor of KOP. We would also like to note that Koppers does well in protecting its value added to customers while seamlessly adjusting budget cuts within its SG&A. We appreciate companies who protect their core product and do their best to preserve value added. Figure 15

## Segmented Recurring Total Revenue



### Liquidity, Capital Structure, Solvency, and Financial Flexibility

Overall Koppers has continued to improve its overall financial flexibility in all aspects, has begun paying dividends to its shareholders, and sustainably buys back treasury stock. Operating liabilities have decreased as a percentage of total assets indicating assets are outpacing the growth of operating liabilities. Debt remains a significant part of their capital structure and their primary means of financing. Since 2020, Koppers has become asset positive with its liabilities no longer exceeding 100%. Since then, the company has become reliably less reliant on debt compared to equity. Koppers has also taken an aggressive stance on paying down debt up until 2023 when the company has seen significant capital expenditures.

EBIT/EBITDA coverage tends to be lumpy, indicating that Koppers usually experiences seasonality, causing periods of low coverage. FFO to Interest coverage and to debt indicates that the company has no problem paying its interest obligations and even has moderate coverage on debt. Return on

# Koppers Holdings Inc.

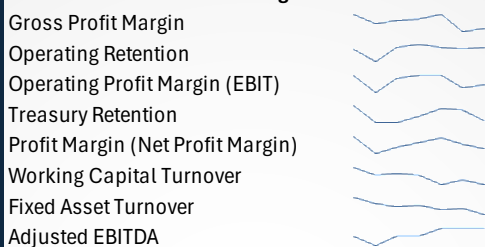
## All Metrics Refer to Recurring Data

### Profitability, Efficiency, and Effectiveness 2016 - TTM

#### DuPont



#### DeGeorge

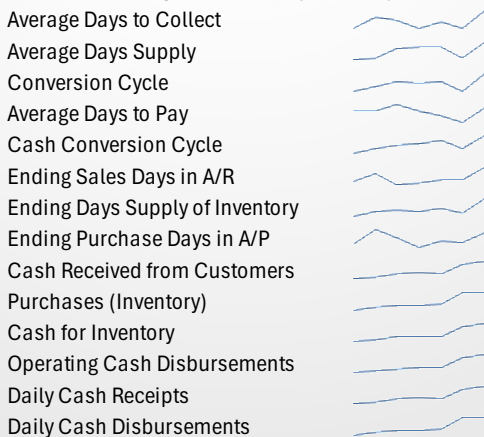


### Source: Company Data

#### Operating Cycle Turnovers



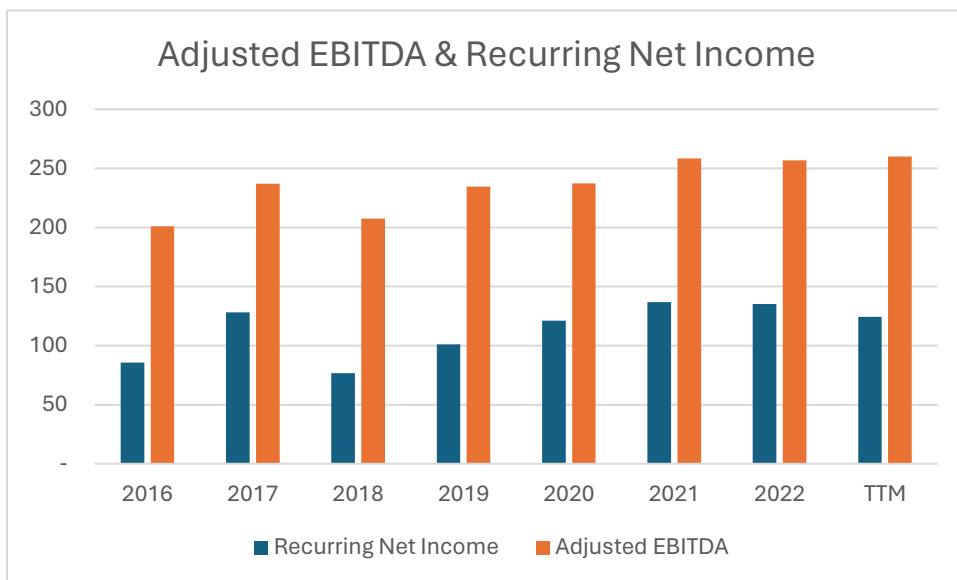
#### Average Cycle Days (360 Days)



### Source: Company Data

capital is lacking when compared to industry benchmarks but is expected to improve due to recent overperformance due to lower capital expenditures than expected.

### Profitability, Efficiency, and Effectiveness



EBIT margin fluctuates although overall improving mostly through its significant improvement in profit margin. Due to the long-term contractual agreements entered into we can expect to see a downward trend in the profit margin until contracts are renegotiated or the economy begins to show signs of improvement. Total asset turnover as well as return on assets is trending lower, indicating reduced efficiency.

### Adjustment Made to Income Statement to Arrive at Recurring NICO

To capture Koppers core growth, the financial statements have been normalized of all nonrecurring and noncash items such as: sale of assets, impairment and restructuring, plant closure, pension settlements, loss on extinguishment of debt, discretionary incentive, inventory adjustments from acquisition, market to market commodity hedging, depreciation and amortization, and LIFO expense/benefit. The tax rate has been normalized at the 25% rate as all companies will gravitate toward the corporate tax rate. KOP has also run low on deferred tax assets.

### Operating Cycle Turnovers

The increasing cash conversion cycle and ending cycle days for inventory are contributing to the declining efficiency ratios like asset turnover as assets are tied up in less liquid form. Cash movement, especially from customers, are reflecting the improved EBITDA figures and operating profit margins, indicating that the company is generating more operational profit and cash flow despite the longer operating and cash conversion cycles. Operating disbursements and purchases of inventory also require financing or in the past through acquisition of other businesses.

## Environmental, Social, and Governance

1. **Provide secure and meaningful work to diverse team of employees who feel engaged, included and value.** Notable actions that took place is the expansion of Koppers college, the restructuring of Health and Environmental Coordinator positions to allow further retention and expanded Wellness and Employee Assistance programs. Overall, Koppers shows significant signs of social awareness which can overall add to the satisfaction of its employees and customers.
2. **Advance Zero Harm culture that places the care and protection of employees, community, and environment first.** Implementation of new health and safety practices and programs. Overall, in 2022, this has resulted in the company reporting zero process safety incidents and nineteen accident-free facilities. Koppers has also placed an emphasis on employing women engineers which is majority dominated by men.
3. **Help build strong communities.** Volunteer events hosted at a number of communities across their facilities and contributed to charitable and philanthropic organizations.

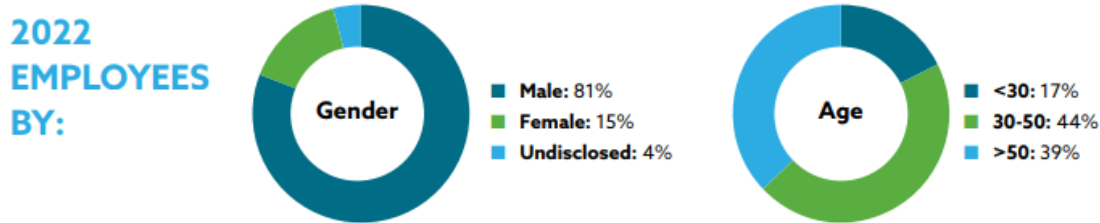


Figure 3: Koppers ESG Report

The workforce consists of mostly middle-aged people and indicates a higher level of experience, with people older than fifty making up the 2<sup>nd</sup> most. 2022 management and board of directors reflects a similar demographic with executives above 50 dominating. This could indicate an elevated level of experience being withheld at Koppers as well as a prominent level of workforce retention.

4. **Decreasing impacts to global climate change and decrease risk of climate change impacts throughout operations.** Koppers has the goal of reducing overall energy use by increasing the use of renewable energy. This was also noted as a major impact to their CMC business and the primary concern for consolidation. Overall reduction in scope 1 and 2 emissions by 50%. Solar panel installation has begun and managed to generate 121 GJ of excess electricity that was fed back to the electricity grid. Resulted in overall emission reduction of 18,656 kg CO<sub>2</sub>. However, it was noted that Koppers was analyzing the feasibility of solar panels. We wonder about this too, considering the efficiency of solar panels and their costs. See Figure
5. **Eliminate waste from our operations.** Entered a 50M 5-year contract with Class 1 railroads for sustainable crosstie disposal and 74.7% of non-hazardous waste was reused. Fifty percent reduction in greenhouse gas emissions by 2030 goal.
6. **Maximize value and reduce risk to stakeholders by operating profitably, transparently, sustainably and with integrity.** 25% of all wood was purchased through sustainable suppliers. Implementation of MicroPro wood preservative that has been granted 4 environmental production certificates. Phasing out of coal tar pitch for non-industrial and downstream uses.
7. **Invest in the future through innovation in new products, processes and technologies that provide sustainable solutions.** 138 iShare submissions with 51% being accepted and submitted 24 ideas to Sustainable Future Challenge. Furthermore, several product innovations have begun which include the development and patent to produce coal tar pitch that can be used as a graphite coating material for electrical batteries.

KOP seems to have taken ESG stances that truly add value to its customers and community that outweigh their costs. Whether it be through educational grants, environmental awareness, or the development of a potentially rewarding patent



# Koppers Holdings Inc.

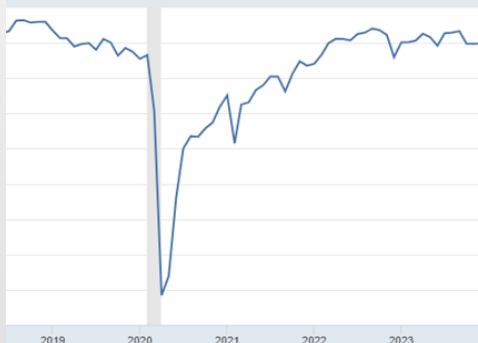
Currency Weights					
	CAD	USD	EUR	GBP	JPY
CAD		0.208	0.012	0.018	0.020
USD	0.790		0.151	0.124	0.271
EUR	0.046	0.147		0.553	0.124
JPY	0.031	0.111	0.052	0.032	
GBP	0.024	0.044	0.203		0.028
MXN	0.020	0.128			
CNY	0.010	0.036	0.026	0.012	0.089
TWD		0.032	0.016		0.059
KRW		0.031	0.014	0.010	0.055
HKD		0.031	0.018	0.019	0.042
SGD		0.023	0.013	0.011	0.037
MYR		0.017			0.032
BRR		0.014	0.015		
THB		0.011			0.028
AUD		0.010		0.010	0.026
CHF		0.010	0.060	0.017	
ILS		0.010	0.011		
SEK			0.039	0.024	
RUB			0.033		
CZK			0.028		
DKK			0.026	0.014	
PLZ			0.026		
HUF			0.022		
NOK			0.020	0.017	
TRY			0.019		
IDR					0.021
PHP					0.014

Source: University of British Columbia

Canadian Dollar on Thursday, February 8, 2024			
appreciation against			Trade-Weighted Index
USD	unch.	◆	
EUR	unch.	◆	
GBP	+0.2%	▲	
JPY	+0.9%	▲	

U.S. Dollar on Thursday, February 8, 2024			
appreciation against			Trade-Weighted Index
CAD	unch.	◆	
EUR	unch.	◆	
GBP	+0.2%	▲	
JPY	+0.9%	▲	

Source: University of British Columbia



(US) fred.stiouisfed.org

Source: FRED

ESG Combined Score ⓘ	B-
ESG Score (Weight: 100.0%) ⓘ	B-
Environmental Pillar Score (Weight: 39.6%) ⓘ	C+
Social Pillar Score (Weight: 38.0%) ⓘ	B-
Governance Pillar Score (Weight: 22.4%) ⓘ	A-
ESG Controversies Score ⓘ	B
Resource Use Score (Weight: 13.4%) ⓘ	C+

Figure 4: Source: Refinitiv

that approves the efficiency of electric batteries, the current shortfall of electric vehicles. Although hard to quantify with hard numbers, there is tremendous potential upside for Koppers. We neglected to include this potential in our forecast.

## Investment Risks and Opportunities

### Trade Weighted Index

The trade-weighted index is often interpreted as a country's international competitiveness. It's a useful measure to aggregate diverging trends among currencies and highlight potential import and export trends. Due to Koppers' exposure to international trade and examination of historical trends, this could present an opportunity for Koppers.

### Industrial Production Index

Although the industrial production index has returned to pre COVID levels, industrial production has remained flat since 2022. A decline in the industrial production index would signal rough earnings and potentially earnings downgrades.

### Housing Starts

Housing starts have in recent years performed outstandingly with many at home projects and new housing starts. However, the housing industry has arguably become a bubble, with homes being valued in many states up to 80% above COVID -19 levels. To include a borderline banking crisis, high interest rates, and a credit crunch on all Americans, Koppers might expect its RUPS segment to underperform when compared to historical performance.

### Green Energy

Although we may be somewhat biased in this field, we believe that green energy is not yet capable of performing efficiently for the current costs associated with initial investment. Green energy does offer many potential upsides, especially with technological innovations. Many of Koppers forward statements pertaining to its CMC segments relate to the high capital costs of energy and the potential green energy has on production. It will be interesting to see how their current solar panels perform.

# Appendix

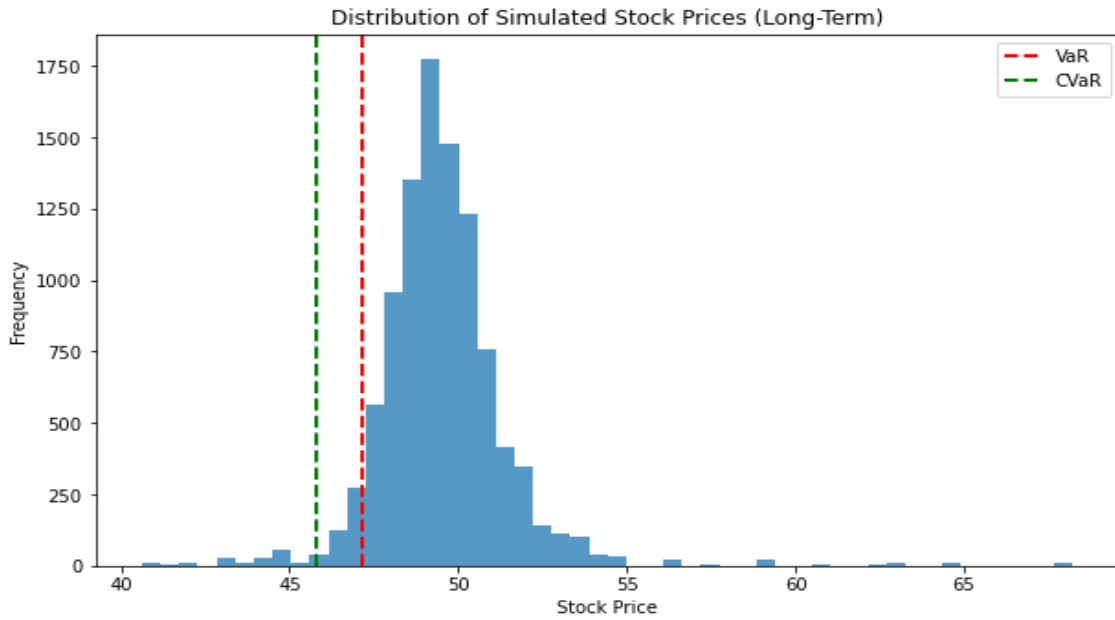


Figure 5: Monte Carlo Empirical Simulation. Iterations: 10,000. Excess log returns over the period of the last 5 years. 95% Confidence. VaR: \$3.46, 6.85% daily downside potential. CvaR: \$4.82, 9.53% in worst-case scenario. Data is non-normally distributed. Source: Company Data and Python

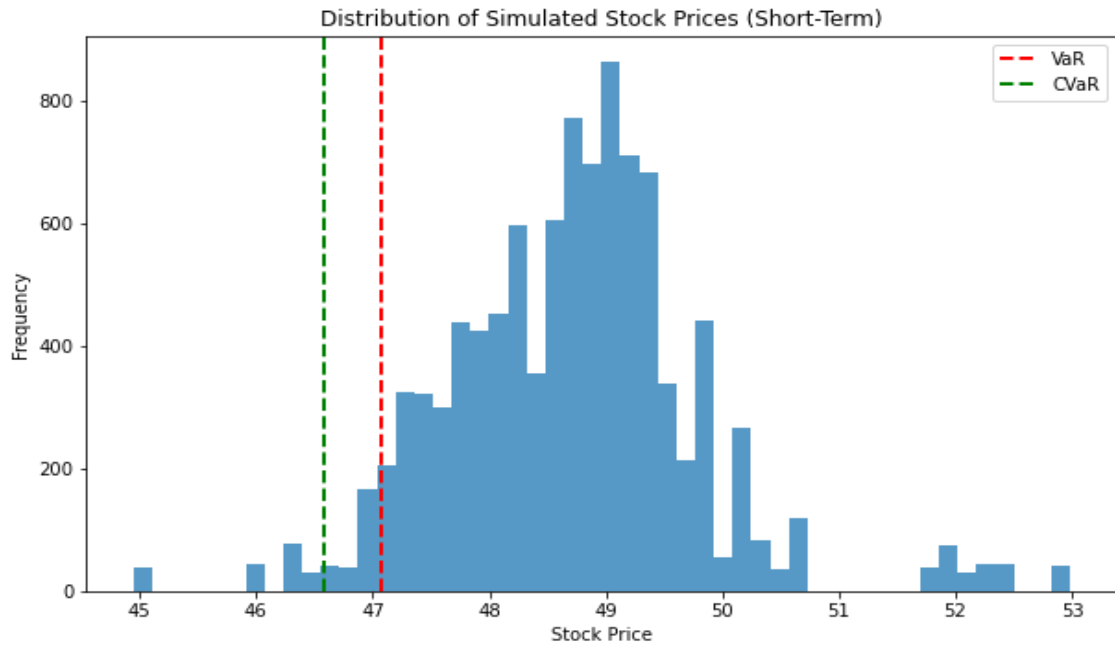


Figure 6: Monte Carlo Empirical Simulation. Iterations: 10,000. Excess log returns over the period of the last year. 95% Confidence. VaR: \$3.53, 6.97% daily downside potential. CvaR: \$4.03, 7.96% in worst-case scenario. Data is non-normally distributed. Source: Company Data and Python

## Key trends

01

The energy transition is generating a **wave of manufacturing activity that depends on chemicals** and materials for support.

02

The **regional competitive landscape has changed significantly** over the last three years, leading many in the chemical industry to rethink their long-term strategies.

03

Digital and artificial intelligence (AI) technologies are important to the future of many industries, but in the chemical industry, **data is becoming an important feedstock for innovation and operational excellence.**

04

Chemical leaders seeking a competitive edge often realize the **vast possibilities of a circular economy.**

05

Increased transparency and collaboration can go a long way in **helping chemical companies build trust and differentiate their brand.**

Figure 7: <http://deloitte.com/us/en/insights/research-centers/center-energy-industrials.html>

## Real new foreign direct investment in US manufacturing rose to the highest level in more than eight years in 2022

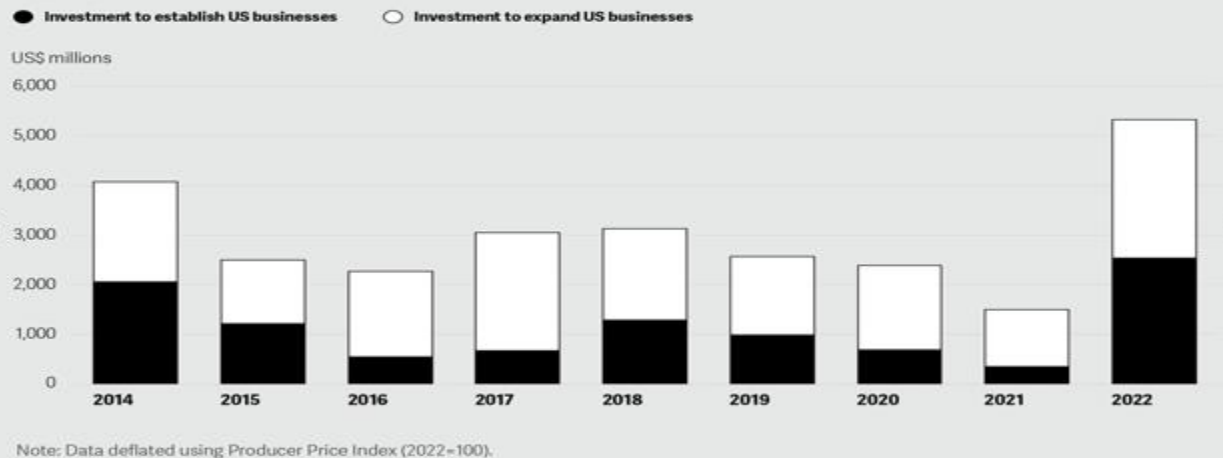


Figure 8: <http://deloitte.com/us/en/insights/research-centers/center-energy-industrials.html>

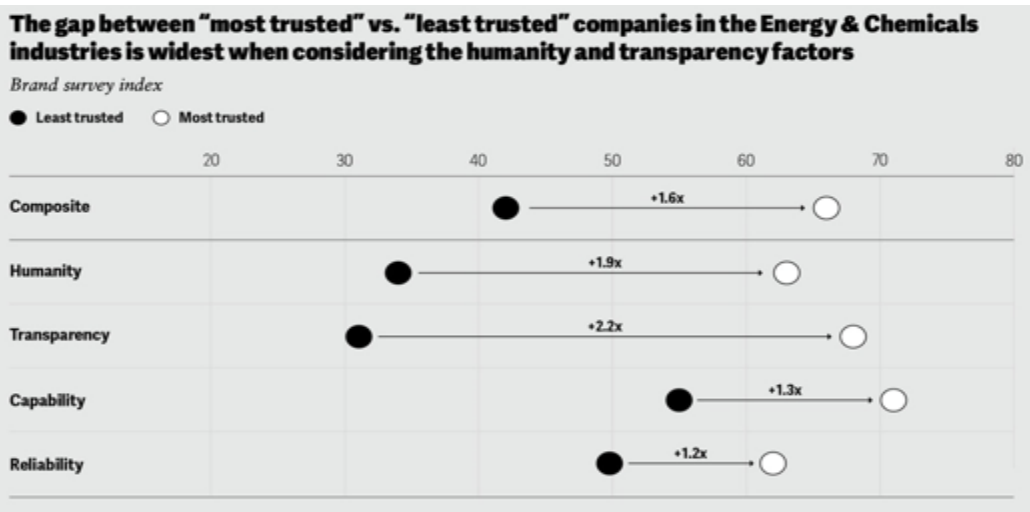


Figure 9: <http://deloitte.com/us/en/insights/research-centers/center-energy-industrials.html>

<b>Cash Flows, Investing, and Fixed Asset</b>							
<b>Year</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>TTM</b>
Operating Cash Flow Earned	154	197	148	136	143	200	219
Free Cash Flow (FCF)	126	133	22	113	56	30	69
Free Cash Flow to Firm (FCFF)	153	39	135	142	79	172	(9)
Free Cash Flow to Equity (FCFE)	75	78	59	34	39	137	(171)
CAPEX Multiple	1.4	2.2	0.7	1.3	2.2	1.9	2.0
Average Life of Fixed Assets	16.8	17.4	16.2	16.7	16.1	18.2	20.7
Average Age of Fixed Assets	10.2	9.2	8.7	9.1	7.6	8.2	8.4
Average Remaining Life	6.6	8.2	7.5	7.6	8.5	9.9	12.3
% Consumed	61%	53%	54%	55%	47%	45%	41%
Marketable Securities Turnover	-	-	-	-	-	-	-

Figure 10: Historical Recurring Performance. Source: Company Data

<b>Liquidity and Operating Cycles</b>							
<b>Year</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>TTM</b>
Working Capital	226	242	223	272	342	313	478
Net Operating Working Capital	177	213	223	265	320	300	450
Current Ratio	1.8	1.8	1.8	1.9	2.2	2.0	2.5
Quick Ratio	0.8	0.8	0.7	0.7	0.8	0.8	1.1
Cash Ratio	0.2	0.1	0.1	0.1	0.2	0.1	0.2
<b>Operating Cycle Turnovers</b>							
Receivable Turnover	10.0	9.0	9.3	9.8	9.4	9.9	8.4
Inventory Turnover	5.0	4.8	4.5	4.4	4.3	4.8	4.2
Payables Turnover	8.1	7.9	7.6	8.1	8.2	8.7	7.9
<b>Average Cycle Days (360 Days)</b>							
Average Days to Collect	36.1	40.2	38.9	36.6	38.4	36.2	42.7
Average Days Supply	72.6	75.2	80.7	81.0	83.4	74.8	86.2
Conversion Cycle	108.7	115.4	119.6	117.5	121.7	111.0	128.9
Average Days to Pay	44.7	45.3	47.5	44.4	43.8	41.3	45.6
Cash Conversion Cycle	64.1	70.1	72.1	73.1	78.0	69.7	83.4
<b>Ending Cycle Days (Check if Company is Exploiting Top Line Flexibility, Channel Stuffing)</b>							
Ending Sales Days in A/R	38.8	43.7	36.0	37.8	39.2	39.2	48.9
Ending Days Supply of Inventory	73.9	82.1	82.7	80.5	85.8	79.5	97.7
Ending Purchase Days in A/P	44.3	50.4	46.5	42.2	46.2	45.2	48.1
Cash Received from Customers	1,476.2	1,544.4	1,622.2	1,677.8	1,654.3	1,938.7	2,084.2
Purchases (Inventory)	1,153.2	1,266.6	1,316.7	1,313.7	1,340.7	1,653.1	1,737.1
Cash for Inventory	1,166.8	1,235.8	1,319.8	1,339.0	1,319.8	1,620.4	1,757.5
Operating Cash Disbursements	1,275.4	1,412.9	1,472.4	1,551.7	1,499.6	1,764.5	1,963.8
Daily Cash Receipts	4.1	4.3	4.5	4.7	4.6	5.4	5.8
Daily Cash Disbursements	3.2	3.5	3.7	3.6	3.7	4.6	4.8

Figure 11: Historical Recurring Performance. Source: Company Data

<b>Evidence of Channel Stuffing?</b>							
<b>Beginning Balance Sales &amp; A/R</b>	137	159	190	164	175	183	216
+Sales	1,476	1,563	1,637	1,669	1,679	1,981	2,124
Available	1,612	1,722	1,827	1,833	1,854	2,163	2,339
-Ending Balance	(159)	(190)	(164)	(175)	(183)	(216)	(289)
Activity	1,453	1,532	1,663	1,658	1,671	1,948	2,051
	Cash In	Cash In	Cash In	Cash In	Cash In	Cash In	Cash In
<b>Beginning Balance COGS &amp; Inventory</b>	237	285	299	296	314	356	466
+Activity	1,153	1,261	1,306	1,309	1,345	1,636	1,720
Available	1,390	1,546	1,605	1,605	1,658	1,992	2,185
-Ending Balance	237	285	299	296	314	356	466
Activity (COGS)	1,153	1,261	1,306	1,309	1,345	1,636	1,720
	COGS	COGS	COGS	COGS	COGS	COGS	COGS
<b>Beginning Balance Purchases &amp; A/P</b>	144	142	177	170	154	172	207
+Activity	1,390	1,546	1,605	1,605	1,658	1,992	2,185
Available	1,535	1,688	1,783	1,774	1,812	2,164	2,393
-Ending Balance	(142)	(177)	(170)	(154)	(172)	(207)	(232)
Activity (COGS)	1,393	1,510	1,613	1,620	1,641	1,956	2,160
	Cash Out	Cash Out	Cash Out	Cash Out	Cash Out	Cash Out	Cash Out
Average Balance A/R	148	174	177	170	179	199	252
Average Daily Activity	4	4	5	5	5	6	6
Average Days	36	40	39	37	38	36	43
Ending Balance A/R	159	190	164	175	183	216	289
Average Daily Activity	4	4	5	5	5	6	6
Ending Days	39	44	36	38	39	39	49
<b>Growing/Shrinking?</b>	GROWING	GROWING	SHRINKING	GROWING	GROWING	GROWING	GROWING
<b>Evidence of Channel Stuffing?</b>	GOOD	GOOD	GOOD	STUFFED	GOOD	GOOD	GOOD

Figure 12: Historical Recurring Performance. Source: Company Data

<b>Cash Flow and Credit Rating</b>							
Year	2017	2018	2019	2020	2021	2022	TTM
Defensive Interval Turnover	64.4	61.7	51.8	55.4	59.0	52.9	69.0
Debt Coverage	0.3	0.1	0.2	0.2	0.2	0.2	0.1
Reinvestment	3.0	1.2	4.0	1.8	1.2	1.7	1.1
Debt Payment	0.4	6.5	5.0	1.8	15.3	87.1	0.2
Debt Payment (Net of Borrowing)	4.3	(1.7)	5.0	1.8	15.3	87.1	1.1
Dividend Payment	-	-	-	-	-	41.5	26.2
Investing and Financing	3.2	1.4	1.2	1.0	1.7	1.6	1.7
Cash Flow to Revenue	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cash Return on Assets	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Cash Return on Equity	(1.7)	(0.8)	(0.8)	(2.8)	1.9	1.6	0.6
Cash to Income	1.1	0.8	0.7	0.6	0.7	0.8	0.5
Cash Flow Per Share	9.1	6.3	7.1	5.9	7.1	8.2	5.7
Interest Coverage	3.9	1.1	1.2	1.2	2.4	2.7	1.2
EBIT Interest Coverage	4.4	2.9	2.9	3.7	5.0	4.5	3.1
EBITDA Interest Coverage	5.6	3.8	3.8	4.9	6.4	5.7	4.0
Funds from Operations (FFO)	197.3	148.2	135.8	142.7	199.6	219.4	202.2
FOO Interest Coverage	5.5	3.7	3.2	3.9	5.9	5.8	3.8
FFO to Debt	0.3	0.1	0.1	0.2	0.2	0.3	0.2
Return on Capital	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Free Operating Cash Flow to Debt	(0.2)	(0.0)	(0.1)	(0.1)	(0.0)	(0.1)	(0.0)
Discretionary Cash Flow to Debt	(0.2)	(0.0)	(0.1)	(0.1)	(0.0)	(0.1)	(0.0)
Net Cash Flow to CapEx	0.3	0.1	0.1	0.2	0.2	0.3	0.2
Debt to EBITDA	2.9	4.8	3.9	3.4	3.1	3.3	3.9
Debt to Capital	(87.3)	(239.3)	(147.8)	44.9	111.6	106.4	268.0

Figure 13: Historical Recurring Performance. Source: Company Data

Profitability, Efficiency and Effectiveness							
Year	2017	2018	2019	2020	2021	2022	TTM
<b>DuPont</b>							
Operating Profit Margin (EBIT)	12.8%	10.0%	12.3%	12.9%	12.8%	10.9%	11.4%
Interest Burden	77.3%	65.5%	65.7%	73.3%	79.8%	77.7%	67.6%
Pretax Profit Margin (EBT)	9.9%	7.0%	8.3%	9.6%	10.9%	9.1%	7.8%
Tax Burden	88.5%	74.7%	85.8%	90.0%	85.4%	86.7%	90.5%
Profit Margin (Net Profit Margin)	8.7%	4.9%	6.2%	7.2%	8.2%	6.8%	5.9%
Total Asset Turnover	154.3%	142.4%	133.5%	129.9%	125.9%	142.3%	135.7%
Return on Assets	13.4%	7.0%	8.2%	9.4%	10.3%	9.7%	7.9%
Financial Leverage 1 (Equity Multiplier)	-816.9%	-703.9%	-668.3%	-2880.4%	1636.0%	1243.7%	823.2%
Return on Equity	-109.4%	-49.1%	-55.1%	-271.3%	168.0%	120.9%	65.4%
<b>DeGeorge</b>							
Gross Profit Margin	21.8%	20.1%	20.5%	20.8%	21.6%	18.6%	19.2%
Operating Retention	58.7%	49.7%	60.0%	62.2%	59.4%	58.5%	59.3%
Operating Profit Margin (EBIT)	12.8%	10.0%	12.3%	12.9%	12.8%	10.9%	11.4%
Treasury Retention	67.8%	49.1%	50.3%	56.1%	63.6%	62.7%	51.3%
Profit Margin (Net Profit Margin)	8.7%	4.9%	6.2%	7.2%	8.2%	6.8%	5.9%
Effective Tax Rate	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Working Capital Turnover	8.0	6.7	7.0	6.7	5.5	6.0	5.4
Fixed Asset Turnover	4.8	4.2	3.9	4.0	3.7	3.8	3.2
Adjusted EBITDA	237	207	235	237	259	257	260

Figure 14: Historical Recurring Performance. Source: Company Data

Koppers Holdings Inc. (KOP)		Recurring							
Adjustments for Recurring NICO		in millions except per share data							
Year ended near 12/31:	2016	2017	2018	2019	2020	2021	2022	TTM	
<b>Net Income - As Reported</b>	29	29	23	67	122	85	62	89	
<b>Pretax Adjustments:</b>									
Sale of assets	(2)	-	8	-	-	(31)	(3)	(2)	
Impairment and restructuring	20	16	4	6	7	2	1	1	
Plant Closure	(0)	(0)	-	14	9	2	-	-	
Pension Settlements	4	10	-	-	-	-	-	-	
Loss on Extinguishment of Debt	-	13	-	-	-	-	-	-	
Discretionary Incentive	-	-	-	-	3	-	-	-	
Inventory Adjustment from Acquisition	-	-	-	-	-	-	(1)	-	
Mark to Market Commodity Hedging	(2)	(4)	7	(4)	(9)	4	7	(11)	
Depreciation and Amortization	53	50	47	51	54	58	56	54	
LIFO Expense (Benefit)	-	(1)	13	4	(14)	28	26	4	
<b>Net Pretax Adjustments</b>	<b>74</b>	<b>85</b>	<b>79</b>	<b>72</b>	<b>50</b>	<b>63</b>	<b>86</b>	<b>47</b>	
Tax at Standard rate of 22%	(18)	(21)	(20)	(18)	(12)	(16)	(21)	(12)	
<b>Net after Taxes</b>	<b>55</b>	<b>64</b>	<b>59</b>	<b>54</b>	<b>37</b>	<b>47</b>	<b>64</b>	<b>35</b>	
Discontinued Operations	(1)	1	(24)	(4)	(32)	0	1	0	
Tax Change Impact	-	21	-	-	-	-	-	-	
Unusual Taxes	2	14	18	(16)	(7)	5	8	0	
<b>Net CQAD Adjustments</b>	<b>56</b>	<b>99</b>	<b>53</b>	<b>35</b>	<b>(1)</b>	<b>52</b>	<b>73</b>	<b>35</b>	
<b>Reclassified NICO</b>	<b>86</b>	<b>128</b>	<b>77</b>	<b>101</b>	<b>121</b>	<b>137</b>	<b>135</b>	<b>124</b>	
<b>EPS - As reported</b>	<b>1.4</b>	<b>1.3</b>	<b>1.1</b>	<b>3.2</b>	<b>5.7</b>	<b>3.9</b>	<b>2.9</b>	<b>4.1</b>	
<b>CQAD Adjustments</b>	<b>2.7</b>	<b>4.5</b>	<b>2.6</b>	<b>1.6</b>	<b>(0.0)</b>	<b>2.4</b>	<b>3.4</b>	<b>1.6</b>	
<b>Reclassified NICO per share</b>	<b>4.1</b>	<b>5.8</b>	<b>3.7</b>	<b>4.8</b>	<b>5.7</b>	<b>6.2</b>	<b>6.4</b>	<b>5.8</b>	
<b>Price Per Share</b>	<b>17.3</b>	<b>44.1</b>	<b>25.8</b>	<b>19.8</b>	<b>33.8</b>	<b>28.1</b>	<b>36.9</b>	<b>38.8</b>	
<b>Effective Tax Rate - As Reported</b>	<b>29.6%</b>	<b>48.1%</b>	<b>82.4%</b>	<b>0.0%</b>	<b>19.1%</b>	<b>28.8%</b>	<b>33.5%</b>	<b>25.1%</b>	
<b>Standard Tax Rate</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	
<b>Income Tax at Standard Rate</b>	<b>10</b>	<b>15</b>	<b>8</b>	<b>16</b>	<b>28</b>	<b>30</b>	<b>24</b>	<b>30</b>	
<b>Income Tax as Reported</b>	<b>11</b>	<b>29</b>	<b>26</b>	<b>-</b>	<b>21</b>	<b>35</b>	<b>32</b>	<b>30</b>	
<b>Unusual Taxes</b>	<b>2</b>	<b>14</b>	<b>18</b>	<b>(16)</b>	<b>(7)</b>	<b>5</b>	<b>8</b>	<b>0</b>	

Figure 15: Adjustment for Recurring NICO. Source: Company Data

Market / Valuation Ratios							
Year	2017	2018	2019	2020	2021	2022	TTM
Closing Stock Price	50.26	16.83	37.74	30.77	30.91	28.05	51.07
Diluted Shares Outstanding	20.77	20.55	20.80	21.10	21.10	20.77	20.44
Market Capital (Market Value of Equity)	1,044	346	785	649	652	583	1,044
Debt	677	990	923	797	805	838	1,011
Cash and Marketable Securities	(60)	(41)	(33)	(39)	(46)	(33)	(59)
Enterprise Value	1,661	1,296	1,675	1,408	1,412	1,387	1,996
Float	-	-	-	-	-	-	-
<b>Relevant Per Share Item</b>							
Earnings	5.8	3.7	4.8	5.7	6.2	6.4	5.9
Book Value	(4.0)	(11.2)	(6.6)	2.3	5.4	5.2	13.3
<b>Relevant Valuation Metrics</b>							
Price to Earnings	8.6	4.6	7.9	5.4	4.9	4.4	8.6
Price to Book Value	(12.7)	(1.5)	(5.7)	13.5	5.7	5.3	3.8
Enterprise Value Multiple	7.0	6.2	7.1	5.9	5.5	5.4	7.7
EV / Modified EBITDA	0.7	0.2	0.5	0.4	0.4	0.3	0.5
Price to Sales	0.3	0.1	0.2	0.2	0.2	0.1	0.3
Price to EBIT	4.4	1.7	3.3	2.7	2.5	2.3	4.0
Price to EBITDA	5.3	2.3	5.8	4.5	3.3	2.7	5.2
Price to Cash Flows	5.2	2.6	5.2	5.1	4.2	3.3	8.7
Price to Free Cash Flow	7.8	15.8	7.0	11.5	21.9	8.5	125.8
Dividends Declared Per Share	-	-	-	-	-	0.20	0.24
Dividend Yield	0.00%	0.00%	0.00%	0.00%	0.00%	0.71%	0.47%
Dividend Payout Ratio	-	-	-	-	-	0.0	0.0
Earnings Retention Rate	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sustainable Growth Rate	(1.1)	(0.5)	(0.6)	(2.7)	1.7	1.2	0.6
Internal Growth Rate	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEG	(0.1)	(0.1)	(0.1)	(0.0)	0.0	0.0	0.1
Market Value Added	1,126	575	922	601	537	474	773

Figure 16: Historical Recurring Performance. Source: Company Data

Company Name	CURRENT CAPITALIZATION							FINANCIAL ESTIMATES							
	Share Price	Diluted Shares	Market Cap	Total Debt	Cash	Net Debt	Enterprise Value	Revenue FY+1	Revenue FY+2	EBITDA FY+1	EBITDA FY+2	Earnings FY+1	Earnings FY+2	Cash Flow FY+1	Cash Flow FY+2
[\$/sh.]															
☐ Koppers Holdings Inc. (XNYS:KOP)	\$ 50.95	21.3	\$ 1,085	\$ 1,011	\$ 59	\$ 952	\$ 2,037	2135	2166	254	275	93	99	30	50
<b>Most Direct Competitors (NO HARD CODING)</b>															
☐ STELLA-JONES INC. (OTCM:STLJF)	\$ 57.41	61	3,525	940	-	940	4,465	3,371	3,690	607	616	681	697	335	312
☐ CABOT CORPORATION (XNYS:CBT)	\$ 80.07	57	4,524	1,375	238	1,137	5,661	4,057	4,265	779	846	924	987	547	531
☐ ELEMENT SOLUTIONS INC (XNYS:ESI)	\$ 22.73	245	5,569	1,955	265	1,690	7,259	2,347	2,488	486	541	935	1,008	306	401
☐ ADVANSIX INC. (XNYS:ASIX)	\$ 25.63	29	743	231	31	200	943	1,489	1,538	153	180	164	188	119	155
☐ WEYERHAEUSER COMPANY (XNYS:WY)	\$ 33.01	743	24,526	5,171	1,581	3,590	28,116	7,737	7,948	1,667	1,805	1,709	1,893	1,497	1,439
☐ L. B. FOSTER COMPANY (XNAS:FSTR)	\$ 23.82	11	255	109	3	106	361	537	573	23	37	108	123	(20)	(24)
<b>Carbon Materials &amp; Chemicals (CMC)</b>															
☐ QUAKER CHEMICAL CORPORATION (XNYS:KWR)	\$ 190.46	18	3,428	988	181	807	4,235	1,957	2,006	317	341	704	740	223	170
☐ NewMarket Corporation (XNYS:NEU)	\$ 588.20	10	5,882	1,091	69	1,022	6,904	2,000	1,987	435	429	647	651	55	61
☐ Olin Corporation (XNYS:OLN)	\$ 51.12	148	7,566	2,945	194	2,751	10,317	6,723	6,912	1,305	1,291	1,156	1,165	843	872
☐ CELANESE CORPORATION (XNYS:CE)	\$ 148.90	109	16,230	15,126	1,508	13,618	29,848	10,979	11,306	2,445	2,786	2,702	3,071	1,837	1,851
☐ KRONOS WORLDWIDE, INC. (XNYS:KRO)	\$ 8.85	115	1,018	446	327	119	1,137	1,645	1,941	(22)	116	151	309	(5)	64
☐ WESTLAKE CORPORATION (XNYS:WLK)	\$ 142.80	129	18,421	5,499	2,228	3,271	21,692	12,584	12,519	2,650	2,601	2,404	2,535	2,247	2,115
<b>Performance Chemicals (PC)</b>															
☐ STELLA-JONES INC. (OTCM:STLJF)	\$ 57.41	61	3,525	940	-	940	4,465	3,371	3,690	607	616	681	697	335	312
☐ CABOT CORPORATION (XNYS:CBT)	\$ 80.07	57	4,524	1,375	238	1,137	5,661	4,057	4,265	779	846	924	987	547	531
☐ ALBEMARLE CORPORATION (XNYS:ALB)	\$ 114.33	117	13,377	3,769	1,499	2,270	15,647	9,553	8,073	3,304	1,969	2,189	2,019	1,428	2,083
☐ ELEMENT SOLUTIONS INC (XNYS:ESI)	\$ 22.73	245	5,569	1,955	265	1,690	7,259	2,347	2,488	486	541	935	1,008	306	401
☐ INNOSPEC INC. (XNAS:IOSP)	\$ 118.09	25	2,937	465	147	(102)	2,835	1,933	1,935	213	241	572	592	136	93
☐ ADVANSIX INC. (XNYS:ASIX)	\$ 25.63	29	743	231	31	200	943	1,489	1,538	153	180	164	188	119	155
<b>Railroad &amp; Utility Products (RUPS)</b>															
☐ WEYERHAEUSER COMPANY (XNYS:WY)	\$ 33.01	743	24,526	5,171	1,581	3,590	28,116	7,737	7,948	1,667	1,805	1,709	1,893	1,497	1,439
☐ L. B. FOSTER COMPANY (XNAS:FSTR)	\$ 23.82	11	255	109	3	106	361	537	573	23	37	108	123	(20)	(24)
☐ RAYONIER INC. (XNYS:RYN)	\$ 32.87	150	4,931	1,611	114	1,497	6,428	823	839	278	296	173	206	257	262
☐ POTLATCHDELTIC CORPORATION (XNAS:PCH)	\$ 44.67	73	3,261	1,055	344	711	3,972	1,010	1,053	195	233	119	156	173	208
☐ UFP INDUSTRIES, INC. (XNAS:UFP)	\$ 117.44	61	7,164	363	559	(196)	6,968	7,323	7,352	815	803	1,433	1,408	876	596
☐ LOUISIANA-PACIFIC CORPORATION (XNYS:LTX)	\$ 69.12	78	5,391	395	369	26	5,417	2,527	2,696	418	519	587	617	318	423

Figure 17: Comps. Source: Company Data and Bloomberg

Name	Price	Exchange	Market Val. of Equity	Total Debt	Debt / Equity	Debt / Capital	5-Yr. Avg. Tax Rate	Levered Beta	Unlevered Beta
□ QUAKER CHEMICAL CORPORATION (XNYS:KWR)	\$ 190.46	New York Stock Exchange	3,428	988	28.8%	22.4%	25%	1.48	1.22
□ NewMarket Corporation (XNYS:NEU)	\$ 588.20	New York Stock Exchange	5,882	1,091	18.5%	15.6%	25%	0.43	0.38
□ Olin Corporation (XNYS:OLN)	\$ 51.12	New York Stock Exchange	7,566	2,945	38.9%	28.0%	25%	1.43	1.10
□ CELANESE CORPORATION (XNYS:CE)	\$ 148.90	New York Stock Exchange	16,230	15,126	93.2%	48.2%	25%	1.35	0.79
□ KRONOS WORLDWIDE, INC. (XNYS:KRO)	\$ 8.85	New York Stock Exchange	1,018	446	43.8%	30.5%	25%	1.16	0.87
□ WESTLAKE CORPORATION (XNYS:WLK)	\$ 142.80	New York Stock Exchange	18,421	5,499	29.9%	23.0%	25%	1.31	1.07
□ STELLA-JONES INC. (OTCM:STLJF)	\$ 57.41	OTC Markets	3,525	940	26.7%	21.1%	25%	0.68	0.57
□ CABOT CORPORATION (XNYS:CBT)	\$ 80.07	New York Stock Exchange	4,524	1,375	30.4%	23.3%	25%	1.25	1.02
□ ALBEMARLE CORPORATION (XNYS:ALB)	\$ 114.33	New York Stock Exchange	13,377	3,769	28.2%	22.0%	25%	1.59	1.31
□ ELEMENT SOLUTIONS INC (XNYS:ESI)	\$ 22.73	New York Stock Exchange	5,569	1,955	35.1%	26.0%	25%	1.31	1.04
□ INNOSPEC INC. (XNAS:IOSP)	\$ 118.09	Nasdaq Stock Market	2,937	45	1.5%	1.5%	25%	1.09	1.07
□ ADVANSIX INC. (XNYS:ASIX)	\$ 25.63	New York Stock Exchange	743	231	31.1%	23.7%	25%	1.72	1.39
□ WEYERHAEUSER COMPANY (XNYS:WY)	\$ 33.01	New York Stock Exchange	24,526	5,171	21.1%	17.4%	25%	1.44	1.24
□ L. B. FOSTER COMPANY (XNAS:FSTR)	\$ 23.82	Nasdaq Stock Market	255	109	42.8%	30.0%	25%	0.77	0.59
□ RAYONIER INC. (XNYS:RYN)	\$ 32.87	New York Stock Exchange	4,931	1,611	32.7%	24.6%	25%	1.08	0.86
□ POTLATCHDELTIC CORPORATION (XNAS:PCH)	\$ 44.67	Nasdaq Stock Market	3,261	1,055	32.4%	24.4%	25%	1.18	0.95
□ UFP INDUSTRIES, INC. (XNAS:UFPI)	\$ 117.44	Nasdaq Stock Market	7,164	363	5.1%	4.8%	25%	1.50	1.44
□ LOUISIANA-PACIFIC CORPORATION (XNYS:LPX)	\$ 69.12	New York Stock Exchange	5,391	395	7.3%	6.8%	25%	1.82	1.73

Figure 18: Comps. Source: Company Data and Bloomberg

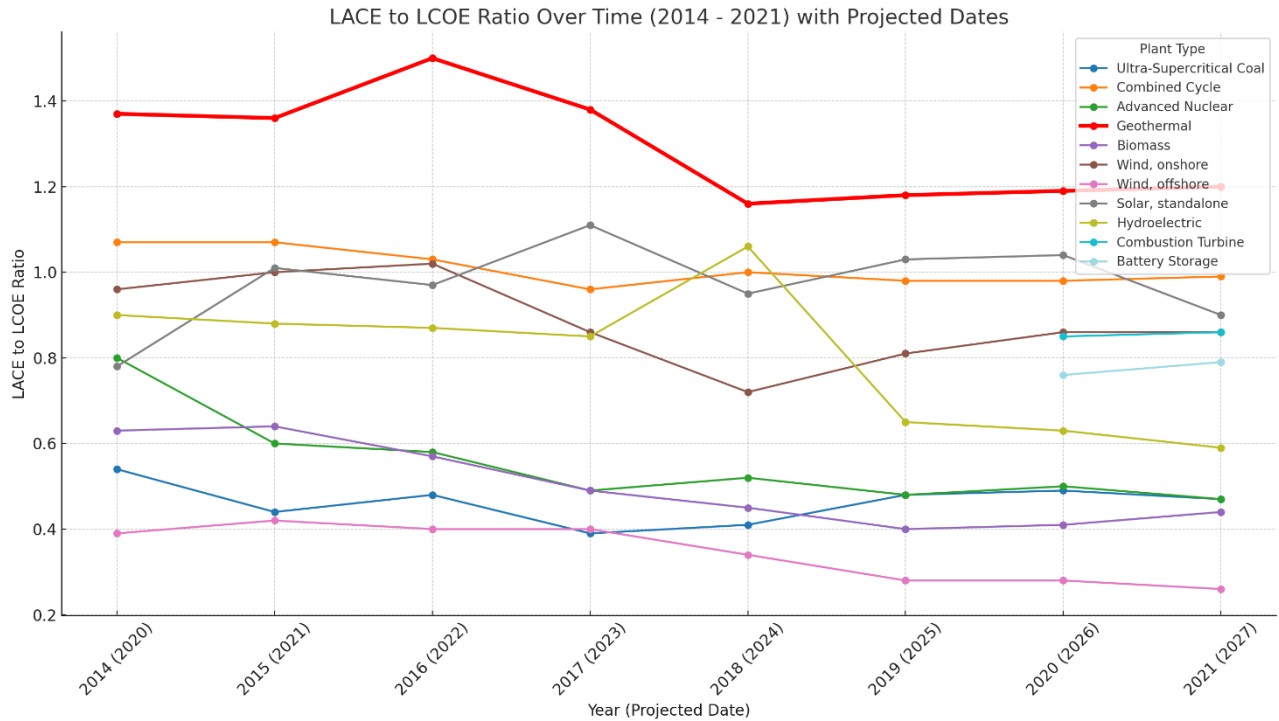


Figure 19: Research Performed at WVU for Geothermal Project. Solar is among the worst performers in terms of cost efficiency. Especially when you consider that solar energy efficiency is about 47% when compared to every other method above which all are above 90% efficiency. Data pulled from eia.gov.



DCF Analysis						
	2022A	Year 1 2023E	Year 2 2024E	Year 3 2025E	Year 4 2026E	Year 5 2027E
EBITDA	\$257	\$233	\$246	\$280	\$290	\$299
Less: Depreciation & Amortization	56	(57)	(68)	(77)	(85)	(94)
EBIT	\$313	\$176	\$178	\$204	\$205	\$205
Less Taxes	(78)	(44)	(44)	(51)	(51)	(51)
Plus: Depreciation & Amortization	(56)	57	68	77	85	94
Less: Capital Expenditures	(105)	(109)	(73)	(76)	(79)	(81)
Less: Inc. / (Dec.) in Net Working Capital	20	(100)	(24)	(68)	(30)	(31)
Unlevered FCF	\$94	(\$19)	\$105	\$86	\$131	\$135
Discount Period (mid-year convention)		0.5	1.5	2.5	3.5	4.5
Discount Factor @ 6% WACC		0.97	0.92	0.86	0.82	0.77
Present Value of FCF		(\$19)	\$96	\$74	\$107	\$104

Enterprise Value		Implied Equity Value and Share Price	
Cumulative Present Value of FCF	\$362 A	Enterprise Value	\$2,594
		Less: Total Debt	(1,011)
		Less: Preferred Stock	-
		Less: Noncontrolling Interest	-
		Plus: Cash & Cash Equivalents	60
		<b>Implied Equity Value</b>	<b>\$1,643</b>
		Fully Diluted Shares	21
		<b>Implied Share Price</b>	<b>\$77.15</b>
<b>Terminal Value</b>			
Terminal Year EBITDA	\$299		
Exit Multiple	10.0x		
Terminal Value	\$2,987		
Discount Factor	0.75		
Present Value of Terminal Value	\$2,232 B		
% of Enterprise Value	86%		
<b>Enterprise Value (A + B)</b>	<b>\$2,594 C</b>		

Figure 20: DCF Analysis. Company Data and Group Analysis

Five-Year Projected Financial Summary – Balance Sheet Summary						
	2022A	Projection Period				
	2023E	2024E	2025E	2026E	2027E	
<b>Financial Statistics</b>						
EBITDA	\$259	\$267	\$313	\$337	\$361	\$383
Interest Expense	41	81	71	66	58	58
Capital Expenditures	125	109	73	76	79	81
% of sales	7.4%	5.1%	3.2%	3.2%	3.2%	3.2%
<b>Capital Structure</b>						
Cash & Equivalents	\$33	\$53	\$56	\$59	\$61	\$62
Total Debt	838	985	905	824	824	774
Net Debt	805	932	849	765	763	712
<b>Credit Statistics</b>						
<b>Coverage</b>						
EBITDA / Int. Exp.	6.4x	3.3x	4.4x	5.1x	6.2x	6.6x
(EBITDA - Capex) / Int.	3.3x	2.0x	3.4x	4.0x	4.9x	5.2x
<b>Leverage</b>						
Secured Debt / EBITDA	NA	NA	NA	NA	NA	NA
Total Debt / EBITDA	3.2x	3.7x	2.9x	2.4x	2.3x	2.0x
Net Debt / EBITDA	3.1x	3.5x	2.7x	2.3x	2.1x	1.9x
<b>Working Capital</b>						
Net Working Capital	\$300	\$400	\$424	\$492	\$521	\$553
% of sales	17.9%	18.9%	19.0%	21.0%	21.5%	22.2%

Figure 21: Projected Balance Sheet. Source: Group Analysis

Income Statement						
Sales	\$2,119	\$2,237	\$2,337	\$2,420	\$2,489	4.7%
% growth	6.97%	5.58%	4.46%	3.57%	2.86%	
Gross Profit	\$415	\$456	\$476	\$493	\$507	(20.6%)
% margin	19.6%	20.4%	20.4%	20.4%	20.4%	
EBITDA	\$267	\$313	\$337	\$361	\$383	8.3%
% margin	13%	14%	14%	15%	15%	
% growth	3.9%	17.3%	7.8%	6.9%	6.1%	
D&A	57	68	77	85	94	10.8%
Interest Expense	81	71	66	58	58	5.2%
Net Income	102	108	115	122	123	(1.9%)
Diluted Shares	21	21	21	21	21	
EPS	\$4.77	\$5.05	\$5.38	\$5.75	\$5.76	(2.0%)
% growth	(25.1%)	6.0%	6.5%	6.8%	0.2%	
Cash Flow Statement						
Cash from Ops	178	195	212	228	237	6.4%
Less: Capex	(109)	(73)	(76)	(79)	(81)	
% of sales	5.1%	3.2%	3.2%	3.2%	3.2%	
Free Cash Flow	\$70	\$123	\$136	\$150	\$157	17.9%
FCF / S	\$3.28	\$5.77	\$6.37	\$7.03	\$7.36	17.8%
% growth	1.0%	75.8%	10.5%	10.4%	4.6%	
Owner Earnings	\$50	\$103	\$115	\$129	\$135	9.5%
OE / S	\$2.35	\$4.85	\$5.42	\$6.05	\$6.35	
% growth	(42.1%)	106.8%	11.7%	11.7%	5.0%	
Balance Sheet						
Cash & Equivalents	\$53	\$56	\$59	\$61	\$62	13.4%
Total Equity	\$784	\$894	\$965	\$1,011	\$1,113	59.2%
Total Debt	\$985	\$905	\$824	\$784	\$722	(2.9%)
Invested Capital	\$1,716	\$1,743	\$1,730	\$1,734	\$1,773	14.2%
Sales / Invested Capital	\$1.23	\$1.28	\$1.35	\$1.40	\$1.40	

Figure 22: Projected Income and Cash Flow Statement. Source: Group Analysis

## Price Target

(in millions except per share data, fiscal year ending December 31)

	Base Case	Bull Case	Bear Case
Current Share Price	\$114.02		

## EV / EBITDA

EBITDA (2025E)	\$280	\$310	\$271
Target Multiple	8.0x	8.5x	7.0x
<b>Enterprise Value</b>	<b>\$2,243</b>	<b>\$2,635</b>	<b>\$1,897</b>
Less: Total Debt	(1,011)	(950)	(1,150)
Less: Noncontrolling Interest	-		
Plus: Cash	60	60	60
<b>Equity Value</b>	<b>\$1,292</b>	<b>\$1,745</b>	<b>\$807</b>
Diluted Shares	21	21	21

<b>Price Target</b>	<b>\$60.66</b>	<b>\$81.92</b>	<b>\$37.89</b>
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Upside / (Downside) vs. Current Pr	(47%)	(28%)	(67%)
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## P / E

EPS (2025E)	\$5.57	\$5.80	\$5.34
Target Multiple	8.0x	12.0x	10.0x

<b>Price Target</b>	<b>\$44.56</b>	<b>\$69.60</b>	<b>\$53.40</b>
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Upside / (Downside) vs. Current Pr	(61%)	(39%)	(53%)
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Figure 23: RV Price Target: Source: Group Analysis