MOI GLOBAL

William Thomson

Managing Partner, Massif Capital

WIDEMOAT Investing Summit

GrafTech

Wide-Moat Investing Summit 2018

Hosted by MOI Global

Presented By

Will Thomson - Massif Capital, LLC

GrafTech (EAF)

An industrial consumables company with a unique business model.

Long-Term Contracts

Vertically Integrated

Lowest Cost Producer

Significant Capital Return Potential

Significant alignment of interest between majority owner and minority shareholders

Steel Production

There are two methods of producing steel: Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF).

- The BOF method consumes Met Coal, Iron and Limestone to produce steel.
- The EAF route passes an electric current through graphite electrodes to melt scrap steel into recastable molten steel.
- EAF's are smaller than BOF's and are characterized by higher productivity and lower overhead costs relative to BOF's.
- Roughly 70% of global steel is produced via BOF and 30% via EAF.
- EAF's have historically been the fastest growing segment of the global steel industry.
- The primary inputs/costs to steel production via EAF are scrap steel, electricity and graphite electrodes (GE). GE represent anywhere from 1% to 5% of steel production cost and have no known substitute.
- Developed nations produce more steel via EAF, developing and emerging markets (including China) produce more steel via BOF.

UHP GE vs. HP GE

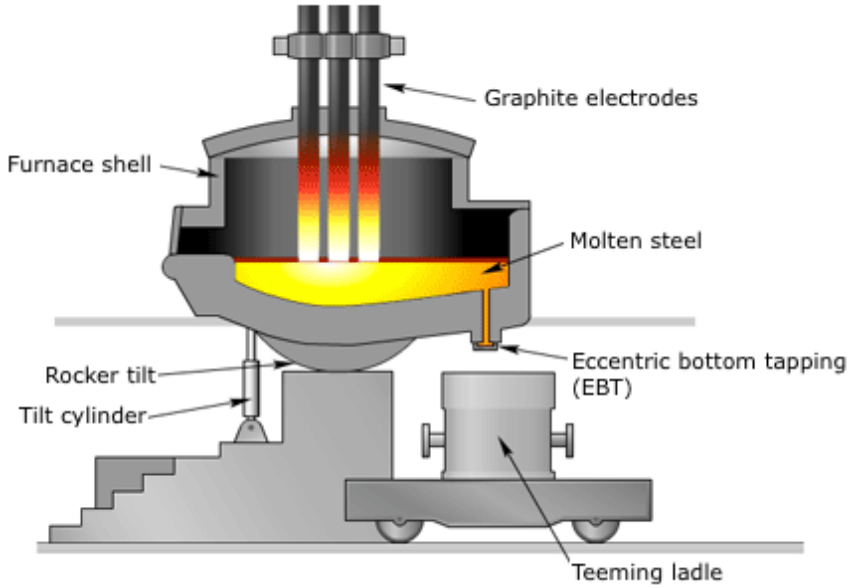
Ladle Electrodes vs. Electric Arc Furnace Electrodes…Chinese Production vs. Rest of World

- There are two general types of GE used in steel making:
  - Ultra High Power (UHP) – Made from Petroleum Needle Coke and used in EAF Steel production.
  - High Power (HP) – Made from Pitch Needle Coke and used to keep liquid virgin steel from BOF in a liquid state.
- The production processes are similar but have significantly different production timelines, the electrodes are different sizes and have dramatically different physical properties. The most significant of which is resistivity (a measure of how strongly the material opposes the flow of electricity) and durability.
- The largest producer of Ladle GE is China, it is commonly believed that China has no meaningful UHP electrode production capacity.

Graphite Electrodes

Scarce specialty industrial consumable critical to the production of steel using an EAF.

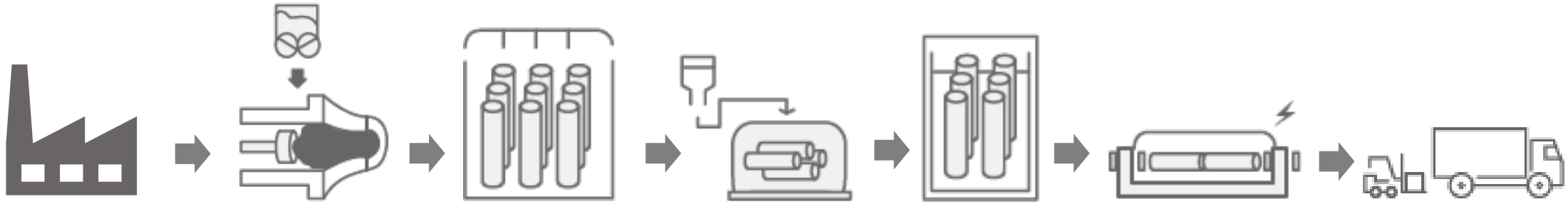
- The typical EAF utilizes nine Ultra High Power (UHP) GE in three columns.
- An electric current, as high as 150,000 amps, is passed through the GE's creating an electric arc between the electrodes and the scrap steel. The electric arc heats the scrap steel up to temperatures as high as 5,000°F.
- Depending on planned production cycles and productivity three UHP GE are consumed in the steel making process every 8 to 10 hours. Stated another way, UHP GE are consumed at a rate of 1.7 kilograms per MT of steel produced.



GE Manufacturing

A complex and time consuming process.

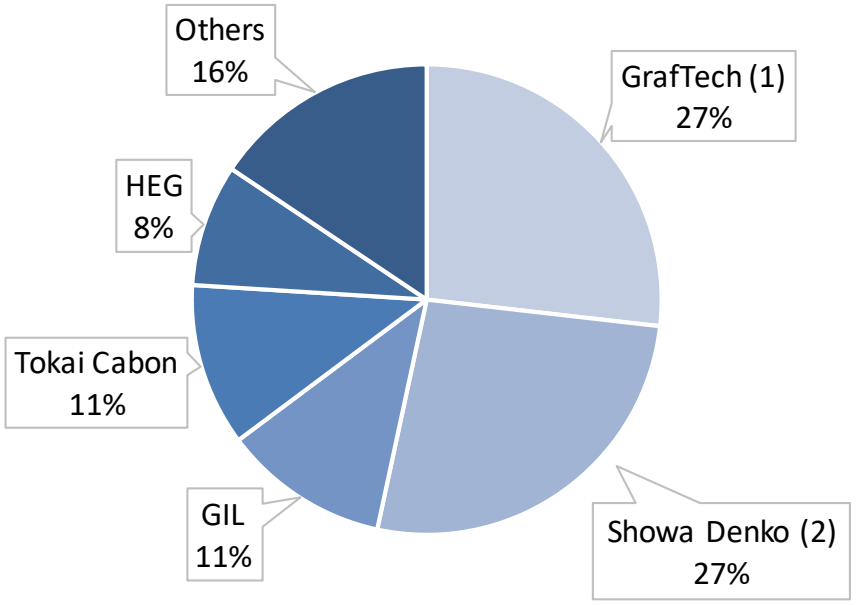
- GrafTech manufactures UHP GE ranging in size up to 30 inches in diameter and 11 feet long.
- The manufacturing process, from Needle Coke production to delivery, typically takes six months.



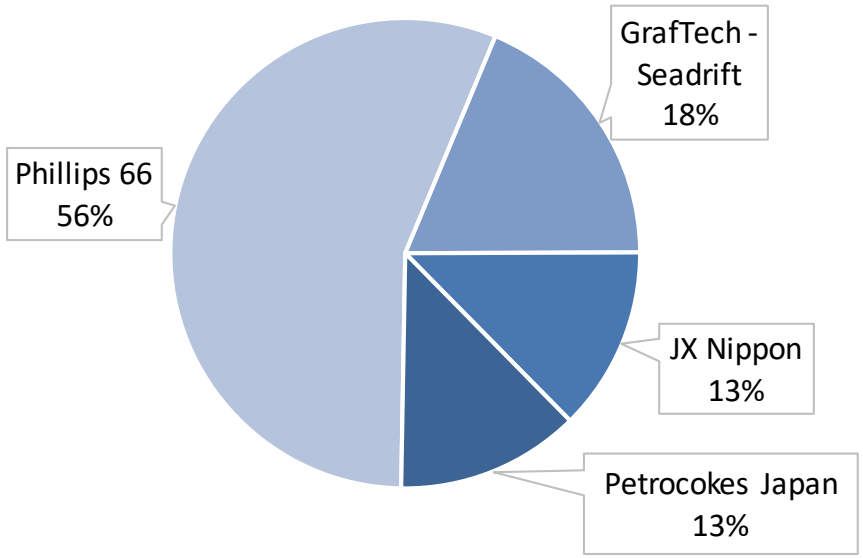
Market Share

GrafTech controls 27% of the GE market (ex. China) and is the only producer with a captive petroleum needle coke producer, an industry comprised on only four producers.

2017 Graphite Electrode Market Share based on Production Capacity (excluding China)



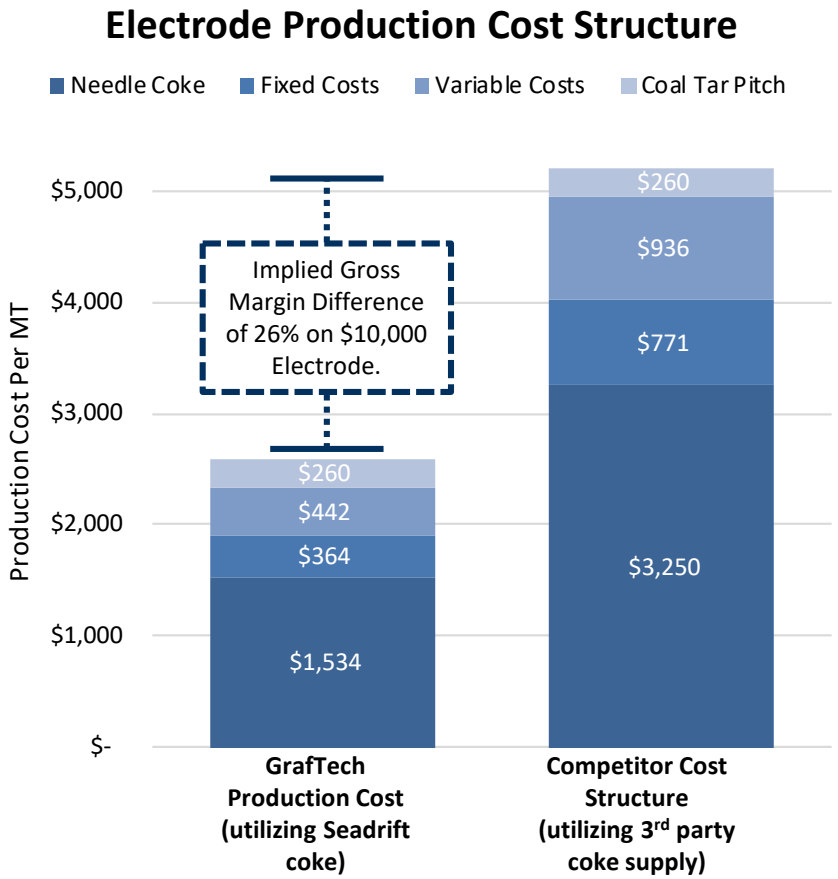
2017 Petroleum Needle Coke Market Share based on Production Capacity (excluding China)



(1) GrafTech production capacity assuming St. Mary's restart. In the absence of a restart GrafTech has 24% market share.
(2) Excludes production capacity figures related to Chinese operations.

Vertical Integration

GrafTech is the only Graphite Electrode Maker that is vertical integrated with a captured Petroleum Needle Coke Producer.



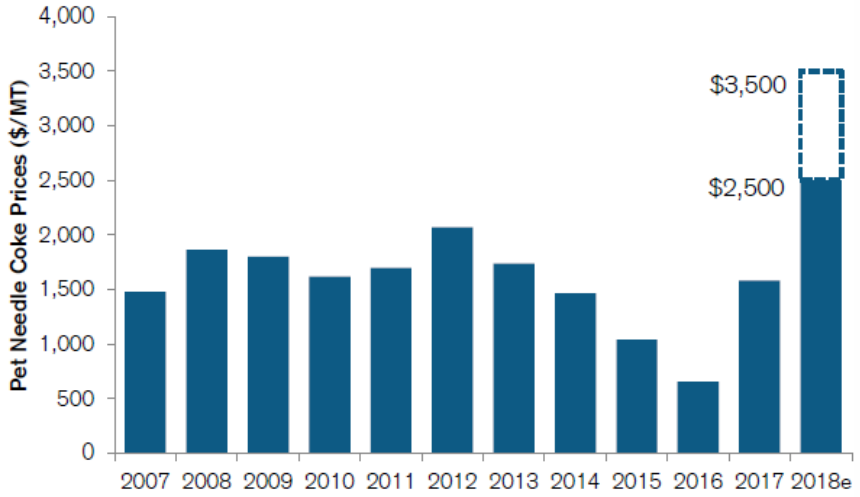
- Via the firms wholly owned Seadrift petroleum needle coke facility, GrafTech can source needle coke for between 60% and 70% of their electrode production.
- A captured petroleum needle coke supply enabled GrafTech to get steel producers comfortable with the idea of signing long term contracts for electrodes. Historically, petroleum needle coke has been sold on 1-year contracts, with 6-month contracts introduced last year due to shortages, with 3-month contracts introduced this year.
- Vertical integration allows GrafTech to reduce all in Graphite Electrode production costs to, or below, the current spot price for petroleum needle coke resulting in EBIT margins of around 60%.

Needle Coke

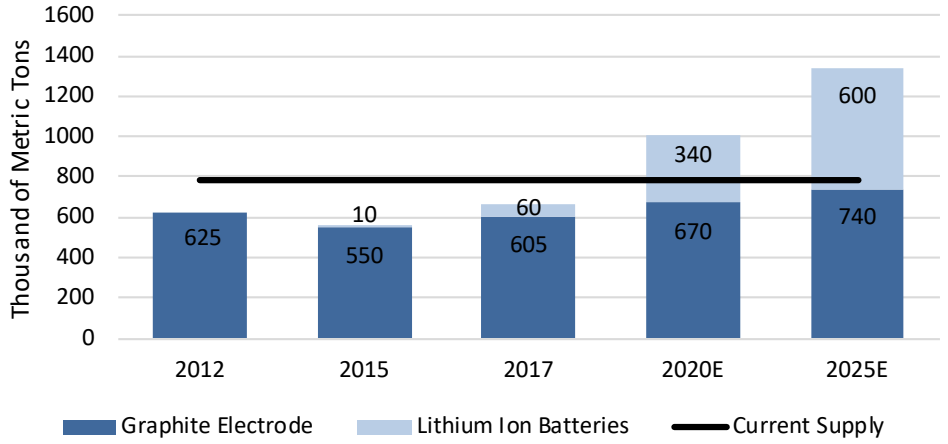
The industries current bottleneck

- Two types of needle coke: petroleum based needle coke and coal-based pitch needle coke.
- UHP GE are made from petroleum needle coke, Ladle GE are made from pitch needle coke.
- GEs made from pitch require meaningfully longer bake times (due to higher impurity levels in pitch vs. petroleum coke) and longer graphitizing time vs. GE made from Petroleum Needle Coke. Pitch based GEs also have lower efficiency due to higher resistivity.

Petroleum Needle Coke Price



Petroleum Needle Coke Demand and Current Supply*

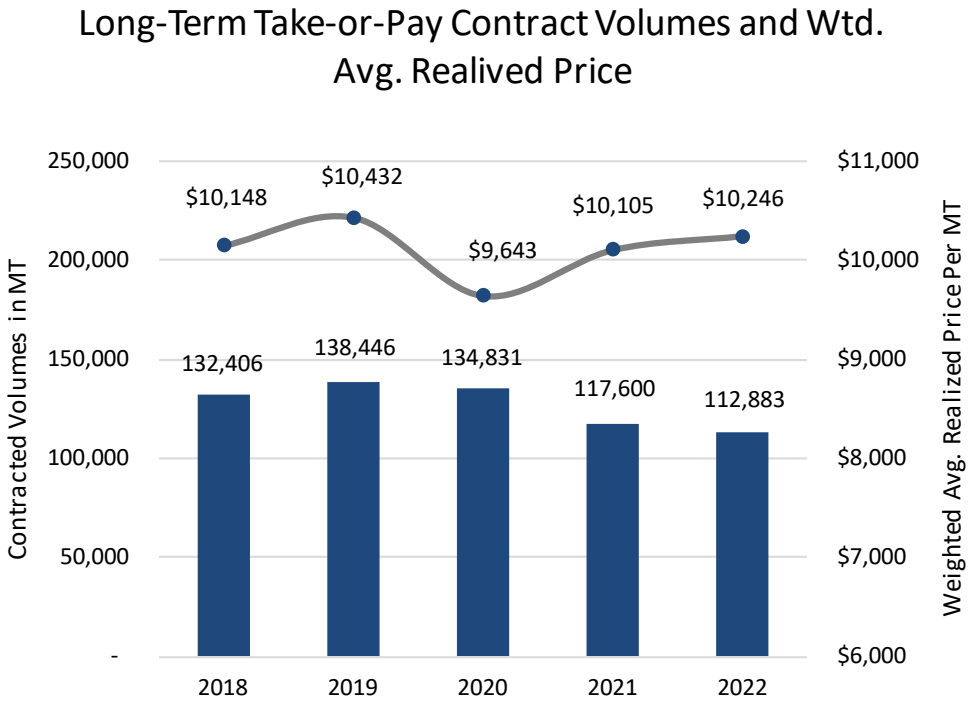


* There is a reasonably significant spread of estimates for the global volume of Petroleum Needle Coke production, we have assumed the highest estimate is accurate: 780,000 MT a year.

Long-Term Contracts

GrafTech Management has leveraged the firms vertical integration by offering customers certainty of supply via three and five year take or pay contracts.

- Between 2016 and the 2H-2017 the price of UHP GE went from approximately $2,500 a ton in the spot market to between $15,000 and $30,000 a ton.
- GrafTech took advantage of their status as the only supplier with a dedicated supply of needle coke to sign 100 take or pay contracts (85% 5-year and 15% 3-Year) creating significant earnings and cashflow visibility for the next five years.
- Gross Margins on LT-Contracts for the next five years are between **70% and 75%** with a **FCF Yield of ≈52%.**
- The next five years of take-or-pay contracts will generate **≈ $2.2 billion in net of debt free cash flow**.
- Management intends to return much of the FCF generated over the next 5 years to shareholders.



Rationalization

Industry Rationalization

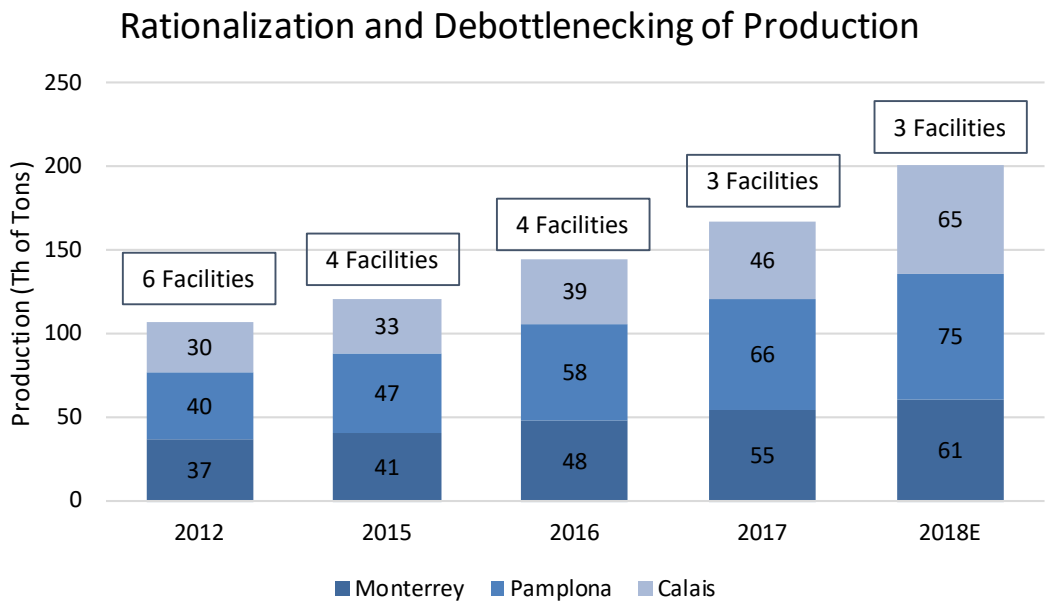
- Since 2013 roughly 25% of global GE production capacity has been closed.
- Utilization rates have risen from 62% to 89%.

	2013	2014	2015	2016	2017	2018E	2019E	2020E
Supply/Capacity (Thousands of MT)								
Ex-China	1,040	900	872	830	830	830	830	830
China	1,000	1,000	1,000	800	700	720	750	750
Total Capacity	**2,040**	**1,900**	**1,872**	**1,630**	**1,530**	**1,550**	**1,580**	**1,580**
Est. UHP Capacity	*979*	*874*	*842*	*799*	*826*	*837*	*853*	*869*
% UHP Capacity	*48%*	*46%*	*45%*	*49%*	*54%*	*54%*	*54%*	*55%*
Demand (Thousands of MT)								
EAF Electrode Demand	756	782	733	752	837	892	947	1,002
BOF Electrode Demand	473	472	466	463	462	456	442	427
Non-Steel Demand	32	33	33	34	35	36	37	38
Total Demand	**1,261**	**1,287**	**1,232**	**1,249**	**1,334**	**1,384**	**1,426**	**1,467**
Implied Total Utilization	*62%*	*68%*	*66%*	*77%*	*87%*	*89%*	*90%*	*93%*
Implied UHP Utilization	*77%*	*89%*	*87%*	*94%*	*101%*	*107%*	*111%*	*115%*

Source: Company Reports, Citi Research, Credit Suisse Research, Massif Capital Estimates

GrafTech Rationalization

- GrafTech divested non-core Engineered Solutions business in 2016.
- Closed 2 facilities and warm idled one.



Future Demand

Chinese EAF Demand

- Historically, Chinese steel production has been almost exclusively BOF production (about 94%).
- In 2017 the Chinese Steel industry ordered or ordered or installed 105 new EAFs which are expected to add a combined capacity of 66 million metric tons of production between now and 2019/2020.
- The drive to replace BOF steel production with EAF production is being driven by a combination of central government policies and sufficient, dependable electricity and domestic scarp steel supply.
- Should all 66 million metric tons of new EAF capacity come online it will increase global demand for UHP electrodes by ≈ 112,200 MT a year. One ton of needle coke is required to make one ton of graphite electrode, implying a 112,000 MT of new Petroleum Needle Coke demand over the next 5 years out of China.

Lithium Ion Battery Demand

- Lithium Ion Battery anodes, specifically for Electric Vehicles, are typically a mixture of natural graphite and synthetic graphite from petroleum needle coke.
- The consistency of synthetic graphite from petroleum needle coke makes it a highly appealing to Lithium Ion Battery producers.
- Lithium-Ion maker demand for Petroleum Needle Coke has grown from nothing in 2012 to roughly 60,000 tons in 2017, roughly 9% of global supply.
- The range of estimates of electric vehicle uptake are highly speculative at this time, too speculative to be relied upon. At this time we are comfortable suggesting only that the potential impact is significant if still unproven.

China

Why won't China swamp the Graphite Electrode market in the same way they have done other industrial markets?

- The majority of GE production in China is "Ladle" electrodes, not UHP electrodes. These electrodes are produced with either anode grade calcinated petroleum coke (a cheaper and more plentiful petroleum derived coke) or pitch needle coke derived from coal. Neither produces the quality of electrode suitable for the harsh operating environment of an EAF.
- Between 2015 and 2017, at government direction, the Chinese GE industry cut production by 40%, a significant enough reduction that both Platts and Jefferies believe that China may have become a net importer of ladle electrodes in 2017.
- To swamp the market China must do two things, build a petroleum refinery capable of producing high quality needle coke and either shut down and retool an existing GE factory or build a new one. The Chinese ability to execute on either strategy is suspect.
- Based on conversations with industry participants and GrafTech, the general consensus is that China does not yet posses the technological knowhow to produce UHP Electrodes from Petroleum Needle Coke. The belief is that a critical knowledge/capability gap exists at both the electrode production level and the Petroleum Needle Coke level.

Valuation: Contracts

Take-or-Pay contracts produce significant cash flow and earnings visibility for 68% of production over the next five years

	2018E	2019E	2020E	2021E	2022E	Perpetuity
Sales Volume	165,381	138,226	134,761	137,320	137,603	138,298
Average Realized Price	*9,530*	*10,432*	*9,643*	*10,105*	*10,246*	*8,500*
Revenues	**1,576**	**1,442**	**1,300**	**1,388**	**1,410**	**1,176**
Seadrift Coke	97	103	98	101	103	104
Fixed Costs	132	105	95	95	94	95
Other Variable Costs	199	174	173	178	183	183
COGS	**428**	**382**	**366**	**374**	**380**	**382**
SG&A	60	60	60	60	60	30
EBIT	**1,088**	**1,000**	**874**	**954**	**970**	**764**
EBIT Margin	*69%*	*69%*	*67%*	*69%*	*69%*	*65%*
- Taxes (21%)	(228)	(210)	(183)	(200)	(204)	(160)
Tax Effected EBIT	**860**	**790**	**690**	**753**	**766**	**603**
+ DD&A	58	42	36	34	32	32
- Capital Expenditures	(75)	(40)	(40)	(40)	(40)	(40)
(+/-) Changes in WC	(122)	(21)	(8)	(5)	(5)	(6)
Free Cash Flow	**721**	**771**	**678**	**742**	**753**	**589**

Assumptions and NPV of Existing Take or Pay Contracts	
Discount Rate for Existing Take-or-Pay	5.0%
Discount on Terminal	10.0%
NPV of FCF	**3,172**

Gordon Growth (GG) Method	
Terminal Growth Rate	1.0%
Terminal Value	6,612
PV of Terminal Value	3,732
Enterprise Value	**6,905**

Multiples Method (MM)	
Exit EBIT Multiple	10.0x
Terminal Value	7,635
PV of Terminal Value	4,310
Enterprise Value	**7,482**

EV to Equity Value	
- 2018E Net Debt	1,469
GG Equity Value	5,436
MM Equity Value	6,013
Share Count	**302**
GG Implied Share Price	$18.00
MM Implied Share Price	$19.91
Blended Price	**$18.96**

Valuation: Spot

	2018E	2019E	2020E	2021E	2022E	Perpetuity
Sales Volume	1,619	63,774	76,572	83,347	92,397	92,397
Average Realized Price	*15,750*	*10,000*	*9,000*	*8,500*	*8,000*	*7,500*
Other Revenue	48	48	48	48	48	48
Revenues	**25**	**638**	**689**	**708**	**739**	**693**
3rd Party Needle Coke	5	212	261	292	331	331
Fixed Costs	1	49	59	64	71	71
Other Variable Costs	2	76	92	100	111	111
COGS	**8**	**338**	**412**	**456**	**513**	**513**
SG&A	0	0	0	0	0	0
EBIT	**17**	**300**	**277**	**253**	**226**	**180**
- Taxes (21%)	(4)	(63)	(58)	(53)	(47)	(38)
Tax Effected EBIT	**13**	**237**	**219**	**200**	**178**	**142**
+ DD&A	0	0	0	0	0	0
- Capital Expenditures	0	0	0	0	0	0
(+/-) Changes in WC	0	0	0	0	0	0
Free Cash Flow	**13**	**237**	**219**	**200**	**178**	**142**

Assumptions and NPV of Existing Take or Pay Contracts	
Discount Rate for Spot	10.0%
Discount Rate for Spot Terminal	10.0%
NPV of FCF	**620**

Gordon Growth (GG) Method	
Terminal Growth Rate	1.0%
Terminal Value	1,593
PV of Terminal Value	899
Enterprise Value	**1,519**

Multiples Method (MM)	
Exit EBIT Multiple	10.0x
Terminal Value	1,797
PV of Terminal Value	1,014
Enterprise Value	**1,634**

EV to Equity Value	
GG Equity Value	1,519
MM Equity Value	1,634
Share Count	**302**
GG Implied Share Price	$5.03
MM Implied Share Price	$5.41
Blended Price	**$5.22**

Base Case DCF Value Range (90% and 110% around DCF Composite Value): **$21.8 to $26.6**
Margin of Safety of: **12% to 28%**

Risks and Catalysts

Potential risks

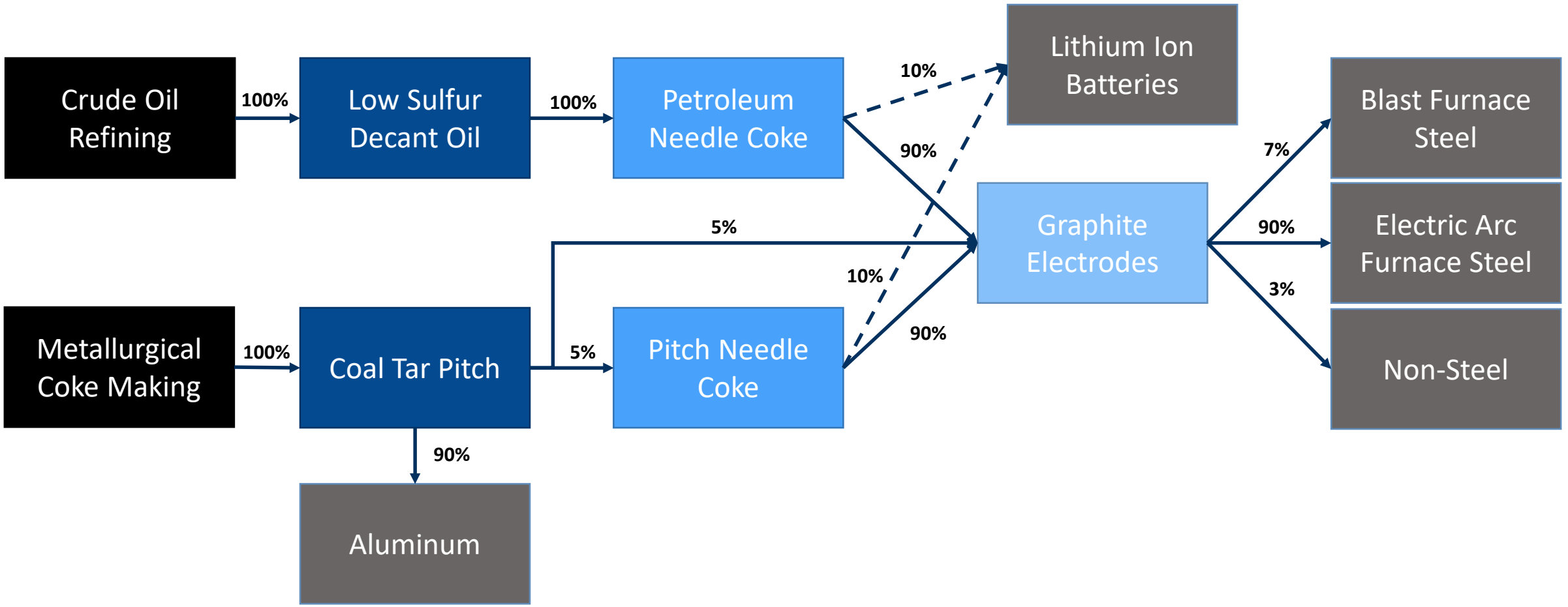
- Significant decrease in spot graphite electrode prices
- Decline in EAF steel production
- Constrained petroleum needle coke supply
- Delays/cost overruns for capacity expansions
- Competitor capacity addition announcements
- Remaining sell-down of Brookfield stake into open market (Brookfield still owns ~85%, 180 lock up period still in place).
- China overcomes technical challenges to become a producer of both high quality petroleum needle coke and UHP GE

Potential catalysts

- Higher electrode or petroleum needle coke prices
- Increase in EAF steel production (stronger industrial production/GDP)
- Successful debottlenecking and restart of warm idled St. Mary's facility.

Appendix

Appendix A: GE Supply Chain



Appendix B: Valuation Alternatives

EV to EBIT

	Bear	Base	Bull
Normalized Revenue Estimate	**1,601.58**	**1,601.58**	**1,601.58**
Operating Margin	65.00%	65.00%	65.00%
EBIT Estimate	**1,041.03**	**1,041.03**	**1,041.03**
EV/EBIT Multiple	6.0x	8.0x	10.0x
Estimated EV of Business	**6,246.16**	**8,328.22**	**10,410.27**
Plus Cash & ST Investments	138.30	138.30	138.30
Total Value of Business+Cash	**6,384.46**	**8,466.52**	**10,548.57**
Less Total Debt	1,468.86	1,468.86	1,468.86
Estimate Fair Value of Business	**4,915.60**	**6,997.65**	**9,079.71**
Shares Outstanding	302.23	302.23	302.23
Estimated Value Per Share	**$16.26**	**$23.15**	**$30.04**
Margin of Safety	-18%	17%	36%
Blended Rate		**$23.15**	

Reverse DCF

Year	FCF Growth Rate	FCF	PV of FCF
2018	-0.79%	728.23	662.03
2019	-0.79%	722.50	597.11
2020	-0.79%	716.82	538.56
2021	-0.79%	711.18	485.75
2022	-0.79%	705.59	438.12
2023	-0.79%	700.04	395.16
2024	-0.79%	694.54	356.41
2025	-0.79%	689.08	321.46
2026	-0.79%	683.66	289.94
2027	-0.79%	678.29	261.51
PV of Future Cash Flows			4,346.03
PV of Terminal Cash Flows			2,752.72
Enterprise Value			**7,098.75**
Less Debt			1,468.86
Plus Cash			138.30
Shares Outstanding			302.00
Per Share Price			**$19.10**

Massif Capital

Any questions or interest in learning more about Massif Capital please contact:

Will Thomson
E-Mail: will.Thomson@massifcap.com
Phone: 860-729-1870

Our Website is: www.massifcap.com