Morgan Stanley

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Steel, Iron Ore and Coal Industry Primer

The Steel, Iron Ore, and Coal Industries



MORGAN STANLEY RESEARCH
North America

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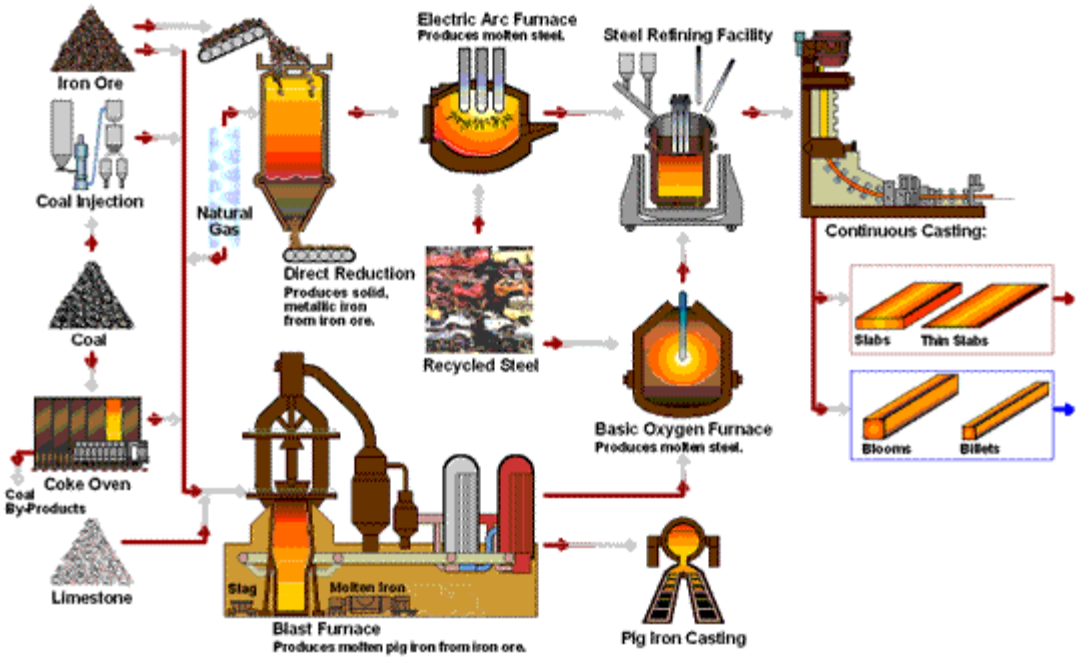
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Steel Overview

Steel Overview: Steel Making Process



Today's steelmaking processes are dominated by two methods –

Method 1 – Blast Furnace (Integrated Production)

- Iron ore and coke are fed into a blast furnace. The raw materials are then transformed into molten iron which is sent into the basic oxygen furnace for conversion to steel. Scrap is added to the BOF vessel and the resulting crude steel is further refined or taken to the continuous castor.

Method 2 – Electric Arc Furnace Production

- EAF production typically utilizes scrap to produce crude steel. Scrap is sent to the EAF where it's melted into a bath and impurities are removed before refinement. Scrap substitutes such as DRI, HBI, and BF pig iron are sometimes added to boost furnace efficiency and for products with lower impurity tolerances. An EAF facility is sometimes referred to as a "mini-mill."

Source: AISI, Morgan Stanley Research

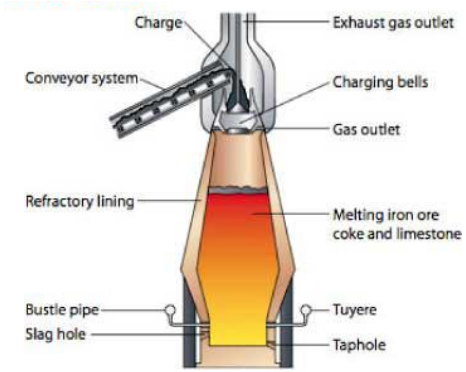
Steel Overview: Method 1 – Blast Furnace (Integrated Production)

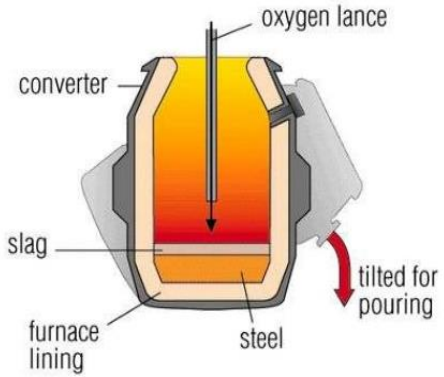
Blast Furnace



Basic Oxygen Furnace







- Process is ideal for the creation of high-quality virgin steels with few impurities. Ideal end-markets include exposed auto sheet and appliances
- Iron ore, coking coal, and limestone are loaded into the blast furnace
- Hot air is blasted up from the bottom of the load, which results in molten “pig” iron falling to the bottom
- The pig iron is transferred to the basic oxygen furnace where oxygen is injected to drive out carbon and impurities
- Recycled steel is added to the BOF and mixed with the pig iron to produce crude steel
- The molten steel is cast into large slabs or billets to be finished later in a rolling mill

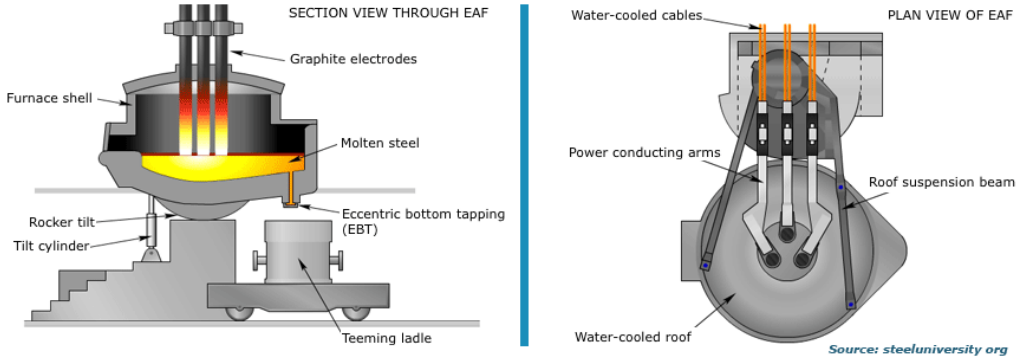
Source: SteelConstruction, EngineeringCapacity, Alibaba, McCloskey, Tex Report, Morgan Stanley Research

Steel Overview: Method 2 – Electric Arc Furnace (Scrap Fed)

Electric Arc Furnace



Section and Plan View of Electric Arc Furnace

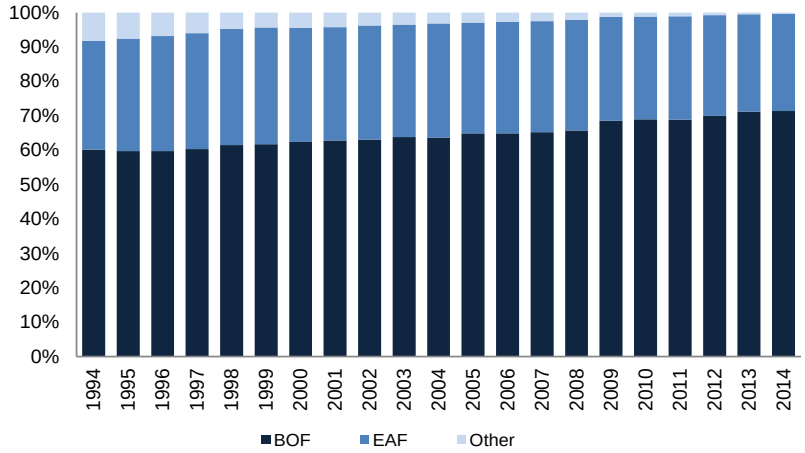


- Electric Arc Furnace (EAF) production has historically been a lower-cost method of production for lower-quality steel and is dominant in regions with an abundance of scrap
- EAFs produce an “arc” of electricity across two graphite electrodes, which is hot enough to melt all the scrap steel and iron charge
- The molten steel is then cast into slabs, billets or blooms for later finishing
- Due to somewhat higher levels of impurities, 100% scrap fed EAFs tend to produce steels that do not require perfect surface quality, such as beams, bars, flats, and angles used in construction
- Some high-quality flat products can be produced by diluting impurities with pre-consumer prime scrap, DRI, iron nuggets or pig iron

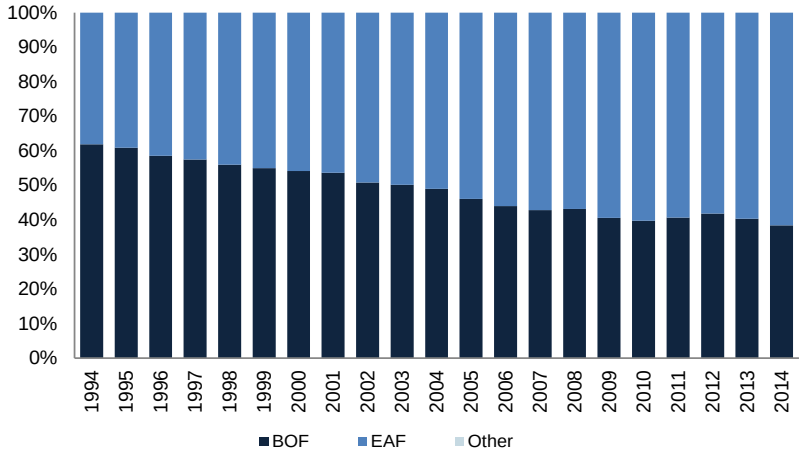
Source: Siemens, Forensic, McCloskey, Tex Report, Morgan Stanley Research

Production by Furnace Type

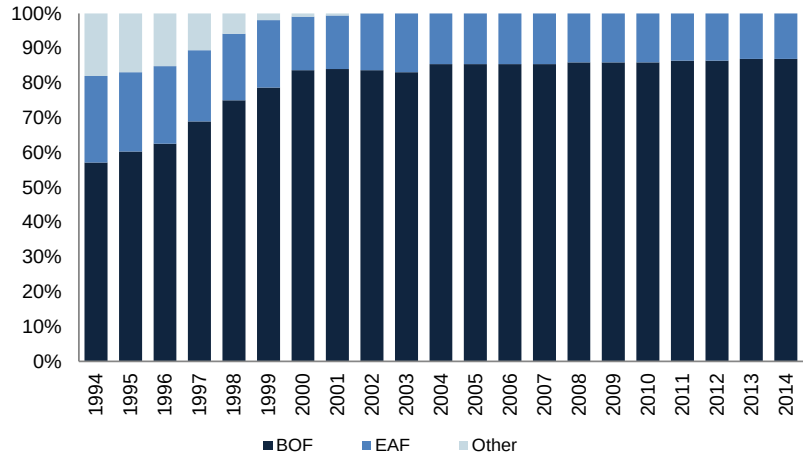
Global – BOF accounts for more than half of production



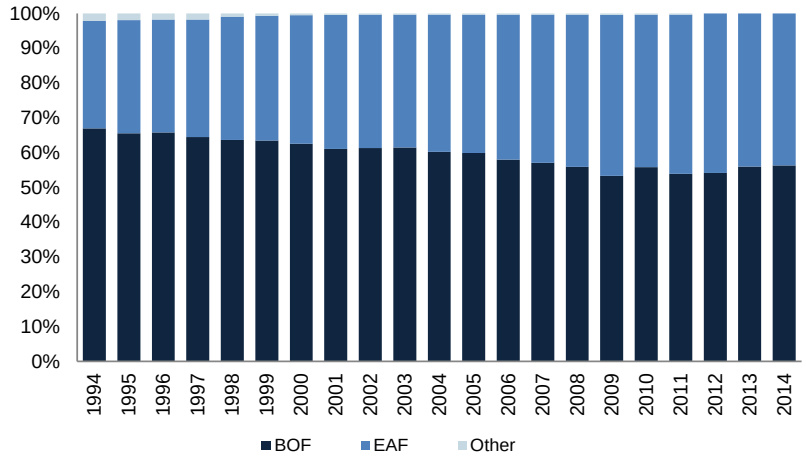
US Prod. - EAFs have taken capacity from BOF



China – BOF prod. increasing with output



Europe - EAFs have been taking Capacity from BOF



Source: CRU Group

Steel Overview: Raw Material Usage (Blast Furnace Vs. EAF)

On paper, blast furnaces should have lower costs at today's raw material costs. However, these models do not factor in fixed-cost disadvantages at blast furnaces and company-specific legacy liability issues that that tend to be more of an issue at older blast furnace operations.

Typical Blast Furnace Cost Structure

Cost Component	Factor	Unit	Unit cost	Fixed	Variable	Total
Iron ore	1.23	t	50		62	**62**
Iron ore transport	1.23	t	15		18	**18**
Coking coal	0.60	t	93		56	**56**
Coking coal transport	0.60	t	15		9	**9**
Steel scrap	0.20	t	250		50	**50**
Scrap delivery	0.20	t	15		3	**3**
Oxygen	83	m 3	0.09		7	**7**
Ferroalloys	0.01	t	1,650		23	**23**
Fluxes	0.59	t	45		27	**27**
Refractories	0.01	t	650		7	**7**
Other costs				5	13	**18**
By-product credits					(20)	**(20)**
Electricity	0.13	MWh	65	1	7	**8**
Labour	2.00	Man hr	40	72	8	**80**
HRC Conversion				20	30	**50**
Total		**($/m. ton)**		**98**	**300**	**398**
		($/short ton)		**96**	**293**	**361**

Typical Electric Arc Furnace Cost Structure

Cost Component	Factor	Unit	Unit cost	Fixed	Variable	Total
Steel scrap	1.09	l.t	250		271	**271**
Scrap delivery	1.09	l.t	15		16	**16**
Oxygen	16.00	m 3	0.09		2	**2**
Ferroalloys	0.01	t	1,650		18	**18**
Fluxes	0.03	t	110		3	**3**
Electrodes	0.002	t	6,500		13	**13**
Refractories	0.01	t	670		5	**5**
Other Costs	1.00	unit	13		13	**13**
Thermal Energy	0.58	GJ	14		8	**8**
Electricity	0.36	MWhr	94.0		34	**34**
Labour	0.35	Man hr	40	10	4	**14**
HRC Conversion				15	35	**50**
Total		**($/m. ton)**		**25**	**422**	**447**
		($/short ton)		**24**	**412**	**405**

Source: Steelonthenet, Morgan Stanley Research

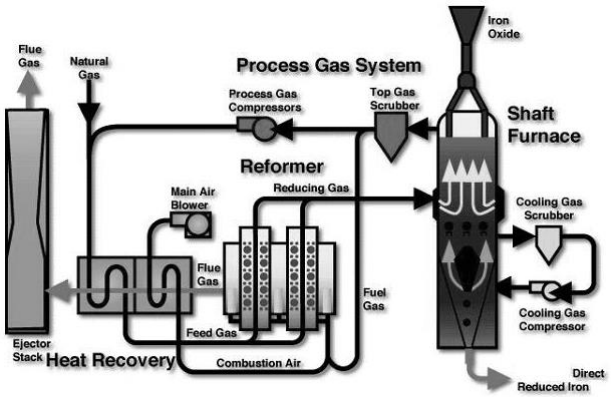
Steel Overview: Scrap Substitutes

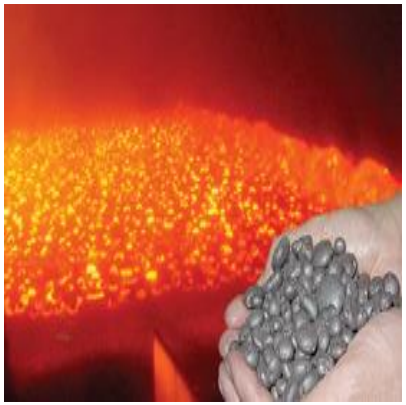
DRI Facility



ITmk3 Facility



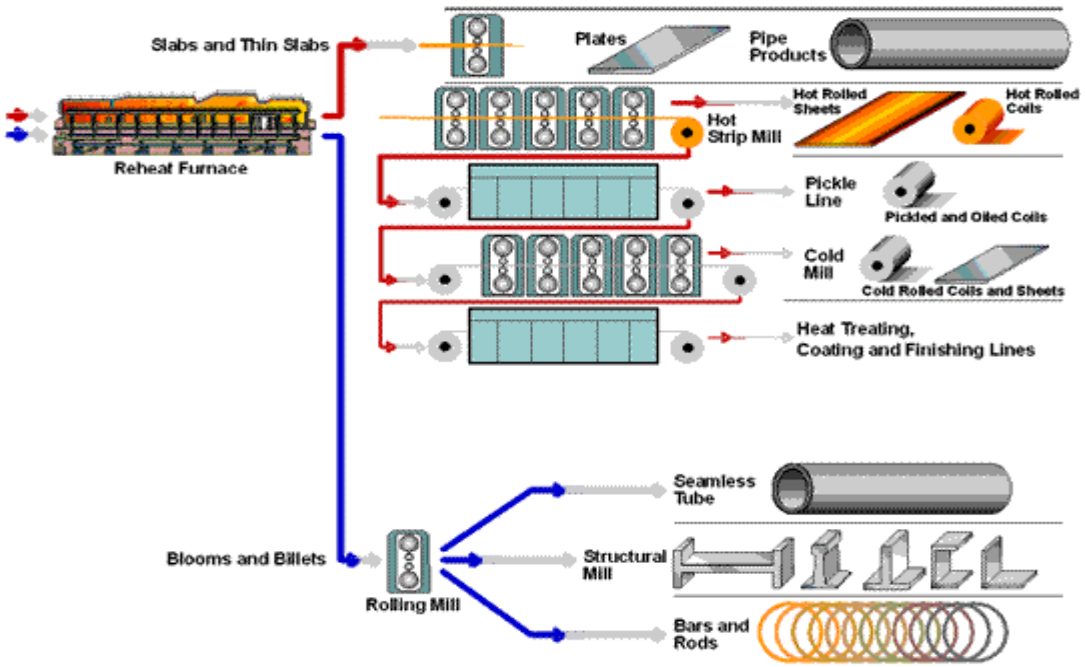




- Direct reduced iron (sponge iron) is a scrap substitute used in electric arc furnaces to eliminate multiple scrap charges and reduce tap-to-tap times
- DRI results from a process in which natural gas drives out the impurities in iron ore, resulting in 97% pure iron content
- This method can help lower residuals in the EAF and maximize energy efficiency in the furnace
- Hot briquetted iron is a less combustible and more compacted form of DRI which can be used in a BF, BOF or EAF
- HBI's low impurity content and high bulk density allow for less power consumption and more efficient operations
- Iron nuggets can also serve as a substitute for pig iron in an EAF or BF furnace and emit 20% less CO_2
- High-grade iron nuggets are made from cheaper low-grade iron ore and coal, which cut down the cost of raw materials and improve the productivity of EAFs

Source: Essar Steel, Kobe Steel, Steel Dynamics, IPIA, MIDREX, Morgan Stanley Research

Steel Overview: Steel Finishing Process



- After being formed in the caster, slabs are sent to the hot strip mill where they are transformed into coiled sheet and plate products
- Hot-rolled coils can undergo a pickling process during which a series of hydrochloric baths remove rust
- Some hot-rolled coils will be hammered or stretched on the cold-rolling mill to strengthen the steel
- Both hot-rolled and cold-rolled coils can also be galvanized to increase their corrosion resistance
- Other processes such as quenching, tempering, and annealing can change hardness and uniformity of the steel
- Blooms and billets are sent to the rolling mill where they are rolled into long products

Source: Steel.org, AISI, Morgan Stanley Research

Steel Overview: Products – Flat Rolled Products

Hot-Rolled Coils



Cold-Rolled Coils



Hot-Dipped Galvanized



Electro-Galvanized



- **Hot-Rolled Coils**: Coils from a hot strip mill, the most common form of steel product – HRC prices are used as a benchmark
- **Cold-Rolled Coils**: CRC is manufactured from HRC that has been chemically cleaned and re-rolled; cold process reduces the thickness of the steel and changes its properties, and must be processed further to prevent rusting
- **Hot-Dipped Galvanized**: CRC or HRC which has been dipped in molten zinc to resist corrosion
- **Electro-Galvanized**: Steel which has been dipped in a solution with an applied electric current, resulting in an even, thin zinc coating
- **End Use**: Flat-rolled products tend to be used more in manufacturing and auto applications, although some (about 20%) are used in construction.

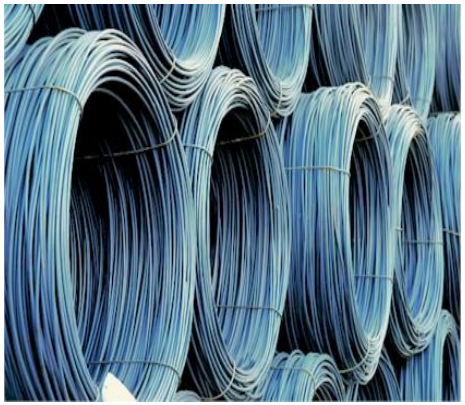
Source: Alibaba, NZ Steel, Pearl Steel, Sentai Metal Products, Morgan Stanley Research

Steel Overview: Products – Long Products

Beams



Wire Rod



Bars

Merchant



Rebar



Special Bar Quality



- **Structural Beams**: Widely used in construction
- **Wire Rod**: Rolled from billets and coiled for further processing, commonly used to make nuts and bolts
- **Bars**: Steel products rolled from billets
  - **Merchant**: Rounds, flats, angles, and squares used to manufacture a wide variety of products including furniture, railings, and farm equipment
  - **Rebar**: Used to strengthen concrete in highways, bridges, and buildings
  - **SBQ**: High-strength carbon or alloy steel products specially engineered to meet the demands of specific markets such as the automotive and machinery industries

Source: Alibaba, Allensteel Hebei, Rebarforsale, SKS Steel, STLD,, Morgan Stanley Research

Steel Overview: Products – Tube and Plate

Plate



OCTG



Mechanical and Line Pipe



Hydro Pipeline



- **Plate**: Flat-rolled product of sheet steel with a width of more than 8 inches, with a thickness ranging from 5-80mm
- **Oil Country Tubular Goods**: Pipe used in wells in oil and gas (petroleum exploration) industries for casing, tubing, and drill pipe
- **Line Pipe**: Used for transportation of gas, oil, water in a pipeline or utility distribution system
- **Mechanical Pipe**: Welded or seamless pipe produced in a large number of shapes for manufacturing, equipment industries, and energy industries

Source: Allen Steel, The Age Australia, Arcelor Mittal, Goldlands, NZ Steel, SBB, SKS Steel, Morgan Stanley Research

Steel Overview: Ferrous Scrap Metal



- Scrap steel and iron is re-melted and re-cast into new steel but differs in regard to its iron elements, shape, and purity
- Mini-mills (EAFs) use scrap as up to 100% of their raw material to make new products
- Integrated Mills (BOFs) use scrap as up to 25% of their basic oxygen furnace charge
- Steel can be recycled an infinite number of times

Source: Allied World Resources, Morgan Stanley Research

Steel Overview: Scrap Metal

Prime Scrap

Busheling



Bundles



Obsolete Scrap

Heavy Melt



Shredded



Scrap metal falls into two basic categories—prime scrap and obsolete scrap

Prime Scrap: Pre-consumer scrap, a very clean product collected from manufacturing waste

- **Busheling**: Type of prime scrap consisting of stampings and clippings from metal production
- **Bundles**: Type of prime scrap formed into cubes after production

Obsolete Scrap: Iron bearing, post-consumer scrap recovered before being land-filled

- **Heavy Melt**: Flat-rolled scrap that has a cross section three inches or greater, generally used in BOFs
- **Shredded**: Large pieces of scrap, such as old car bodies and appliances sent through a shredder before being sent to an electric arc furnace

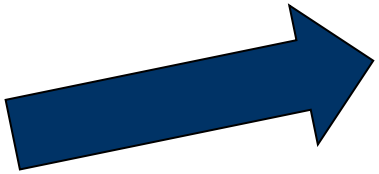
Source: CCOJ Trade Express Scrap Metal, Mehar Trade India, Morgan Stanley Research

Steel Overview: Scrap Recycling Business





















- As annual crude steel production rises, the demand for scrap metal as a raw material increases
- Scrap processors buy up scrap from peddlers, factories, demolition crews, auto parts yards, and small feeder yards
- The pieces are sorted, shredded, and sorted again into ferrous, non-ferrous, and zorba (mixed pieces of aluminum and copper wire from autos)
- Non-ferrous products are sold to smelters, ferrous products to steel mills, and zorba is typically sold to China and other low-wage countries, where it is hand-sorted

Source: CMC Recycling, Homer Shiffrin, Metco, Moon Syndicat, NR Canada, Scrap Metal Exports, Siemans, World Steel Association, Morgan Stanley Research

Steel Overview: Service Centers









- Metals service centers stock and distribute metals for industrial customers and perform first-stage processing
- Processing services can include sawing, shearing, drilling, and punching
- Service centers produce a wide variety of specialty products for specific industries
- They also reduce the need for end-users to tie up capital in inventory and pre-processing equipment
- Approximately 30% of all industrial steel products in the US pass through service centers
- Approximately 40% of all flat-rolled products pass through

Source: Bell Steel, High Steel, MSCI, PDM Steel, Siegal Steel, Sugar Steel, Morgan Stanley Research

Steel Overview: Fabricators









- Fabricators process, weld, kit, and assemble steel structures
- Fabricators sell to general contractors, construction managers, developers, and owners
- Fabricators bid on construction projects, assemble kits and drawings based on plan & spec construction work, and prepare metals for job site delivery
- Many fabricators assume price risk by bidding jobs and buying steel at a later date

Source: Bell Steel, High Steel, MSCI, PDM Steel, Siegal Steel, Sugar Steel, Morgan Stanley Research

Global Steel Market

Global Steel Market: Key Industry Themes

Chinese Demand Appears to Be Leveling Off

In 2014, China accounted for 48% of global steel demand. After multiple decades of continuous growth China experienced its first demand decline in 2014, and appears to be on track for another decline in 2015. With China as the world's largest producer and consumer of steel, by a wide margin, a small demand decline has led to a significant surge in net exports.

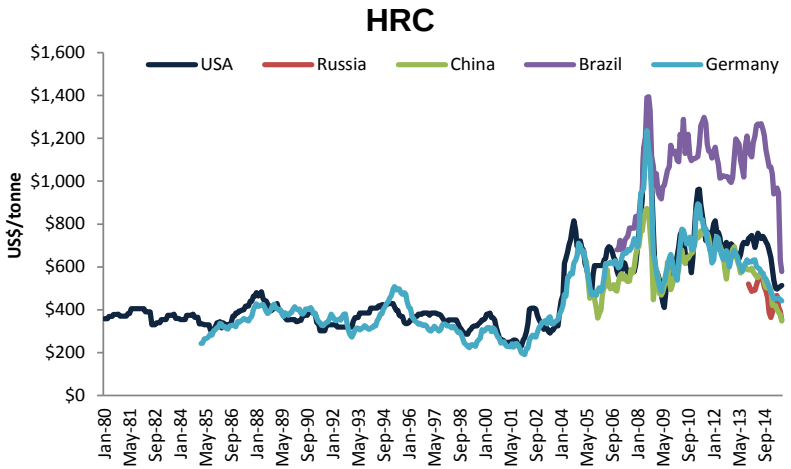
Chinese Supply Rationalization Appears to Be Real

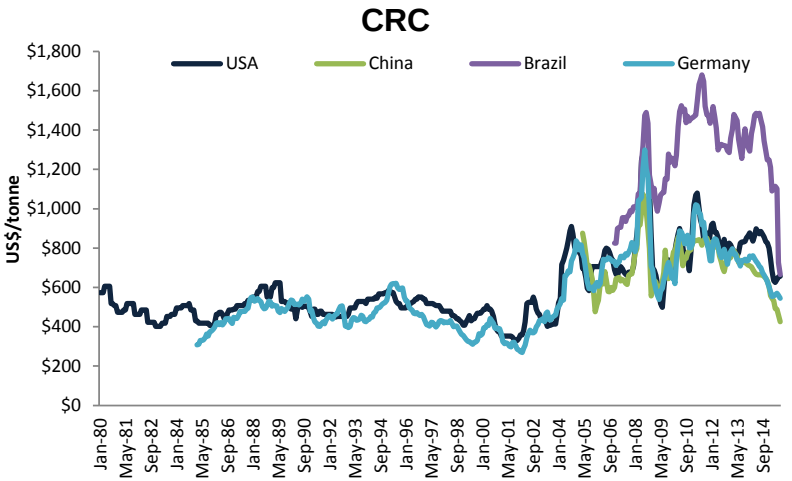
Much of Chinese steel capacity has been built in the Hebei region around Beijing and is the cause of poor air quality in the dense population center. With air quality becoming an important social issue, the government has targeted 80mtpy of capacity closures. It appears these closures are happening and capacity edged lower in 2014.

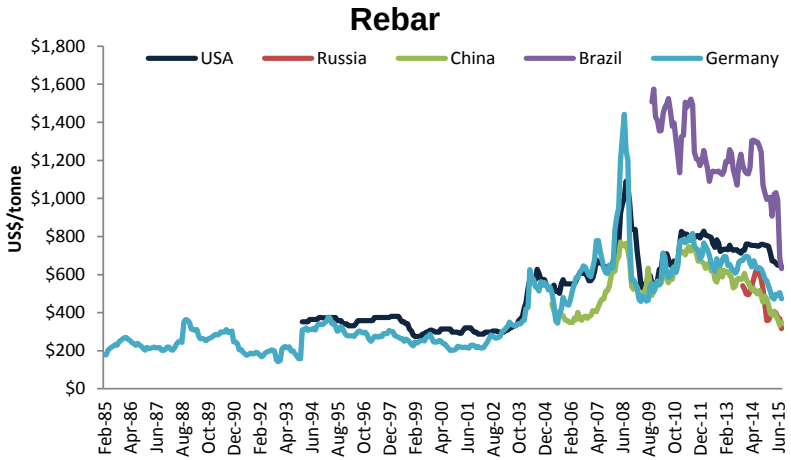
Trade Measures Are a Key Focus as Regional Markets Struggle to Protect Themselves from Global Oversupply

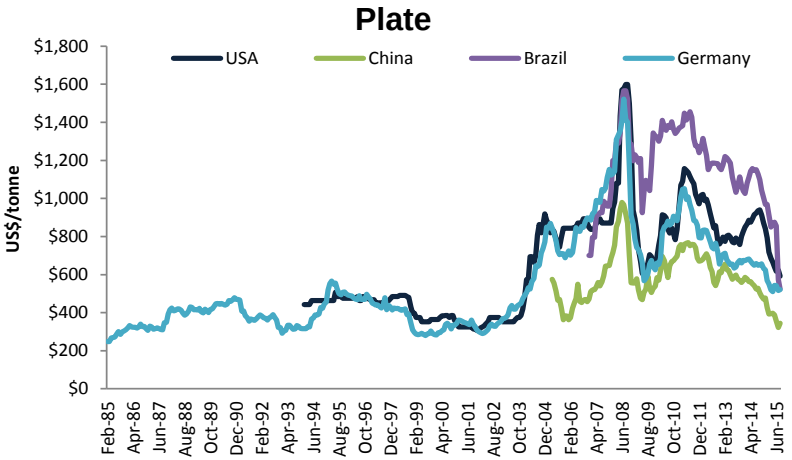
Surging Chinese exports have led to depressed export prices and import pressures across the globe. Many countries turned to trade protection in order to shield themselves from low-priced imports. The success or failure of trade measures may differentiate the good regional markets for steel from the bad.

Global Steel Historical Pricing





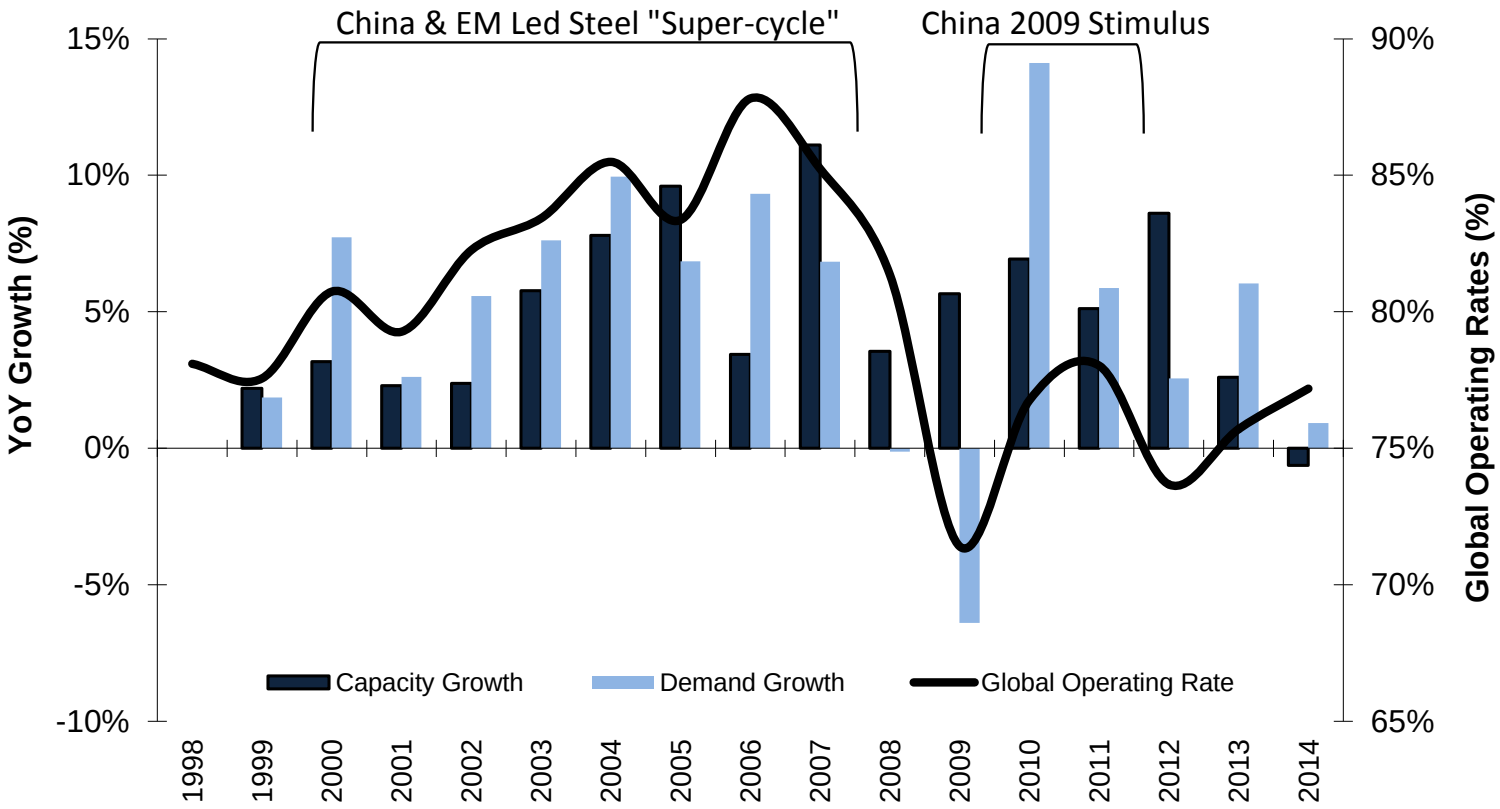




Source: CRU, SBB, Morgan Stanley Research

Global Steel Market: Capacity, Apparent Demand, Operating Rates

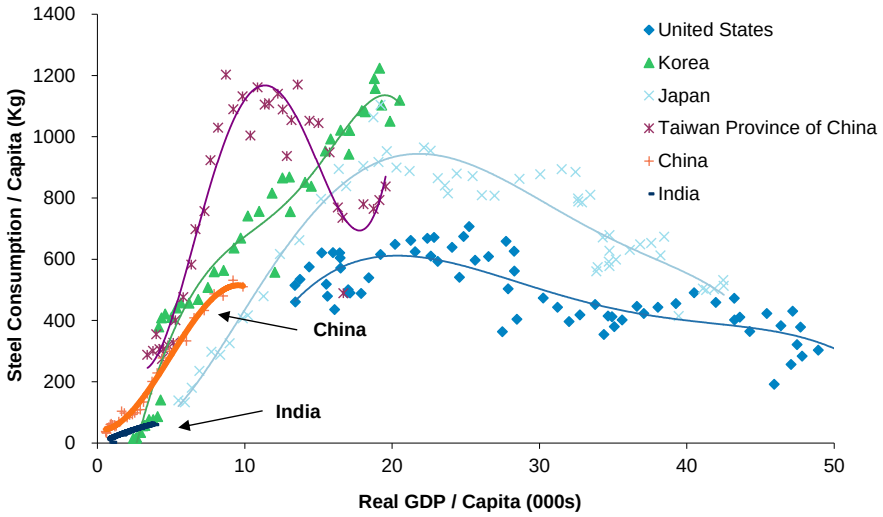
Operating slipped from healthy levels in the 80s after the GFC as DM demand collapsed and capacity growth in China outstripped demand. The path back to a balanced market will likely include a combination of demand stabilization in China, capacity cuts in China, and a lift in still sub-normal levels of DM consumption.

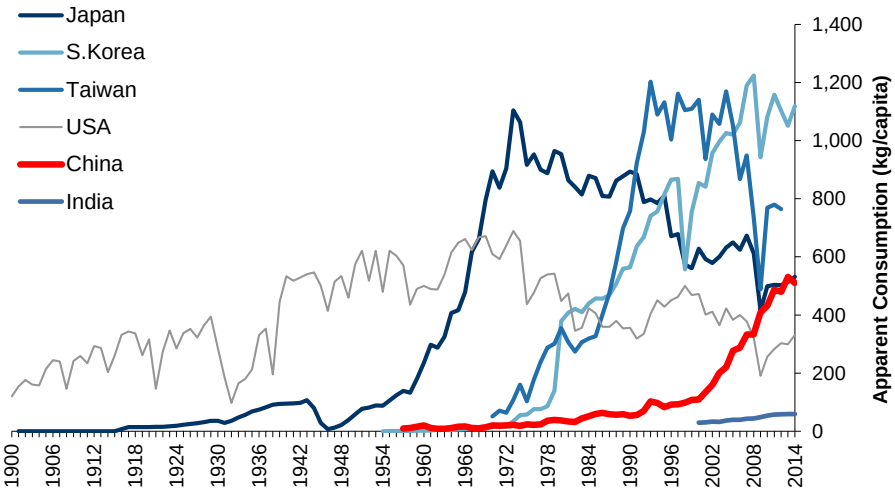


Source: World Steel Association, CRU, Morgan Stanley Research

Global Steel Market: China Demand

China per capita demand appears to be leveling out





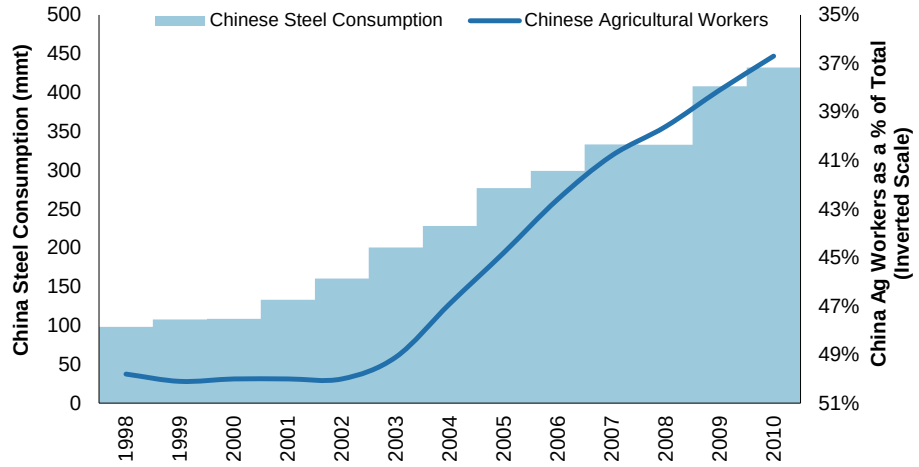
China per capita consumption may be peaking

- As countries develop, per capita consumption of steel tends to grow sharply as companies approach the $10k/capita mark. This usually corresponds with the beginning of initial build out of heavy infrastructure in a developing economy. Once a peak is reached, per capita consumption tends to gradually decline over the next few decades.
- It appears that China may have reached peak steel demand in 2013. This is consistent with the country's economic rebalancing efforts to move more towards consumption-led growth and away from investment-led growth.
- China's per capita consumption level has roughly doubled that of the US today, but is in line with US levels from the 1940s though the 1970s when the US built the bulk of the infrastructure still used today.
- Without the engine of China growth, it is difficult to see where incremental demand will come from. Some have pointed to India, a heavily populated country with extremely low steel consumption per capita. For this to happen, the Modi government needs to get serious about reform since excessive red tape and corruption have been holding back meaningful investment.

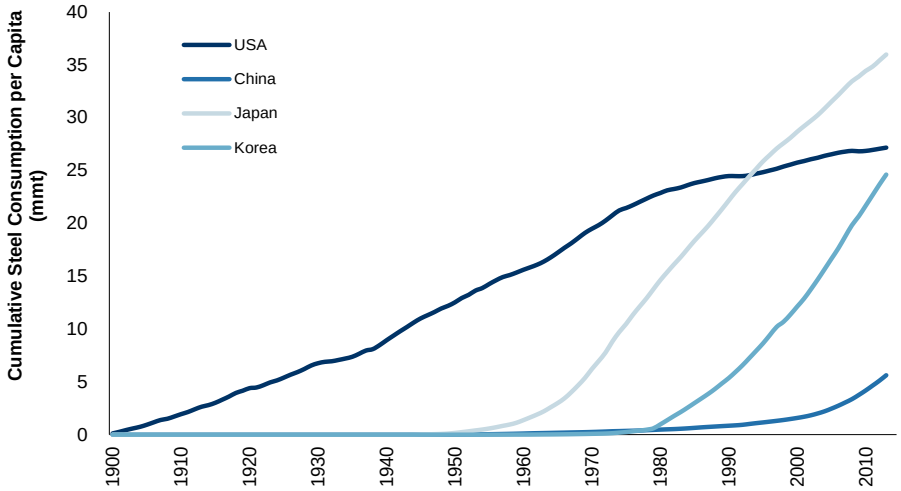
Source: World Steel Association, IMF, Morgan Stanley Research

Global Steel Market: China Demand

Urbanization should continue to drive steel consumption



China still has a lot more to build



While China steel demand may have peaked, we don't think it will fall off sharply

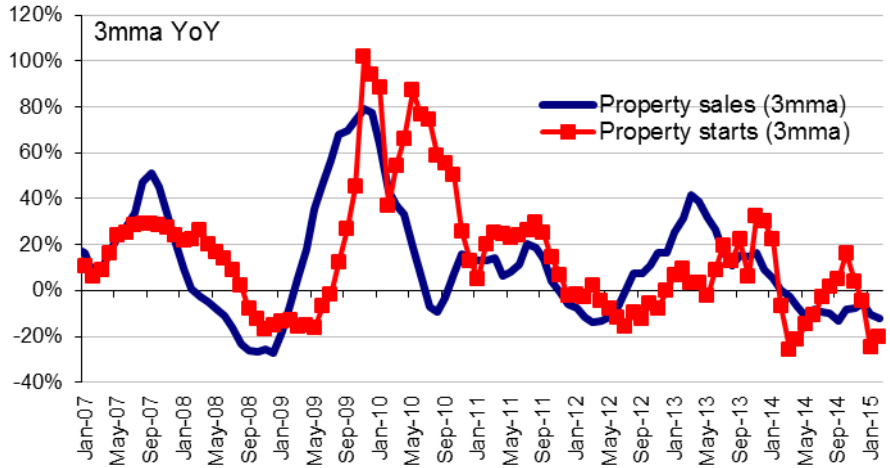
- Urbanization in China should help keep steel consumption per capita at high levels for many years. Urbanization drives steel demand through infrastructure, residential, and commercial property builds.

- In terms of cumulative steel consumed in China, the country still lags well behind developed economies. While the rate of consumption growth may no longer be improving, there appears to be potential for many years of heavy consumption ahead.

Source: World Steel Association, World Bank, Morgan Stanley Research

Global Steel Market: Chinese Property Market and Infrastructure (FAI)

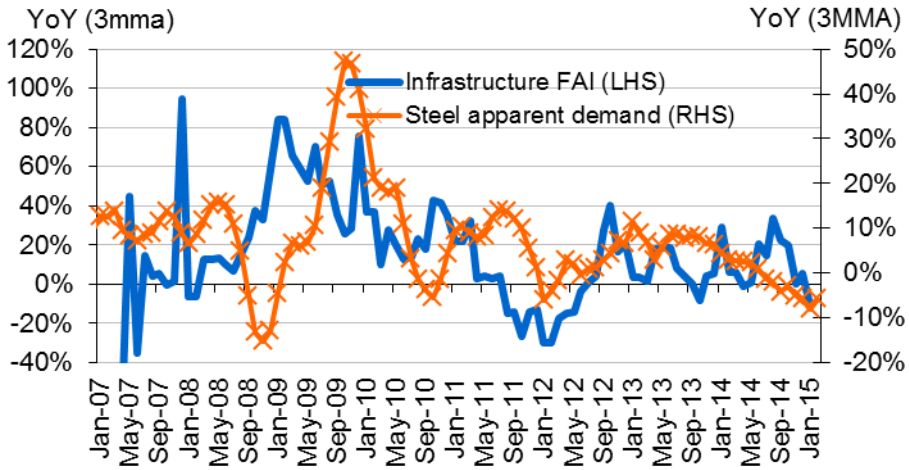
China Property Sales and Construction Starts



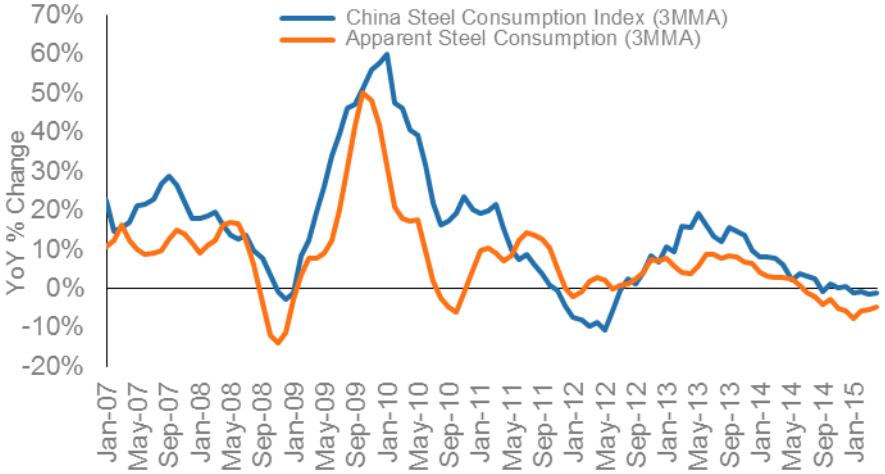
The two most important drivers of Chinese demand are property construction and FAI

- Property builds drive about 40% of total steel demand in China. A huge effort was undertaken after the GFC to build property in lower-tier cities. However, unsold inventory in these lower-demand cities is very high, which has softened the overall numbers over the past couple of years.
- Infrastructure FAI accounts for 25% of steel demand. Historically, local governments funded many of these projects through land sales, but demand for land is waning. However, the government is trying to roll out a PPP program to fund future infrastructure. It is still unclear if PPP will gain traction.

China Infrastructure FAI vs. Steel Demand



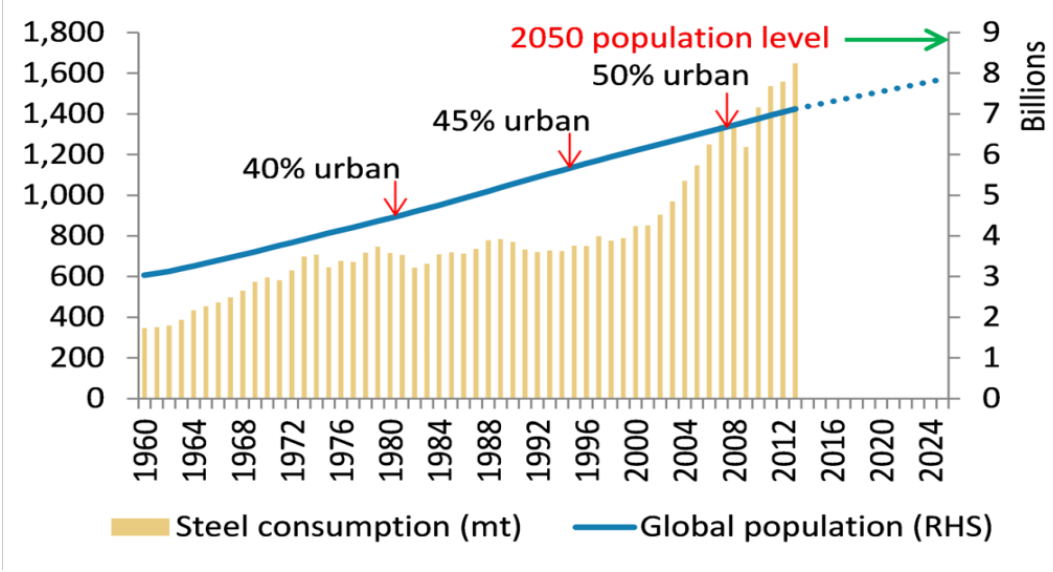
MS China Apparent Steel Consumption Index



Source: NBS, CISA, World Steel Association, Morgan Stanley Research

Global Steel Market: Potential Future Demand Sources

Global Urbanization



While new sources of demand growth tend to surprise the market, we are tracking three potential sources:

- **One Belt, One Road (OBOR):** OBOR represents an effort by the Chinese government to increase diplomatic coordination, standardize trade facilities, create free trade zones, integrate financial markets, and develop growth markets. Specifically, this economic development is targeted towards the "Silk Road Economic Belt", which links China with Europe through Central Asia, and the "21st Century Maritime Silk Road", which connects China with Southeast Asia, Africa, and Europe. This program could trigger an urbanization wave in China and the 65 other countries that this program reaches, generating new demand for resources.
- **China PPP:** The Chinese government is trying to migrate funding of provincial infrastructure away from land sales and towards public-private partnerships (PPP). PPP project have been slow to take off, and nearly RMB2tn of approved projects are not moving forward. If the government can streamline the PPP process, it could reignite steel demand growth.
- **India:** India's per capita steel consumption is only 59kg, which is 1/10 of China's and well below other countries with similar wealth levels. Given the size of the population and a government that took power on a pledge to reform the economy, India could potentially move the needle of global steel demand growth later in the decade or next.

Source: World Steel Association, Morgan Stanley Research

Global Steel Market: One Belt, One Road (OBOR) Initiative Developments

date	News
29-May-2015	China plans to initiate over 900 “One Belt, One Road” related projects, with first stage comprising 50 projects, which include 20 projects on the sea routes and remaining on the land routes. (Source: Shanghai Securities Daily)
27-May-2015	China Development Bank' Vice Chairman recently revealed that CDB has prepared more than US$800bn support to OBOR. He said that CDB has cumulatively provided financial support to more than 400 projects in OBOR countries, accounting for 1/3 of the banks’ international business. (Source: China News)
26-Mar-2015	Guangdong province recently announced Implementation Plan of One Belt One Road (OBOR). The plan lists 68 priority projects with total investment at US$55.4bn, covering infrastructure, energy, agriculture, fishery, manufacturing and service industries. (Source: Securities Daily)
22-Apr-2015	China Minsheng Investment Group said on April 17 that it would invest $5 billion to develop an industrial park in Indonesia, in a move to support China's "one belt, one road". It said the investment was part of a $40 billion worth of agreements that it signed with the Indonesia-China Business Council in Beijing on Friday. (Source: Reuters)
29-Mar-2015	On March 29, NDRC, Ministry of Foreign Affairs and Ministry of Commerce jointly released the official planning for “one belt one road” policy. According to estimates, the “one belt one road” plan will bring investment of Rmb400bn in 2015.(Source: NDRC website)
26-Mar-2015	All 6 Central China provinces have mentioned to bring new projects that can integrate into the “one belt one road” plan. Both Hunan and Jiangsu has mentioned to connect on “one belt one road” route through more convenient transportation connection. (Source: 21st Century Business Herald)
11-Mar-2015	Bank of China signs agreement with Anhui Conch to provide the company up to US$5bn funding mainly to be used for company’s development in OBOR markets, according a statement on the bank’s website. (Source: Bloomberg)
28-Jan-2015	A total of 20 provinces have announced their strategic position and main development plan in the context of the One Belt One Road program. (Source: Shanghai Securities Daily)
23-Jan-2015	More than 60 provinces have decided to participate in China’s One Belt One Road program. Meanwhile, China has signed MoUs with a number of countries. The One-Belt-One-Road program involves more than 4bn population in the 60+ provinces (Source: Shanghai Securities Daily)
13-Jan-2015	Shanghai Securities Daily reported that the plan on “one belt one road” has been approved and is expected to be released soon. Xinjiang and Lianyungang will be the first two cities to start the projects. (Source: Shanghai Securities Daily)
10-Dec-2014	Securities Daily reported that China may soon publish plans over the “One Belt One Road”, an initiative that will benefit a total of 65 countries. The plan would cover infrastructure, transportation, trading and economic cooperation etc. (Source: Securities Daily)
05-Nov-2014	China plans an Rmb100bn fund to finance construction of infrastructure linking its markets to three continents. The fund, overseen by Chinese policy banks, will be used to build and expand railways, roads and pipelines in Chinese provinces that are part of the strategy to facilitate trade over land and shipping routes. (Source: Bloomberg & Xinhua News)
01-Sep-2013	President Xi Jinping proposed the plan to build "21st Century Maritime Silk Road" and "Silk Road Economic Belt", during his visit to Central and Southeast Asia. (Source: NDRC)

Source: Morgan Stanley Research

Global Steel Market: One Belt, One Road (OBOR) Initiative (cont'd)

Countries	Population ('000)	GDP per capita (current US$)	Urban population (% of total)
China	**1,357,380**	**6,807**	**53**
OECD	**1,261,860**	**38,021**	**80**
>40% urbanization			
D.R.C.	67,514	484	41
Egypt	82,056	3,314	43
Indonesia	249,866	3,475	52
Iran	77,447	4,763	72
Nigeria	173,615	3,006	46
Philippines	98,394	2,765	45
South Africa	53,157	6,886	64
Thailand	67,011	5,779	48
SUBTOTAL	**869,060**	**3,555**	**51**
<40% urbanization			
Bangladesh	156,595	958	33
Ethiopia	94,101	505	19
India	1,252,140	1,498	32
Myanmar	53,259	n/a	33
Pakistan	182,143	1,275	38
Vietnam	89,709	1,911	32
SUBTOTAL	**1,827,946**	**1,355**	**32**

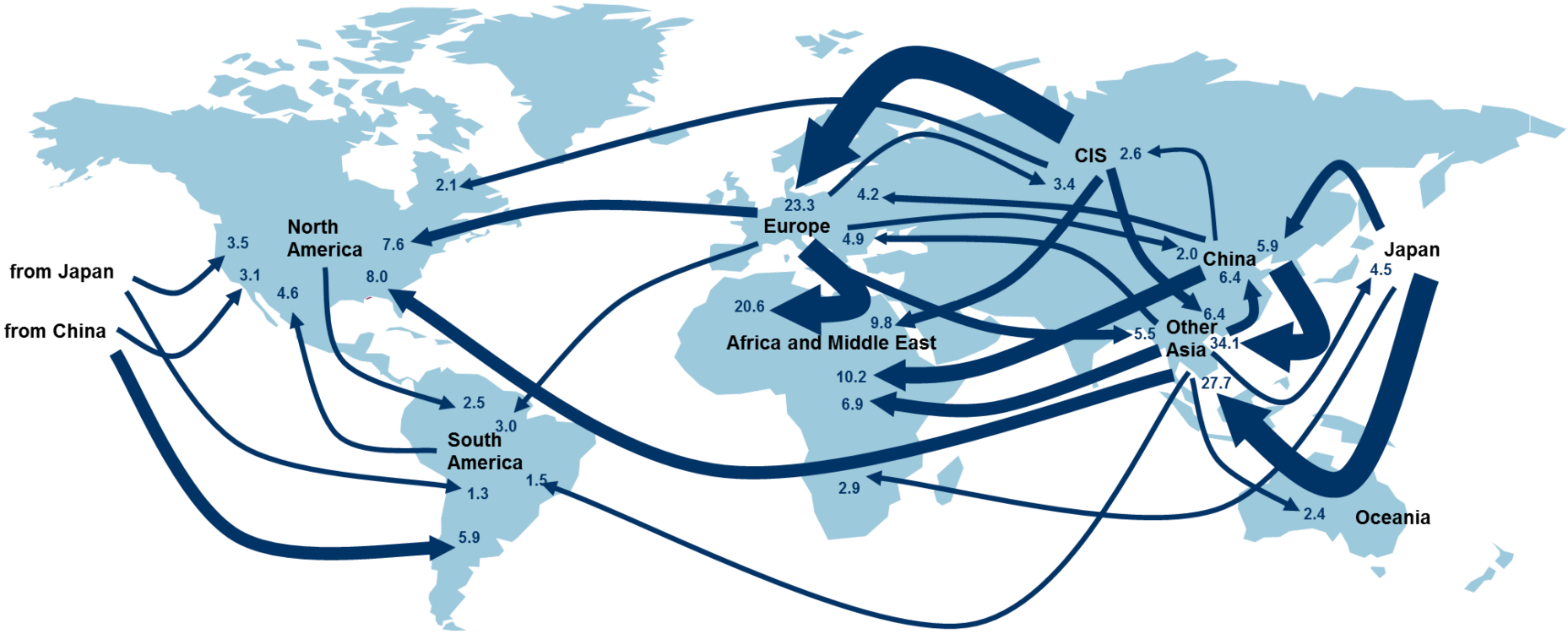
Urbanization in OBOR target countries could be critical to the program's success

- China has identified these countries, and the remaining countries of the 65, as emerging economies that will likely require commodity-intensive infrastructure investment over the next ten years
- Among these developing economies, steel demand grew at a CAGR of 4.8% between 2004-2013
- Steel intensity per capita grew from 169kg to 206kg during the same period
- China is hoping to replicate their own growth in steel demand, with a CAGR of 10.4% and per capita growth from 212kg to 545kg between 2004-2013
- This directive could also see Chinese overcapacity leave the country, although absolute steel production could still increase as China begins to meet demand in these economies

Source: Morgan Stanley Research

Global Steel Market: Steel Trade Flows (2013)

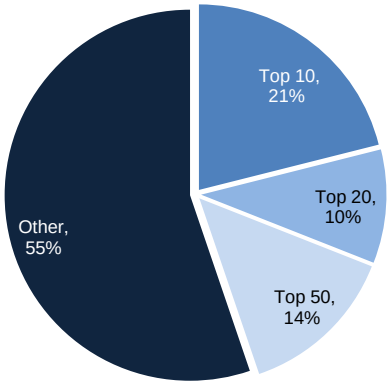
The key net exporting regions are China, Japan, CIS, and EU-27. Key importing regions are MEA, SE Asia, and NAFTA.



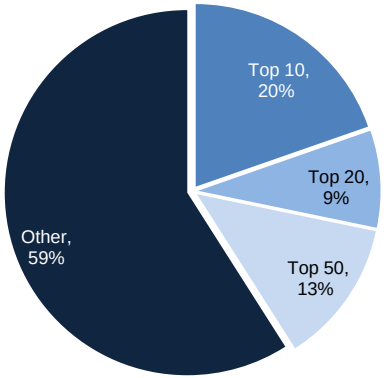
Source: World Steel Association, Morgan Stanley Research

Global Steel Market: Industry Consolidation

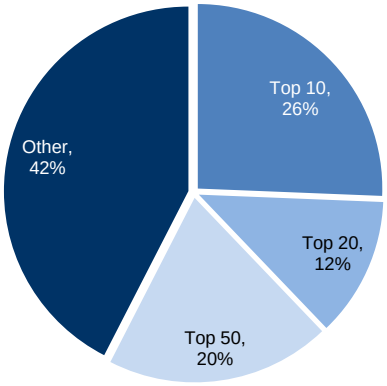
1980 Producer Concentration



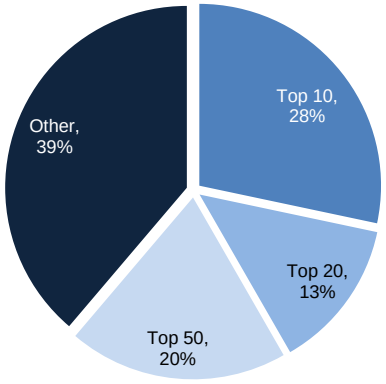
1990 Producer Concentration



2000 Producer Concentration



2014 Producer Concentration



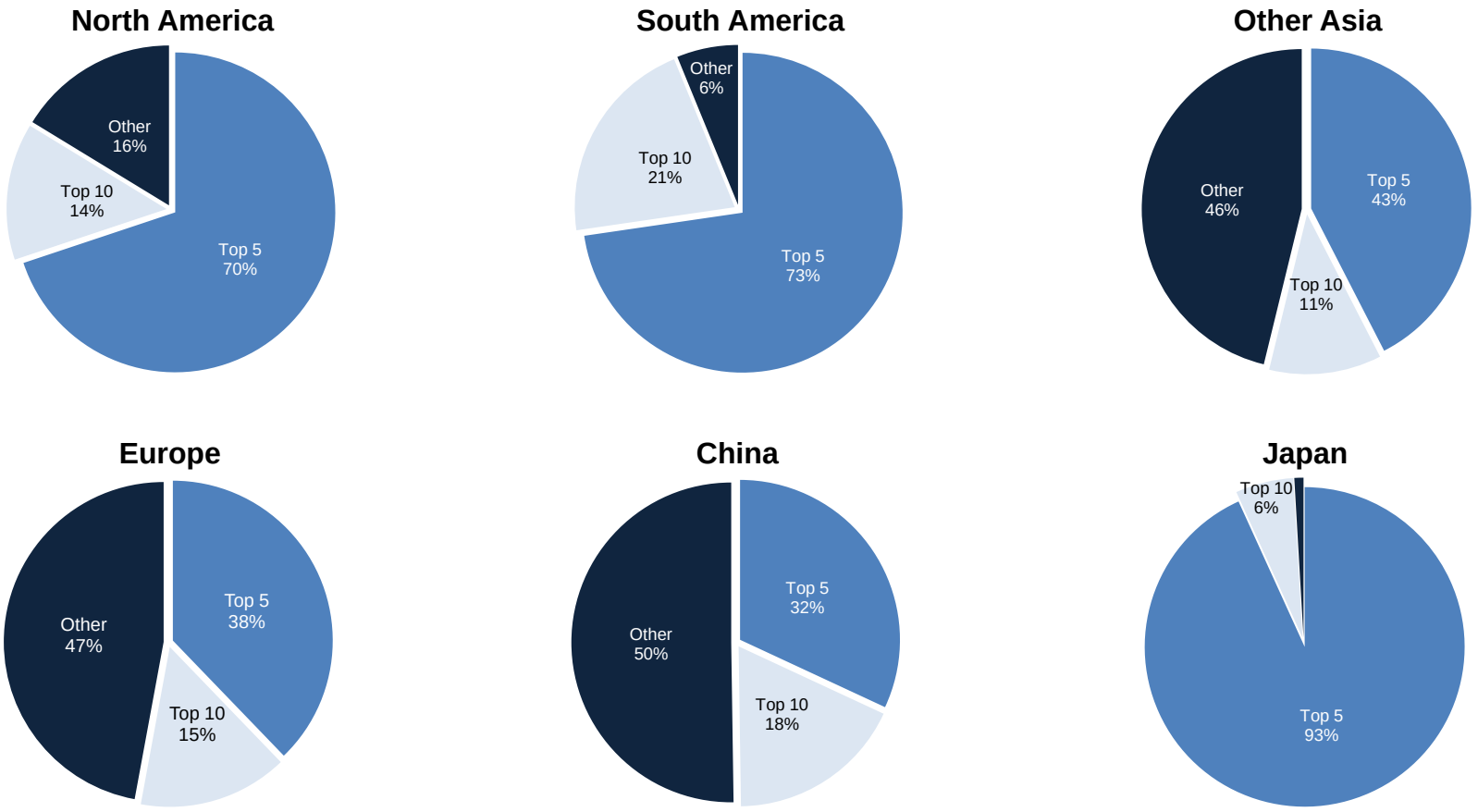
Globally the industry is still fairly fragmented

- While the industry is significantly more concentrated than is was 35 years ago, it is still very fragmented on a global basis. Importantly, the industry is far more fragmented that the iron ore and autos markets, which are key supplier and customer markets.
- While many of the developed-world markets have consolidated in recent years, new entrants, primarily in China, have muted the global impact.

Source: CRU, Morgan Stanley Research

Global Steel Market: Industry Consolidation

Regional market concentration is quite high particularly in Japan, South America, and North America



Source: CRU Group, Morgan Stanley Research

Global Steel Market: Global Steel EBITDA/t

Global Steel EBITDA/t by Company	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
USA																		
AK Steel	$101	$86	$94	$117	$77	$106	$74	$58	$68	$179	$123	$130	$177	$323	$74	$43	$113	$65
Nucor	$99	$87	$89	$107	$92	$91	$51	$49	$30	$126	$133	$160	$147	$205	$23	$60	$108	$103
Steel Dynamics	NA	NA	$100	$75	$75	$87	$41	$102	$65	$191	$150	$179	$165	$226	$93	$125	$153	$128
US Steel	$79	$63	$96	$82	$41	$32	$4	$37	$19	$111	$113	$124	$102	$174	($57)	$39	$69	$89
Average	**$89**	**$75**	**$93**	**$97**	**$68**	**$72**	**$35**	**$49**	**$32**	**$130**	**$125**	**$144**	**$135**	**$206**	**$4**	**$56**	**$97**	**$96**
BF	$85	$69	$95	$95	$55	$59	$25	$43	$30	$126	$115	$125	$119	$203	($30)	$40	$78	$84
EAF	$99	$87	$90	$102	$89	$90	$49	$57	$35	$136	$136	$163	$151	$209	$38	$75	$119	$109
Operating Rate	92%	91%	89%	87%	84%	86%	79%	89%	85%	95%	88%	88%	87%	81%	51%	70%	74%	75%
Latin America	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
CSN	NA	NA	NA	$182	$125	$148	$134	$144	$195	$344	$406	$338	$509	$583	$504	$801	$707	$381
Gerdau	NA	NA	NA	NA	$102	$85	$85	$82	$72	$172	$161	$170	$209	$224	$158	$179	$124	$108
ICH	NA	NA	NA	NA	NA	NA	NA	NA	$88	$204	$106	$119	$101	$115	$31	$88	$117	$130
Simec	NA	NA	NA	NA	NA	NA	NA	NA	$90	$224	$106	$117	$96	$102	$10	$81	$111	$126
Ternium	NA	NA	NA	NA	NA	NA	NA	NA	$141	$223	$259	$228	$171	$277	$80	$179	$189	$149
Usiminas	NA	NA	NA	NA	NA	$141	$115	$108	$128	$234	$319	$250	$337	$354	$157	$244	$110	$56
Average	**NA**	**NA**	**NA**	**$95**	**$114**	**$119**	**$107**	**$106**	**$115**	**$223**	**$238**	**$208**	**$249**	**$277**	**$167**	**$251**	**$199**	**$145**
Operating Rate		87%	90%	88%	81%	87%	80%	84%	87%	91%	88%	85%	84%	84%	67%	76%	80%	73%
Europe/CIS																		
Arcelor	NA	NA	NA	$89	$48	$84	NA	$47	$63	$125	$162	NA	NA	NA	NA	NA	NA	NA
ArcelorMittal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$125	$177	$242	$79	$100	$118	$92
British Steel	$133	$70	$60	$16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Corus	NA	NA	NA	NA	NA	$2	$0	$5	$26	$68	$87	$63	$70	$73	($103)	$66	$47	NA
Evraz	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$257	$386	$87	$162	$188	$141
MMK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$108	$116	$133	$112	$102
NLMK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$462	$141	$207	$188	$128
Severstal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$276	$162
SSAB	$179	$111	$98	$83	$56	$100	$54	$68	$96	$207	$286	$296	$290	$381	$35	$106	$160	$92
Rautaruukki	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$169	$188	$301	$296	($105)	$196	$149	$36
Riva	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	($3)	$45	$81	NA
Salzgitter	$86	$57	$60	$59	$34	NA	$51	$34	$41	$67	$101	$88	$120	$92	($1)	$40	$50	NA
ThyssenKrupp	NA	NA	NA	$8	$8	$8	$9	$5	$7	$11	$13	$14	$17	$20	$4	$11	$14	NA
Voestalpine	$100	$80	$79	$85	$79	$83	NA	$82	$112	$148	$218	$205	$277	$380	$397	$212	$315	$272
Average	**$125**	**$75**	**$68**	**$33**	**$34**	**$23**	**$15**	**$24**	**$39**	**$73**	**$104**	**$111**	**$184**	**$227**	**$65**	**$104**	**$130**	**$114**
Operating Rate		70%	77%	75%	76%	84%	83%	84%	83%	86%	84%	89%	91%	85%	65%	75%	76%	73%
Asia																		
Angang	NA	NA	NA	NA	NA	NA	NA	$37	$65	$79	$135	$136	$154	$90	$63	$77	$41	$28
Baoshan Iron & Steel	NA	NA	NA	NA	NA	NA	$113	$138	$199	$236	$200	$197	$194	$163	$146	$186	$137	$107
Hyundai Steel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	$77	$212	$106	$92
JFE	NA	NA	NA	NA	NA	NA	NA	NA	$167	$235	$239	$219	$261	$265	$156	$197	$139	$99
Jindal Steel	NA	NA	NA	NA	NA	NA	NA	NA	$326	$417	$572	$574	$429	$423	$685	$761	$765	$628
JSW Steel	NA	NA	NA	NA	NA	NA	NA	NA	$166	$227	$370	$273	$253	$274	$175	$180	$186	$148
Maanshan Iron & Steel	NA	NA	NA	NA	NA	NA	NA	$32	$89	$101	$82	$67	$73	$72	$64	$75	$61	$37
NSSM	NA	NA	NA	NA	NA	NA	NA	NA	$133	$193	$218	$208	$240	$221	$125	$175	$150	$93
POSCO	NA	NA	NA	NA	NA	NA	NA	NA	NA	$186	$252	$200	$219	$243	$194	$240	$192	$167
SAIL	NA	NA	NA	NA	NA	NA	$38	($0)	$34	$87	$220	$126	$184	$226	$149	$169	$134	$93
Tata Steel	NA	NA	NA	NA	NA	NA	$95	$61	$112	$191	$344	$177	$200	$140	$126	$74	$155	$101
Average	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**$85**	**$61**	**$134**	**$185**	**$229**	**$192**	**$215**	**$197**	**$135**	**$166**	**$140**	**$106**
Operating Rate		78%	79%	73%	77%	76%	76%	80%	83%	84%	83%	88%	83%	81%	77%	79%	79%	77%
Global EBITDA/t	$109	$75	$80	$65	$65	$59	$48	$53	$91	$158	$188	$159	$196	$218	$101	$139	$137	$111
Real Global EBITDA/t	$109	$69	$69	$53	$51	$44	$34	$37	$60	$102	$117	$95	$113	$118	$53	$71	$67	$52
Global Operating Rates		77%	78%	75%	76%	79%	77%	80%	81%	85%	84%	86%	87%	84%	73%	80%	83%	80%
Frieght Rates	$10	$8	$8	$5	$6	$8	$7	$7	$13	$22	$18	$15	$31	$37	$19	$23	$21	$17

Source: Company data, Morgan Stanley Research

Global Steel Market: Supply/Demand Model

Morgan Stanley Global Steel Supply/Demand Model	2007	2008	2009	2010	2011	2012	2013	2014e	2015e	2016e	2017e	2018e	2019e	2020e
Demand - Finished Steel (mmt)														
EU (27)	200	184	120	145	155	139	140	146	149	151	153	155	156	158
Other Europe	32	28	24	30	33	35	37	38	39	40	41	41	42	43
CIS/Russia	56	50	36	48	55	58	59	58	52	54	56	58	60	61
North America	141	130	83	110	121	133	131	144	143	152	157	161	165	170
South America	41	44	34	45	46	46	46	47	45	46	48	51	53	56
China	423	435	548	576	624	656	730	713	710	710	713	717	717	717
Japan	81	78	53	64	64	61	64	64	64	65	63	63	62	59
S.Korea	55	59	45	52	56	54	52	56	55	56	56	57	57	58
India	52	51	58	65	68	71	73	74	77	84	92	100	108	118
Other Asia/Pacific	74	89	70	93	84	86	89	92	96	99	102	105	107	109
Africa/Middle East	64	70	69	72	71	73	76	79	82	85	89	92	96	99
Global Demand - Finished Steel	**1,218**	**1,217**	**1,139**	**1,300**	**1,376**	**1,411**	**1,497**	**1,511**	**1,512**	**1,541**	**1,571**	**1,600**	**1,625**	**1,647**
% change Y-o-Y	**6.8%**	**-0.1%**	**-6.4%**	**14.1%**	**5.9%**	**2.6%**	**6.0%**	**0.9%**	**0.1%**	**1.9%**	**1.9%**	**1.9%**	**1.6%**	**1.4%**
World ex-China	796	782	591	724	753	755	767	797	802	831	857	883	908	930
% Change	4.3	-1.7	-24.4	22.5	4.0	0.3	1.5	4.0	0.6	3.7	3.1	3.0	2.8	2.4
China	423	435	548	576	624	656	730	713	710	710	713	717	717	717
% Change	11.9	2.9	26.1	5.1	8.3	5.2	11.2	-2.3	-0.5	0.0	0.5	0.5	0.0	0.0
Global Demand - Crude Steel	**1,339**	**1,337**	**1,252**	**1,428**	**1,512**	**1,551**	**1,645**	**1,660**	**1,661**	**1,694**	**1,726**	**1,758**	**1,786**	**1,810**
% change Y-o-Y	**8.1%**	**-0.1%**	**-6.4%**	**14.1%**	**5.9%**	**2.6%**	**6.0%**	**0.9%**	**0.1%**	**1.9%**	**1.9%**	**1.9%**	**1.6%**	**1.4%**
Ratio Finished/Crude - %	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
Production - Crude Steel (mmt)														
EU (27)	210	199	139	173	178	169	166	169	169	169	171	173	174	177
Other Europe	31	32	29	34	39	40	36	38	39	40	41	42	42	43
CIS/Russia	124	114	98	108	113	111	108	106	104	110	113	115	117	120
North America	132	125	84	112	119	122	119	121	119	131	135	136	137	138
South America	48	47	38	44	48	47	46	45	46	47	49	50	50	50
China	489	500	574	627	684	730	815	823	824	827	835	843	848	853
Japan	120	119	88	110	108	107	111	111	110	112	111	111	109	107
S.Korea	52	54	49	59	69	69	69	74	75	75	76	77	78	78
India	53	58	64	69	73	78	79	82	88	95	105	113	121	129
Other Asia/Pacific	51	49	40	47	49	45	49	50	52	54	56	58	59	60
Africa/Middle East	35	34	33	36	36	37	39	40	41	41	43	44	47	49
Global Production	**1,346**	**1,330**	**1,234**	**1,418**	**1,515**	**1,554**	**1,638**	**1,660**	**1,667**	**1,702**	**1,733**	**1,761**	**1,783**	**1,807**
% change Y-o-Y	**7.9%**	**-1.2%**	**-7.3%**	**14.9%**	**6.9%**	**2.6%**	**5.4%**	**1.3%**	**0.4%**	**2.1%**	**1.9%**	**1.6%**	**1.3%**	**1.3%**
World ex-China	857	830	660	791	831	824	823	837	843	874	898	917	935	953
% Change	3.4	-3.1	-20.5	19.9	5.1	-0.9	-0.1	1.7	0.7	3.8	2.7	2.1	1.9	2.0
China	489	500	574	627	684	730	815	823	824	827	835	843	848	853
% Change	16.8%	2.2%	14.7%	9.3%	9.1%	6.7%	11.6%	0.9%	0.2%	0.3%	1.0%	1.0%	0.6%	0.6%
Operating Rate - Crude Steel														
Global Operating Rate	**85%**	**81%**	**71%**	**77%**	**78%**	**74%**	**76%**	**77%**	**77%**	**79%**	**81%**	**82%**	**82%**	**83%**

Source: Company Data, Morgan Stanley Research estimates

US Steel Market

US Steel Market: Key Industry Themes

New trade law and ongoing trade cases

Recent changes to the trade laws will make it easier for mills to bring cases against dumped or subsidized imports. In addition, a handful of cases were filed in 2015 on flat-rolled steels, which could impact the market. Since the US market is, in general, short steel, imports set the price. We believe imports will move the US premium higher than the current ~$150/t over Asia, the degree of the increase will depend on the outcome of the current round of trade cases.

Industry consolidation

Recently the US flat-rolled industry has undergone a significant amount of consolidation as a result of both high-cost plant closures and M&A. This consolidation wave could lead to a higher average US price premium. We think this trend will continue.

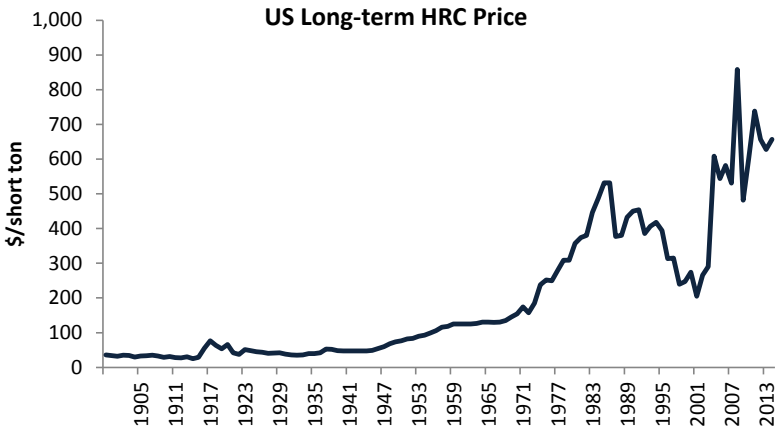
The outlook for US demand

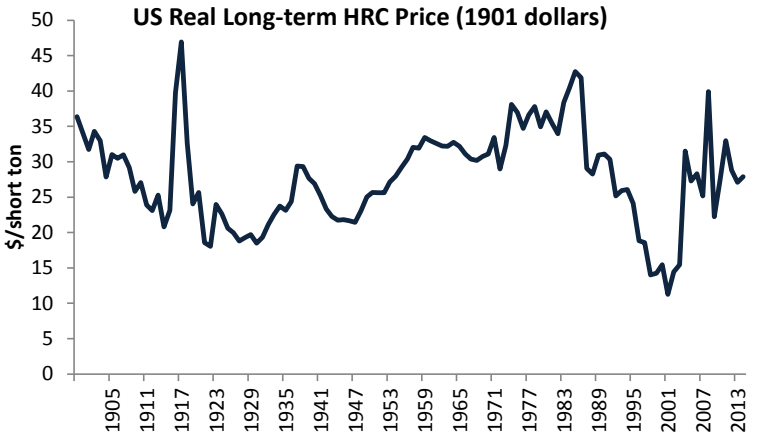
Since the GFC, US demand has remained well below its pre-crisis norm of ~400-450 kg/capita. Even in 2014, which was considered a decent year by post-GFC standards, per capita steel consumption was only 321kg. The largest steel end-market in non-residential construction (40% of total demand), which has slowly been improving, is still far from its norm. We think increasing public cries for refreshing the decrepit infrastructure in the US could eventually be a meaningful source of demand.

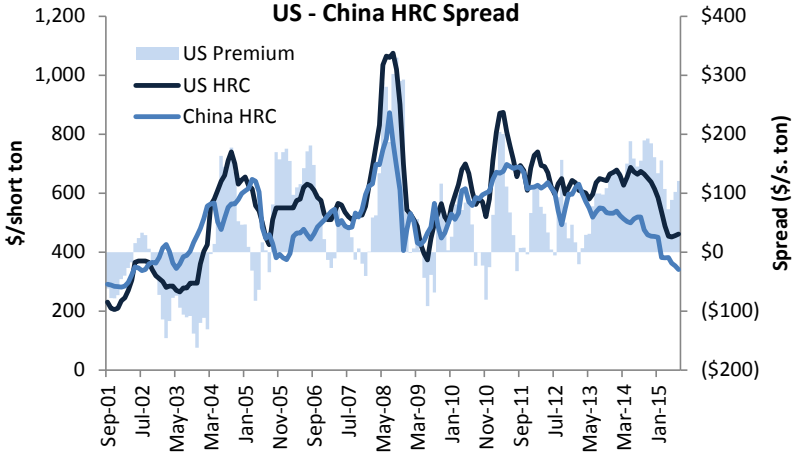
Source:Morgan Stanley Research

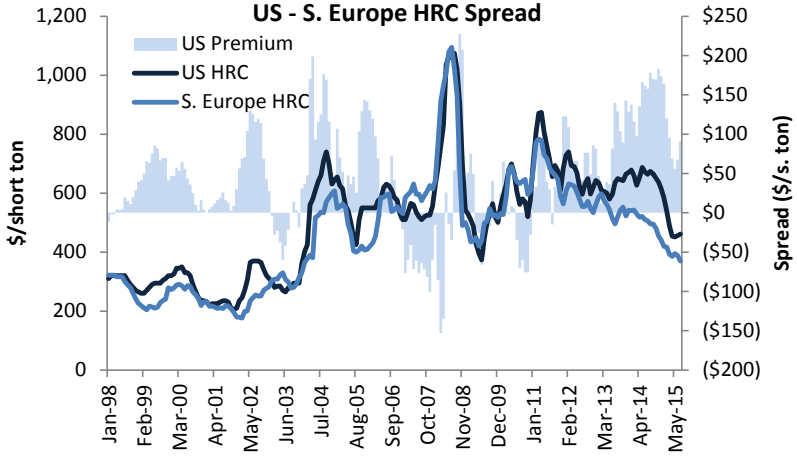
US Steel Market: Key Price Trends

In real terms, prices are fairly close to the long-term average. As global prices fall, lagging US prices have led to wide spreads that have attracted imports.





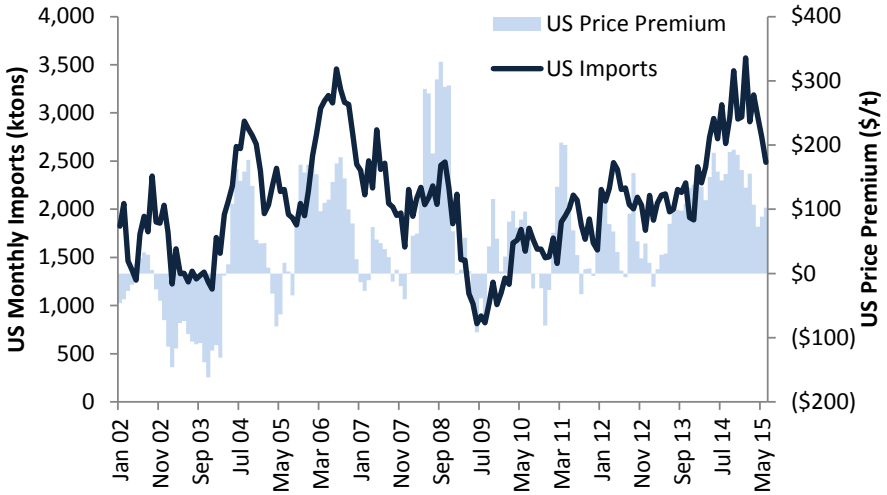




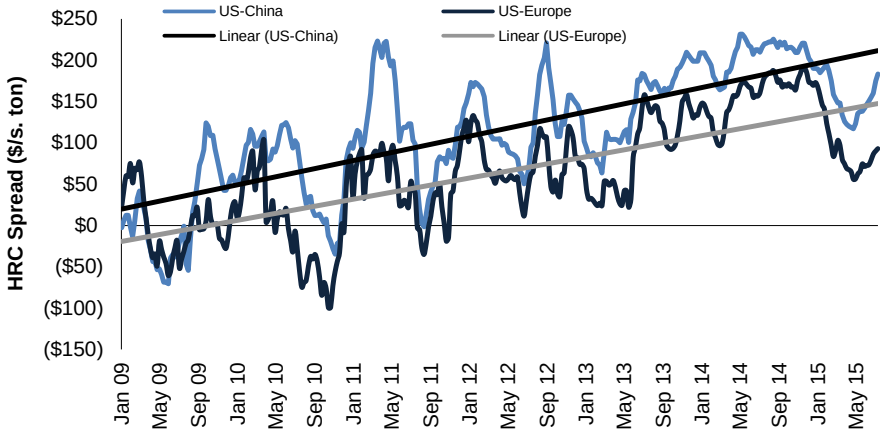
Source: CRU Group, SBB, Morgan Stanley Research

US Steel Market: Imports

Imports Dictate US Prices



Premia Have Been Improving on Better Demand and Consolidation



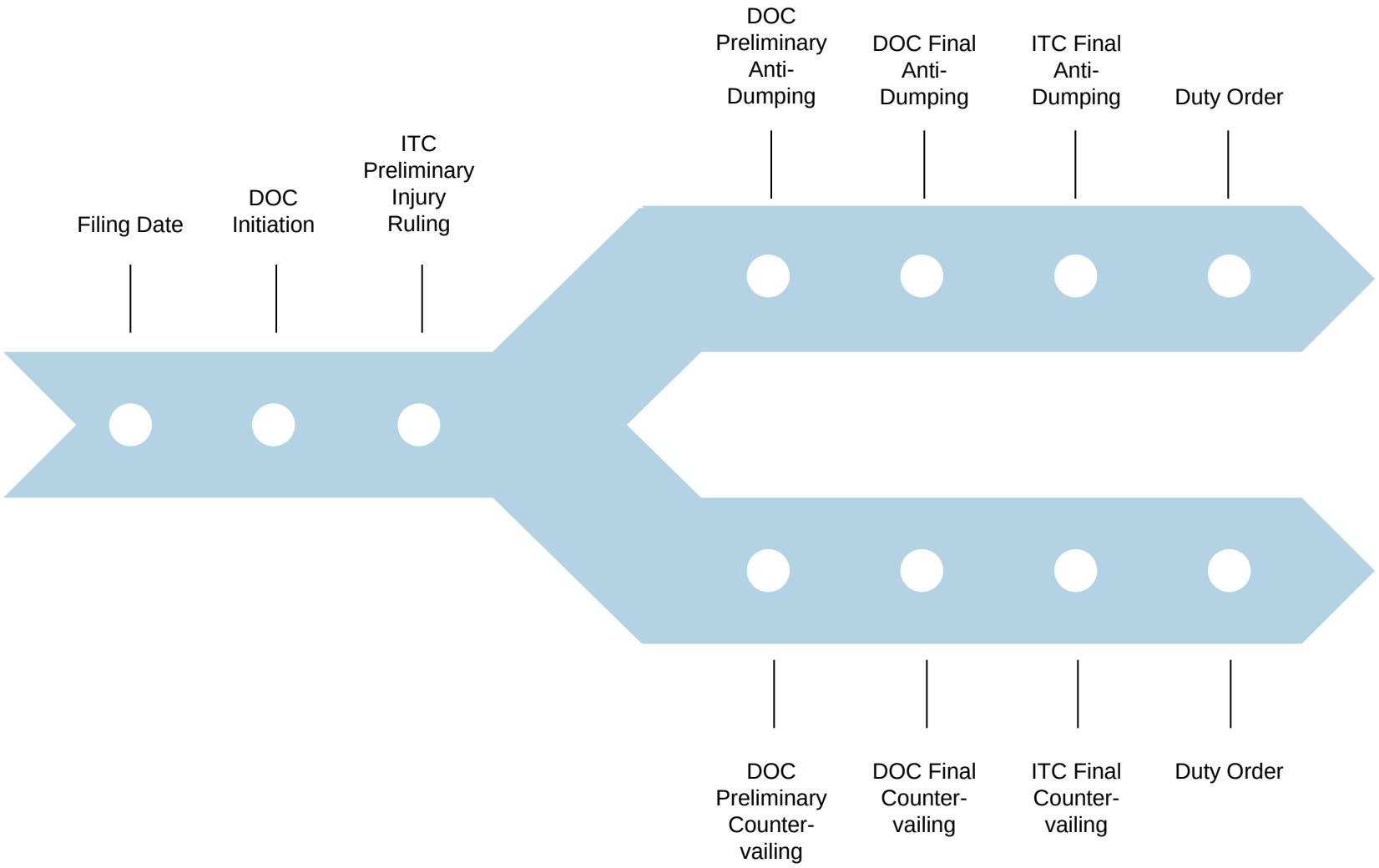
Imports are the key driver of US Pricing

- The US market is, in general, short steel, and a US premium is required to attract enough imports to balance the market.
- As a result, prices tend to oscillate around the price that attracts an imported ton. For example, we believe the sustainable price for steel in the US market is $150/t higher than the Asian export price. $100/t covers the logistics from an Asian port to a US Midwest buyer, and the remaining $50/t covers the required cushion to mitigate lead time and quality risk.
- Trade cases are important because they could potentially widen the $150/t spread in the future.

Source: AISI, CRU, Platts, Morgan Stanley Research

US Steel Market: Imports – Anatomy of a US Trade Case

The rulings of a US trade case are handled by the International trade Commission (ITC) and the Department of Commerce (DOC). The entire process normally takes a minimum of 10 months to complete.



Source: Morgan Stanley Research

US Steel Market: Recent Changes to Trade Law

Introduced in March and passed in June 2015, the *Leveling the Playing Field Act* seeks to maintain fair marketplace conditions for US steelmakers

At its core, the legislation seeks to strengthen antidumping and countervailing duty statutes that allow businesses and workers to file complaints with the Commerce Department and International Trade Commission when they feel they are being harmed by international producers. Producers believe the new, broader definition of harm should allow mills to file trade cases in short order instead of having to wait until severe harm is obvious.

The customs bill in conference should address trade enforcement issues

The house and senate are conferencing the customs reauthorization bill, which is expected to pass in the fall of 2015. The legislation will address issues involving the enforcement of existing trade law, and will seek to crack down on illegally imported materials. Details could help fight imported steel that comes in improperly labeled to avoid duties.

Source: Morgan Stanley Research

US Steel Market: Imports – Existing Trade Barriers

In addition to the cases listed below, cases on hot-rolled coil, cold-rolled coil, and coated sheet steel were filed in mid-2015.

			AD Duties				CV Duties			
Product Long Name	Product Short Name	Country	Median	Min	Max	Duty Order	Median	Min	Max	Duty Order
Stainless Steel Angle	Stainless Angle	Japan	115%	70%	115%	5/18/2001	NA	NA	NA	NA
Stainless Steel Angle	Stainless Angle	Korea South	100%	40%	100%	5/18/2001	NA	NA	NA	NA
Stainless Steel Angle	Stainless Angle	Spain	43%	24%	61%	5/18/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Belarus	115%	115%	115%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	China	133%	133%	133%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Indonesia	71%	60%	71%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Korea	23%	23%	102%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Latvia	17%	17%	17%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Moldova	233%	233%	233%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Poland	25%	2%	47%	9/7/2001	NA	NA	NA	NA
Steel Concrete Reinforcing Bars	Rebar	Ukraine	42%	42%	42%	9/7/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Argentina	43%	41%	45%	9/19/2001	42%	42%	42%	9/11/2001
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	South Africa	9%	9%	9%	9/19/2001	6%	6%	6%	12/3/2001
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Kazakhstan	243%	243%	243%	11/21/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	China	68%	64%	91%	11/29/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Netherlands	3%	3%	3%	11/29/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Romania	18%	16%	89%	11/29/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Taiwan	29%	20%	29%	11/29/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Thailand	4%	4%	20%	11/29/2001	2%	2%	2%	12/3/2001
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Ukraine	90%	90%	90%	11/29/2001	NA	NA	NA	NA
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	India	39%	37%	44%	12/3/2001	16%	8%	32%	12/3/2001
Hot-Rolled Carbon Steel Flat Products	Hot-Rolled	Indonesia	48%	48%	48%	12/3/2001	10%	10%	10%	12/3/2001
Welded Large Diameter Line Pipes	Welded Large Line Pipe	Japan	31%	31%	31%	12/6/2001	NA	NA	NA	NA
Welded Large Diameter Line Pipes	Welded Large Line Pipe	Mexico	50%	50%	50%	2/27/2002	NA	NA	NA	NA
Stainless Steel Bar	Stainless Bar	France	4%	4%	72%	3/7/2002	NA	NA	NA	NA
Stainless Steel Bar	Stainless Bar	Germany	15%	4%	32%	3/7/2002	NA	NA	NA	NA
Stainless Steel Bar	Stainless Bar	Italy	4%	3%	33%	3/7/2002	13%	13%	13%	3/8/2002
Stainless Steel Bar	Stainless Bar	Korea South	11%	5%	13%	3/7/2002	NA	NA	NA	NA
Stainless Steel Bar	Stainless Bar	United Kingdom	65%	4%	126%	3/7/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Brazil	85%	74%	95%	10/29/2002	6%	3%	7%	10/22/2002
Carbon and Alloy Steel Wire Rod	Wire Rod	Canada	6%	1%	10%	10/29/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Indonesia	4%	4%	4%	10/29/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Mexico	20%	20%	20%	10/29/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Moldova	369%	369%	369%	10/29/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Trinidad & Tobago	11%	11%	11%	10/29/2002	NA	NA	NA	NA
Carbon and Alloy Steel Wire Rod	Wire Rod	Ukraine	116%	116%	116%	10/29/2002	NA	NA	NA	NA
Light-Walled Rectangular Pipe and Tube	Light Rect. Pipe & Tube	Turkey	42%	27%	42%	5/30/2008	NA	NA	NA	NA
Circular Welded Carbon Quality Steel Pipe	Circular Welded Pipe	China	69%	69%	86%	7/22/2008	41%	30%	617%	7/22/2008
Light-Walled Rectangular Pipe and Tube	Light Rect. Pipe & Tube	Korea South	31%	1%	16%	8/5/2008	NA	NA	NA	NA
Light-Walled Rectangular Pipe and Tube	Light Rect. Pipe & Tube	Mexico	4%	2%	12%	8/5/2008	NA	NA	NA	NA
Light-Walled Rectangular Pipe and Tube	Light Rect. Pipe & Tube	China	249%	249%	265%	8/5/2008	15%	2%	201%	8/5/2008

Source: ITA, Morgan Stanley Research

US Steel Market: Imports – Existing Trade Barriers (Cont.)

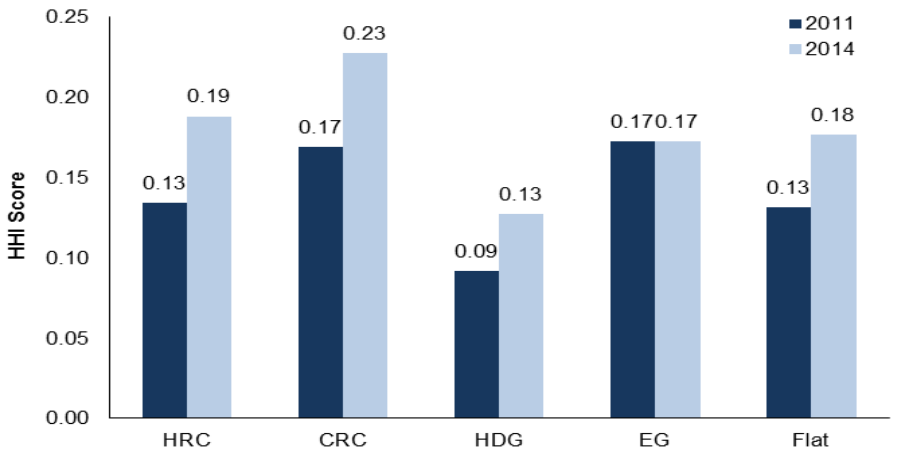
Product Long Name	Product Short Name	Country	AD Duties				CV Duties			
			Median	Min	Max	Duty Order	Median	Min	Max	Duty Order
Circular Welded Austenitic Stainless Pressure Pipe	Welded Stainless Pressure Pipe	China	33%	11%	55%	3/17/2009	110%	1%	299%	3/19/2009
Steel Threaded Rod	Threaded Rod	China	55%	55%	206%	4/14/2009	NA	NA	NA	NA
Circular Welded Carbon Quality Steel Line Pipe	Welded Line Pipe	China	74%	74%	101%	5/13/2009	36%	31%	40%	1/23/2009
Oil Country Tubular Goods	OCTG	China	32%	32%	99%	5/21/2010	13%	10%	16%	1/20/2010
Seamless Carbon and Alloy Steel Standard Line and Pressure Pipe	Seamless Line & Pressure Pipe	China	66%	50%	99%	11/10/2010	35%	14%	57%	11/10/2010
Welded Stainless Pressure Pipe	Welded Stainless Pressure Pipe	Malaysia	167%	23%	167%	7/21/2014	NA	NA	NA	NA
Welded Stainless Pressure Pipe	Welded Stainless Pressure Pipe	Thailand	24%	24%	24%	7/21/2014	NA	NA	NA	NA
Welded Stainless Pressure Pipe	Welded Stainless Pressure Pipe	Vietnam	16%	16%	16%	7/21/2014	NA	NA	NA	NA
Oil Country Tubular Goods	OCTG	India	6%	2%	10%	9/10/2014	12%	6%	19%	7/11/2014
Oil Country Tubular Goods	OCTG	Korea South	13%	10%	16%	9/10/2014	NA	NA	NA	NA
Oil Country Tubular Goods	OCTG	Taiwan	3%	0%	3%	9/10/2014	NA	NA	NA	NA
Oil Country Tubular Goods	OCTG	Turkey	36%	0%	36%	9/10/2014	9%	3%	16%	7/11/2014
Oil Country Tubular Goods	OCTG	Vietnam	111%	24%	111%	9/10/2014	NA	NA	NA	NA
Steel Concrete Reinforcing Bar	Rebar	Mexico	44%	21%	67%	11/6/2014	NA	NA	NA	NA
Steel Concrete Reinforcing Bar	Rebar	Turkey	NA	NA	NA	NA	1%	1%	1%	11/6/2014
Non-Oriented Electrical Steel	NOES	China (PRC)	408%	408%	408%	12/3/2014	159%	159%	159%	12/3/2014
Non-Oriented Electrical Steel	NOES	Germany	99%	86%	99%	12/3/2014	NA	NA	NA	NA
Non-Oriented Electrical Steel	NOES	Japan	205%	136%	205%	12/3/2014	NA	NA	NA	NA
Non-Oriented Electrical Steel	NOES	Korea	7%	7%	7%	12/3/2014	NA	NA	NA	NA
Non-Oriented Electrical Steel	NOES	Sweden	113%	98%	127%	12/3/2014	NA	NA	NA	NA
Non-Oriented Electrical Steel	NOES	Taiwan	28%	28%	52%	12/3/2014	13%	9%	17%	12/3/2014
Carbon and Certain Alloy Steel Wire Rod	Wire Rod	China (PRC)	106%	106%	110%	1/8/2015	186%	178%	193%	1/8/2015

Source: ITA, Morgan Stanley Research

US Steel Market: Top Players and Consolidation

Steel Product Market Share by Top 5 Producers

	2011		2014	
	Top 5	HHI	Top 5	HHI
HRC	72%	0.13	89%	0.19
CRC	77%	0.17	90%	0.23
HDG	56%	0.09	69%	0.13
EG	86%	0.17	86%	0.17
Flat	70%	0.13	82%	0.18
Rebar	92%	0.26	92%	0.26
Merchant Bar	80%	0.22	80%	0.22
Structural	96%	0.26	96%	0.26
Wire Rod	84%	0.17	84%	0.17
Long	78%	0.19	78%	0.19



Top 5 producers in flat products have strengthened their market share and continue to squeeze out smaller producers

- The flat-rolled market has become significantly more concentrated in recent years as a result of both high-cost mill closures and robust M&A activity.
- In 2014, the Herfindahl-Hirschman index (HHI) for flat-rolled rose to 0.18, which is consistent with a highly concentrated industry.

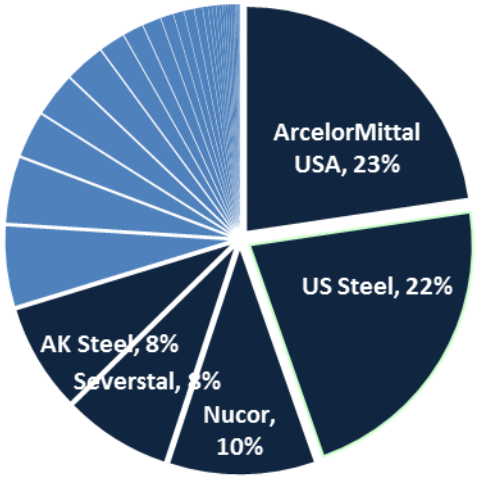
Long product market has remained relatively stable

- The long product market has consistently been concentrated in the US, which is one of the reasons why returns have been more robust amongst the long-product producers.

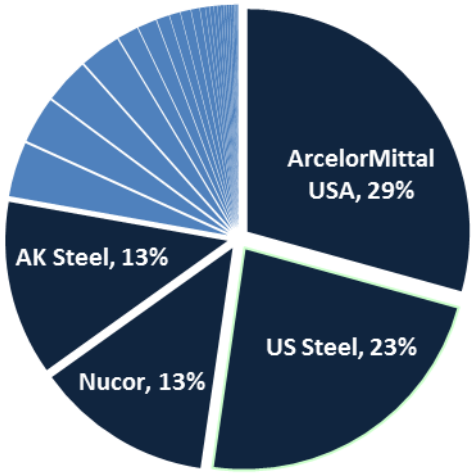
Source: CRU, Company Data, Morgan Stanley Research

US Steel Market: Top Players and Consolidation

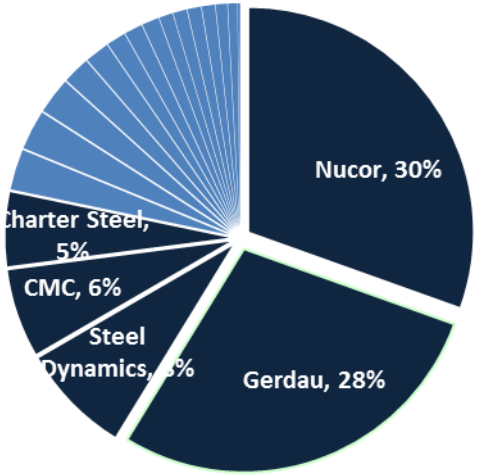
2011 Flat Products Market Share by Company



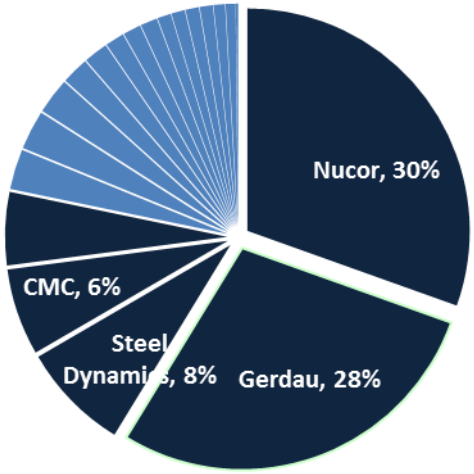
2014 Flat Products Market Share by Company



2011 Long Products Market Share by Company



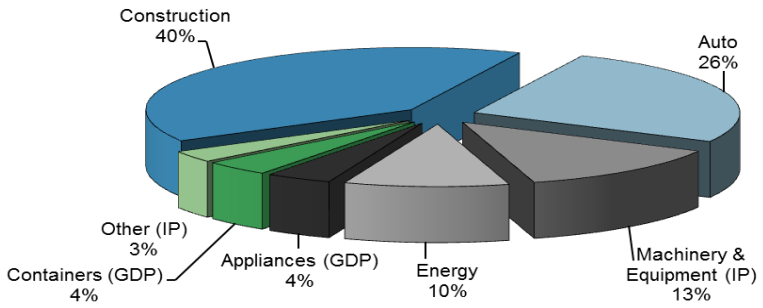
2014 Long Products Market Share by Company



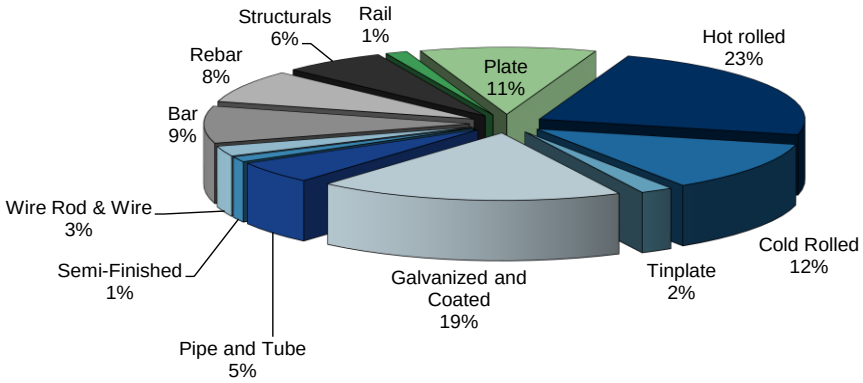
Source: CRU, Morgan Stanley Research

US Steel Market: Domestic Products and End-Market

Aggregate US Steelmaker End-Markets (2014)



Aggregate US Steelmaker Product Mix (2014)



Construction and auto act as the primary end-markets for steel products

- Construction and auto have remained relatively constant over the past five years, and should continue to serve as the largest consumers of steel
- Energy has nearly doubled its share over the past four years, although it continues to make up a relatively small portion of the end-market mix. Clearly, energy will shrink sharply in 2015 as the rig count plummets.

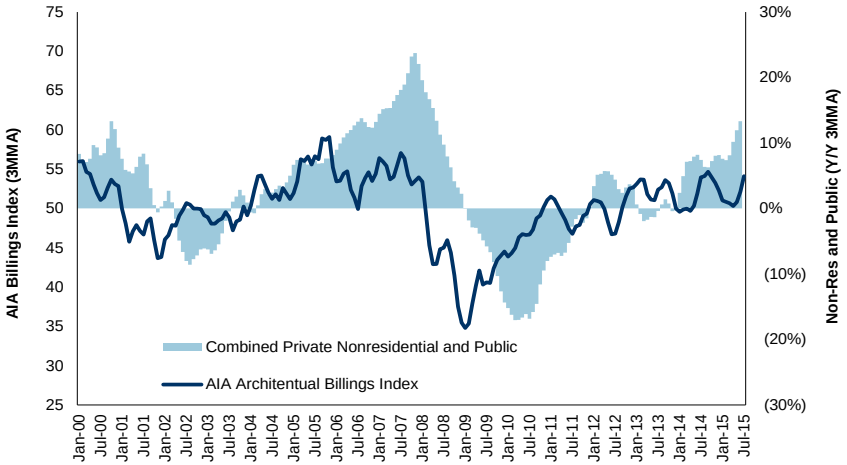
Galvanized & coated sheet, hot-rolled, and cold-rolled products continue to dominate the product mix

- Steel product mix has remained relatively constant over the past five years, with extremely marginal decreases in galvanized/coated sheet, bar, cold-rolled, and structurals
- Marginal increases in plate, rebar, and hot-rolled products

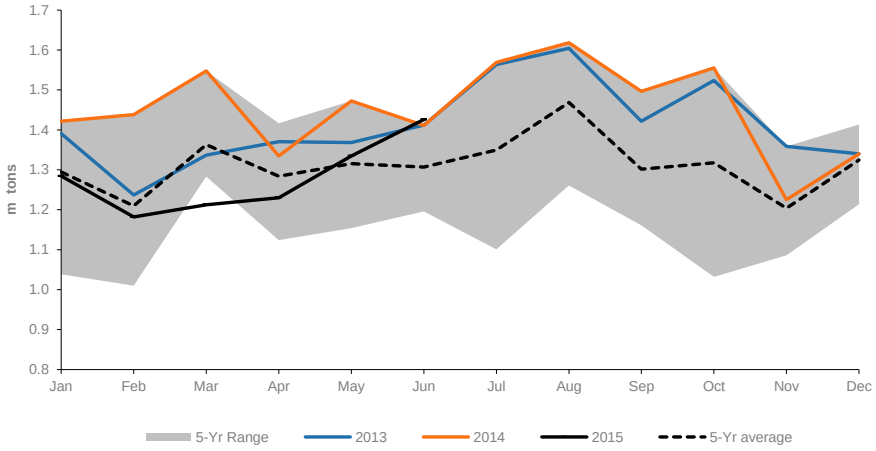
Source: AISI, MSCI, Morgan Stanley Research

US Steel Market: Demand – Non-Residential Construction

Value of Private/Public Construction and AIA Billings



US Construction Steel Shipments



Non-residential construction has been gradually improving since 2012

- The Architectural Billings Index (ABI) is a key lead indicator to watch since it tends to lead non-res spending by about 9 months. Since 2012 the diffusion index has been above 50, indicating growth, which is finally beginning to translate into higher steel demand.
- Products used in non-residential construction can serve a variety of other markets as well, implying that strong demand in non-resi can lead to higher steel prices in general.
- Rebar, structural beam, and to a lesser degree flat-rolled, are the primary steel products used for construction, and represent ~40% of total steel demand.

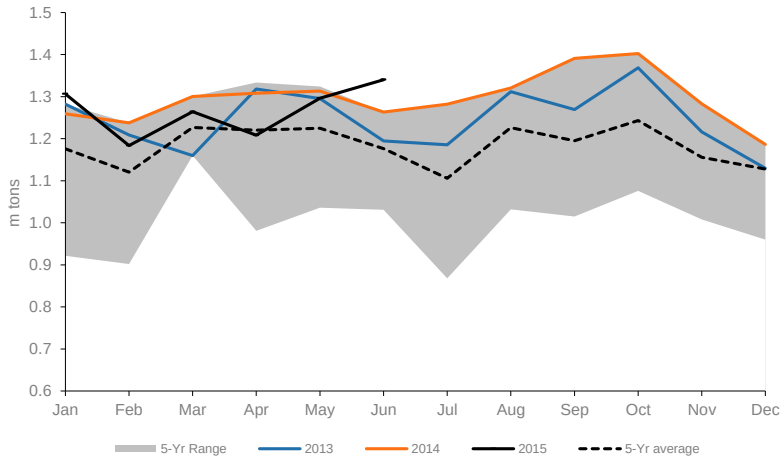
Infrastructure investments in the US could prop up construction demand

- Deteriorating conditions of bridges, roads, and railways could drive future construction-related demand for steel.
- It is clear a major refresh of US infrastructure is needed, and there is a growing public outcry to move on this front.
- In general, there is bi-partisan political support for improving infrastructure, but lack of agreement over funding has been the key stumbling block.

Source: AIA, AISI, US Census Bureau, Morgan Stanley Research

US Steel Market: Demand – Automotive

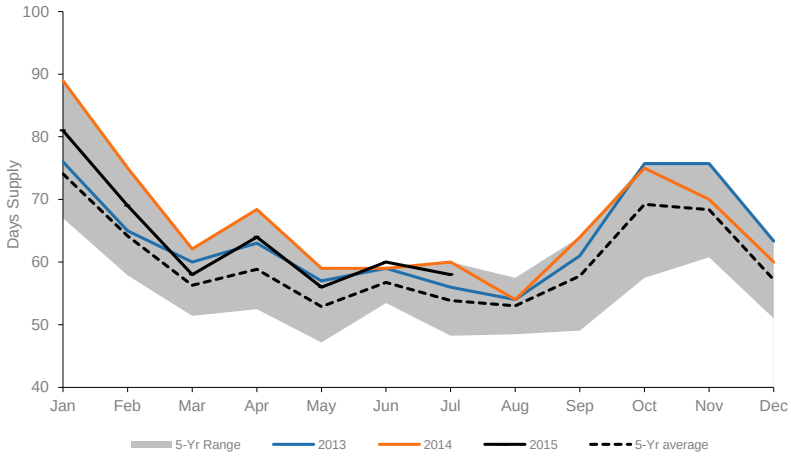
US Auto Steel Shipments



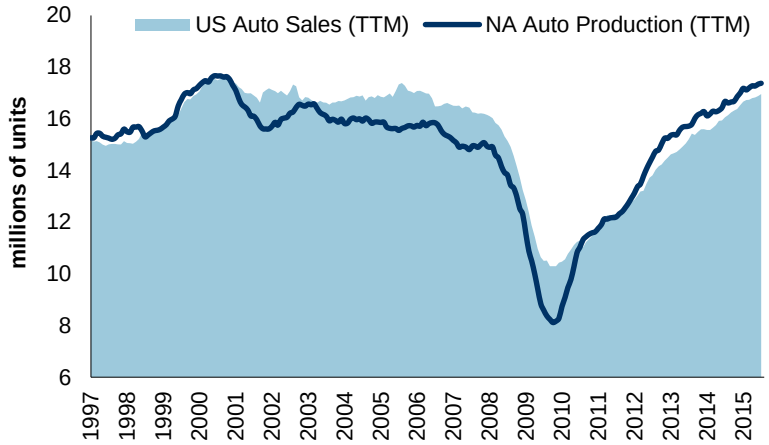
Auto production continues to grow at a robust pace

- Key steel products in autos include high-quality flat-rolled, special bar quality (SBQ) bars, and wire rod
- Production has recently been outpacing sales as more companies have been onshoring, a trend we expect to continue over the next several years
- US auto SAAR (seasonally adjusted annual rate of sales) is expected to grow by 3% in both 2015 and 2016, with sales peaking in 2017

US Auto Inventories



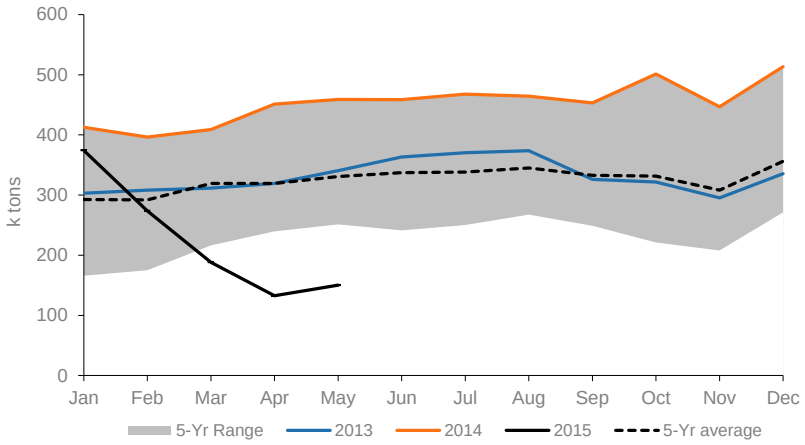
US Auto Sales and Production



Source: Wards, AISI, Morgan Stanley Research

US Steel Market: Demand – Energy

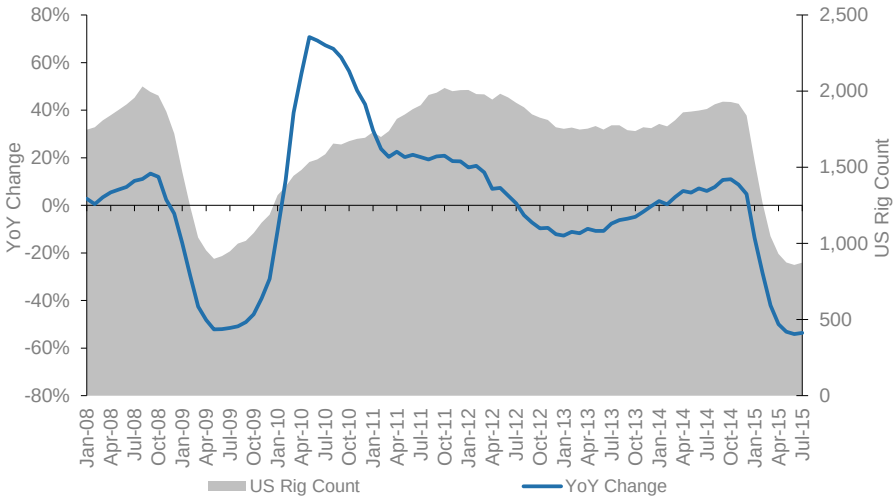
US Oil, Gas, and Petrochemical Steel Shipments



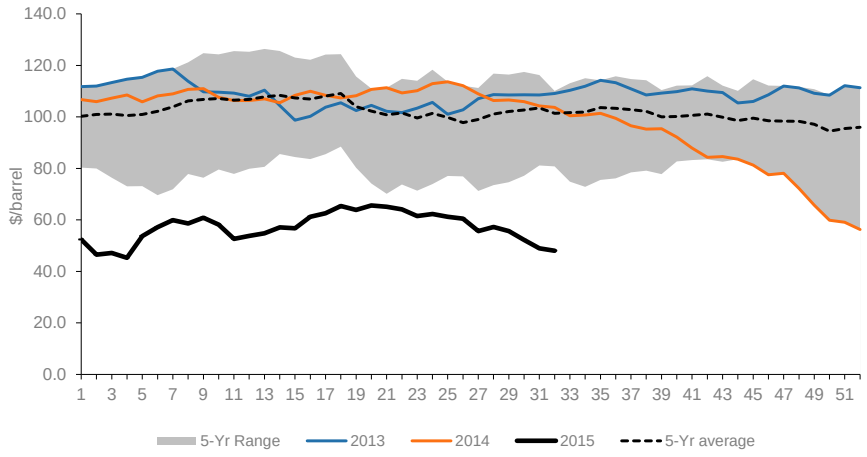
Weakening oil and natural gas price environment have been threatening energy sector steel demand

- US rig count expected to fall by 45% in 2015, highlighting the headwinds for steel demand in the energy sector
- However, a slight 16% rebound is forecasted for 2016 which could boost sentiment for the steel sector
- As a whole, energy only accounts for ~10% of total US steel consumption, so any weakness in the sector would not drastically influence demand
- Key energy products are oil-country tubular goods (OCTG), line pipe and, to a lesser extent, special bar quality (SBQ) steel

US Rig Count



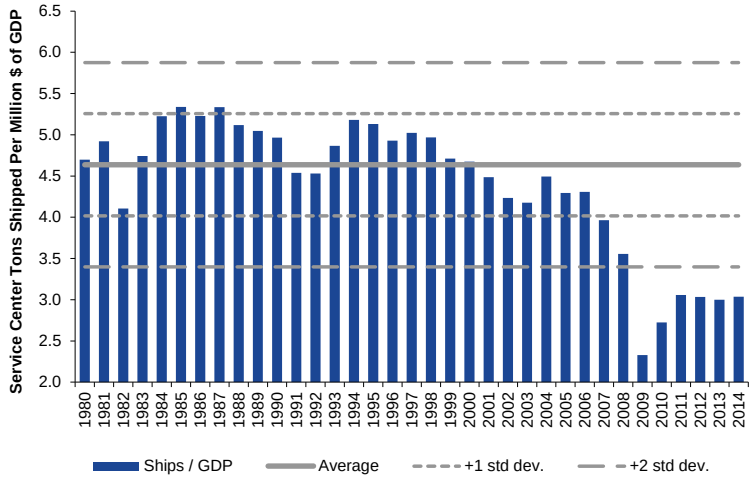
Oil Price



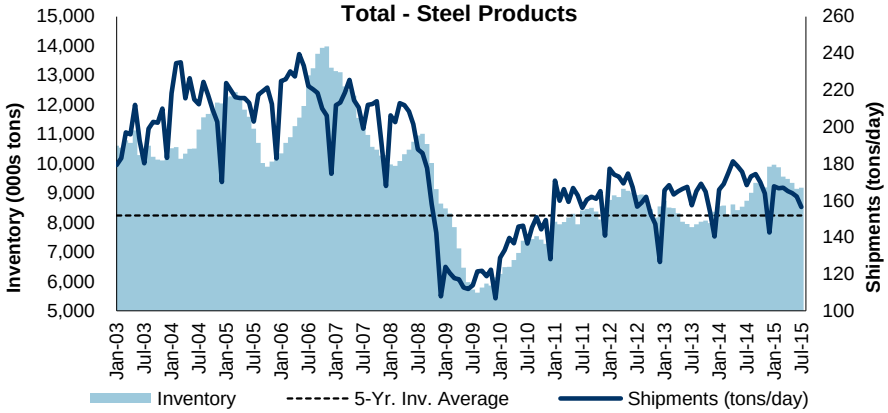
Source: Baker Hughes, AISI, Morgan Stanley Research

US Steel Market: Service Center Shipments per GDP

Service Center Shipments per Millions of GDP



Service Center Inventories Are Well Below Pre-GFC



36% of all steel sold in the US passes through a service center prior to being sold to the end user

- Service center shipments/GDP are still far off pre-GFC norms. We think this highlights the lack of steel intensity of the recovery since non-res, and particularly the fact that infrastructure spending is only playing a minor role. This really shows how the US is under-investing in infrastructure today, and we see meaningful potential for demand improvement since these levels are unsustainable.
- Service centers are holding far less inventory since the GFC, since demand has not fully recovered. If demand does normalize at some point, it would likely be accompanied by a large amount of restocking.

Source: MSCI, BEA, Morgan Stanley Research

US Steel Market: Supply/Demand Model

	Shipments			Imports*		Exports		Apparent Demand		Production		Capacity		US Op.	Net Imports	
Year	(000 tons)	% Change	INDEX	(000 tons)	% Change	(000 tons)	% Change	(000 tons)	% Change	(000 tons)	% Change	(000 tons)	% Change	Rate	(000 tons)	% Change
1985	69,688	-3.8%	0.80	18,507	-14.9%	929	-0.3%	87,265	-6.4%	87,290	-4.3%	133,597	-1.0%	**65.3%**	17,577	-15.5%
1986	76,686	10.0%	0.88	17,929	-3.1%	1,127	21.2%	93,488	7.1%	80,406	-7.9%	127,906	-4.3%	**62.9%**	16,802	-4.4%
1987	83,494	8.9%	0.96	17,946	0.1%	2,070	83.7%	99,370	6.3%	88,389	9.9%	112,163	-12.3%	**78.8%**	15,876	-5.5%
1988	84,259	0.9%	0.97	15,028	-16.3%	4,576	121.1%	94,711	-4.7%	99,287	12.3%	111,690	-0.4%	**88.9%**	10,452	-34.2%
1989	84,736	0.6%	0.97	14,710	-2.1%	4,555	-0.5%	94,891	0.2%	97,434	-1.9%	115,919	3.8%	**84.1%**	10,155	-2.8%
1990	78,868	-6.9%	0.90	13,505	-8.2%	6,346	39.3%	86,028	-9.3%	97,763	0.3%	116,722	0.7%	**83.8%**	7,159	-29.5%
1991	82,354	4.4%	0.94	13,795	2.1%	4,288	-32.4%	91,862	6.8%	87,447	-10.6%	117,632	0.8%	**74.3%**	9,507	32.8%
1992	89,022	8.1%	1.02	13,971	1.3%	3,968	-7.4%	99,024	7.8%	91,604	4.8%	112,779	-4.1%	**81.2%**	10,002	5.2%
1993	95,347	7.1%	1.09	20,770	48.7%	3,826	-3.6%	112,292	13.4%	95,906	4.7%	109,920	-2.5%	**87.3%**	16,944	69.4%
1994	96,859	1.6%	1.11	17,773	-14.4%	7,080	85.1%	107,551	-4.2%	97,941	2.1%	108,216	-1.5%	**90.5%**	10,693	-36.9%
1995	100,530	3.8%	1.15	19,888	11.9%	5,031	-28.9%	115,388	7.3%	103,176	5.3%	112,470	3.9%	**91.7%**	14,858	39.0%
1996	105,538	5.0%	1.21	22,321	12.2%	6,036	20.0%	121,824	5.6%	105,309	2.1%	115,801	3.0%	**90.9%**	16,286	9.6%
1997	102,143	-3.2%	1.17	31,664	41.9%	5,520	-8.5%	128,287	5.3%	108,561	3.1%	121,422	4.9%	**89.4%**	26,144	60.5%
1998	105,103	2.9%	1.20	24,504	-22.6%	5,426	-1.7%	124,181	-3.2%	108,752	0.2%	125,282	3.2%	**86.8%**	19,078	-27.0%
1999	109,050	3.8%	1.25	26,512	8.2%	6,529	20.3%	129,032	3.9%	107,395	-1.2%	128,157	2.3%	**83.8%**	19,982	4.7%
2000	98,940	-9.3%	1.13	21,711	-18.1%	6,144	-5.9%	114,507	-11.3%	112,242	4.5%	129,941	1.4%	**86.4%**	15,567	-22.1%
2001	100,000	1.1%	1.15	21,527	-0.8%	6,009	-2.2%	115,519	0.9%	99,321	-11.5%	125,450	-3.5%	**79.2%**	15,519	-0.3%
2002	105,628	5.6%	1.21	16,196	-24.8%	8,220	36.8%	113,605	-1.7%	100,958	1.6%	113,774	-9.3%	**88.7%**	7,977	-48.6%
2003	110,952	5.0%	1.27	28,389	75.3%	7,893	-4.0%	131,448	15.7%	103,261	2.3%	121,265	6.6%	**85.2%**	20,496	157.0%
2004	103,224	-7.0%	1.18	24,928	-12.2%	9,492	20.3%	118,660	-9.7%	109,879	6.4%	116,193	-4.2%	**94.6%**	15,436	-24.7%
2005	108,609	5.2%	1.24	35,953	44.2%	9,728	2.5%	134,834	13.6%	104,606	-4.8%	119,506	2.9%	**87.5%**	26,225	69.9%
2006	106,112	-2.3%	1.22	26,587	-26.1%	11,082	13.9%	121,617	-9.8%	108,234	3.5%	123,515	3.4%	**87.6%**	15,505	-40.9%
2007	97,957	-7.7%	1.12	25,956	-2.4%	13,477	21.6%	110,436	-9.2%	108,228	0.0%	124,445	0.8%	**87.0%**	12,479	-19.5%
2008	60,352	-38.4%	0.69	14,180	-45.4%	9,281	-31.1%	65,251	-40.9%	100,697	-7.0%	124,402	0.0%	**80.9%**	4,899	-60.7%
2009	60,352	0.0%	0.69	14,180	0.0%	9,281	0.0%	65,251	0.0%	64,149	-36.3%	124,677	0.2%	**51.5%**	4,899	0.0%
2010	83,443	38.3%	0.96	18,852	32.9%	12,004	29.3%	90,292	38.4%	88,730	38.3%	126,110	1.1%	**70.4%**	6,849	39.8%
2011	91,830	10.1%	1.05	21,834	15.8%	13,454	12.1%	100,211	11.0%	95,212	7.3%	127,881	1.4%	**74.5%**	8,380	22.4%
2012	95,949	4.5%	1.10	25,826	18.3%	13,744	2.2%	108,030	7.8%	97,769	2.7%	129,661	1.4%	**75.4%**	12,081	44.2%
2013	95,423	-0.5%	1.09	24,829	-3.9%	12,682	-7.7%	107,570	-0.4%	95,766	-2.0%	124,910	-3.7%	**76.7%**	12,147	0.5%
2014	98,249	3.0%	1.13	33,634	35.5%	12,044	-5.0%	119,838	11.4%	97,195	1.5%	125,420	0.4%	**77.5%**	21,589	77.7%
2015E	95,110	-3.2%	1.09	33,634	0.0%	12,044	0.0%	116,699	-2.6%	94,669	-3.6%	126,920	0.4%	**74.6%**	21,589	0.0%
2016E	105,071	10.5%	1.20	31,952	-5.0%	12,044	0.0%	124,979	7.1%	105,927	11.9%	126,920	0.0%	**83.5%**	19,907	-7.8%
2017E	107,842	2.6%	1.24	33,230	4.0%	12,044	0.0%	129,028	3.2%	109,099	3.0%	128,734	1.4%	**84.7%**	21,186	6.4%
2018E	108,671	0.8%	1.25	34,559	4.0%	12,044	0.0%	131,186	1.7%	110,051	0.9%	128,734	0.0%	**85.5%**	22,515	6.3%
2019E	109,483	0.7%	1.25	35,942	4.0%	12,044	0.0%	133,380	1.7%	110,985	0.8%	130,548	1.4%	**85.0%**	23,897	6.1%
2020E	110,277	0.7%	1.26	37,379	4.0%	12,044	0.0%	135,611	1.7%	111,898	0.8%	130,548	0.0%	**85.7%**	25,335	6.0%

Source: Morgan Stanley Research

US Steel Market: Key Leading Indicators

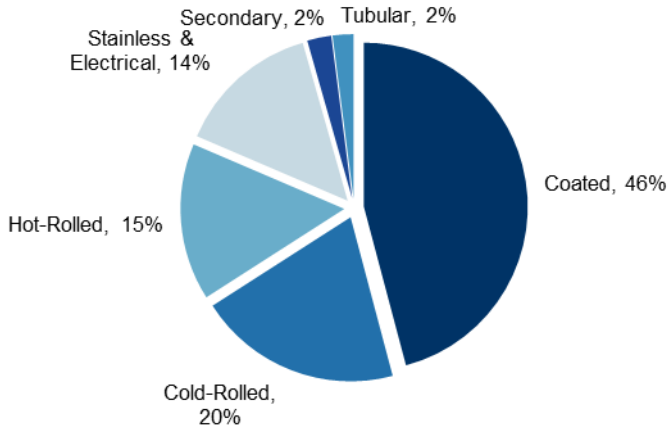
Prices	**Turkish Scrap (SBB/Bloomberg)**
	China Steel Futures(SBB/Bloomberg)
	Iron Ore CIF China (Platts/Bloomberg)
	Shanghai HRC (Antaike/Bloomberg)
Economic	**US PMI**
	China PMI
	China M2
Other	**AIA Billings Index (AIA Website)**
	Dodge Construction Starts (Mcgraw-Hill)
	China Property Sales (NBS)
Coincident and Lagging Indicators	**US Imports (Census Bureau)**
	US Shipments (AISI)
	US Production (AISI)
	US Export (AISI)
	US Preliminary Imports Licenses (AISI)
	US Service Center Shipments (MSCI)
	US Benchmark Scrap Prices (AMM)
	Global Steel Production (WSA)
	US Auto SAAR (Bloomberg)

Source: Morgan Stanley Research

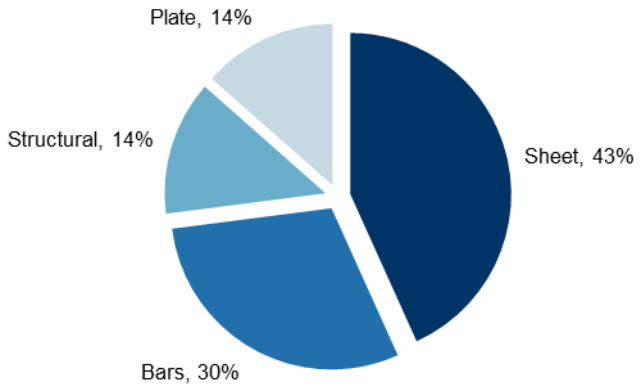
US Steel Companies and Valuation

US Steel Market: Company Comparison by Product

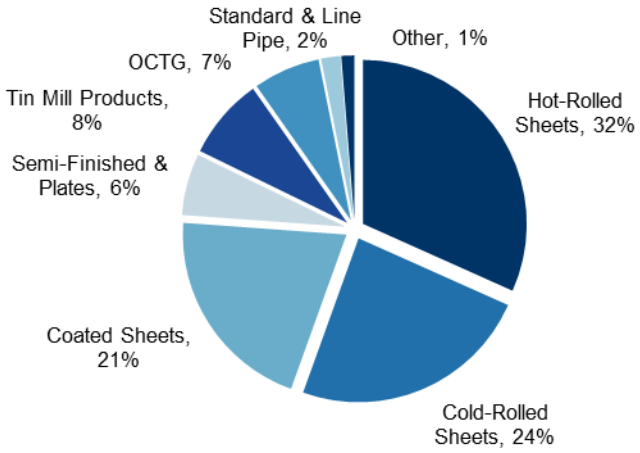
AK Steel Products



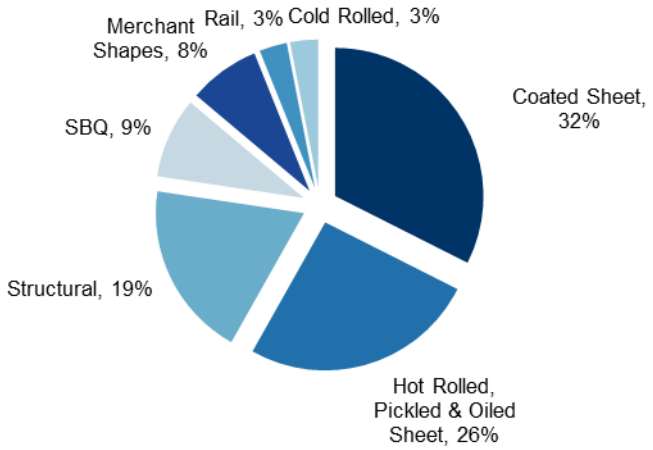
Nucor Products



US Steel Products



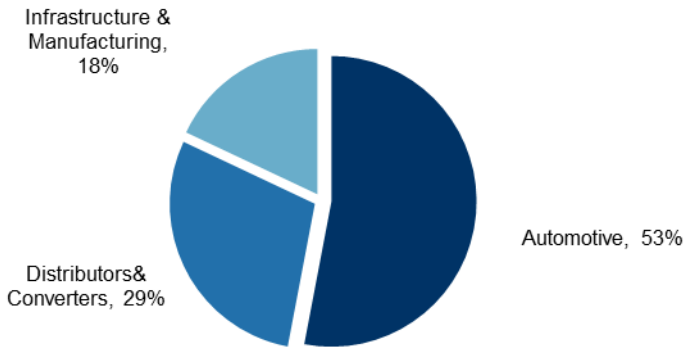
Steel Dynamics Products



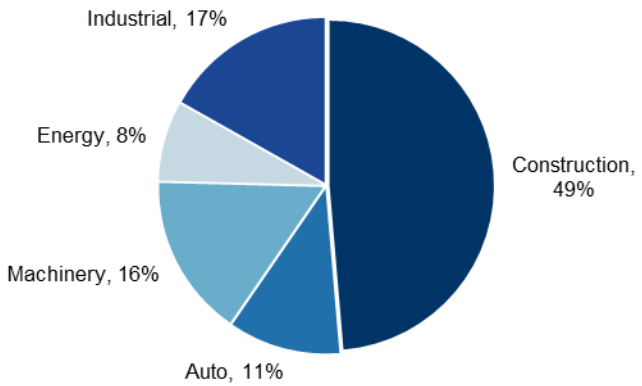
Source: Company Data, Morgan Stanley Research

US Steel Market: Major Player End-Market Exposure

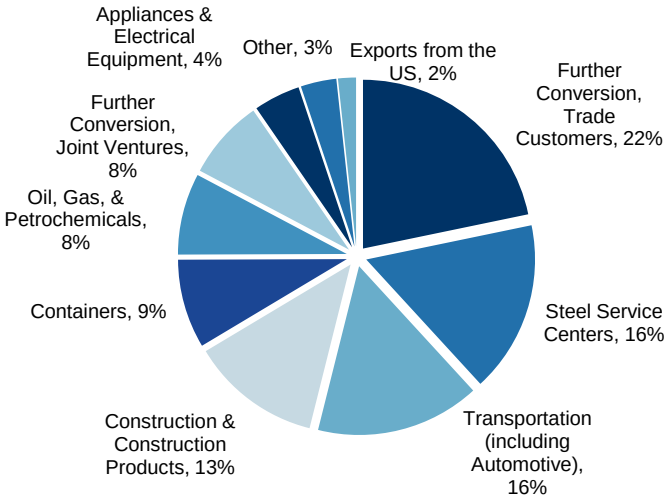
AK Steel End-Markets



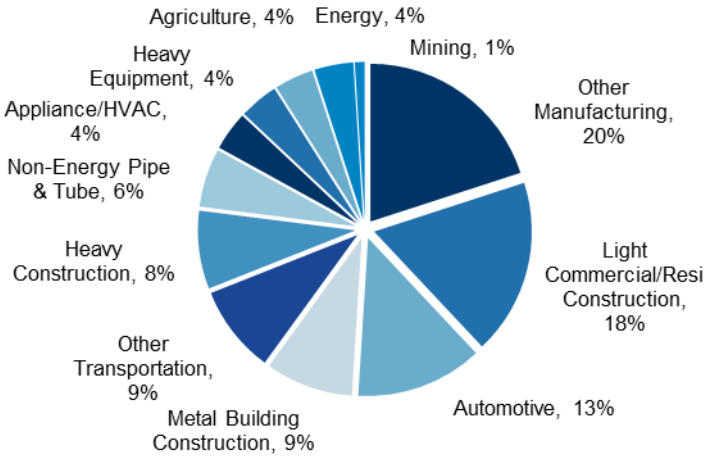
Nucor End-Products



US Steel End-Products



Steel Dynamics End-Products



Source: Company Data, Morgan Stanley Research

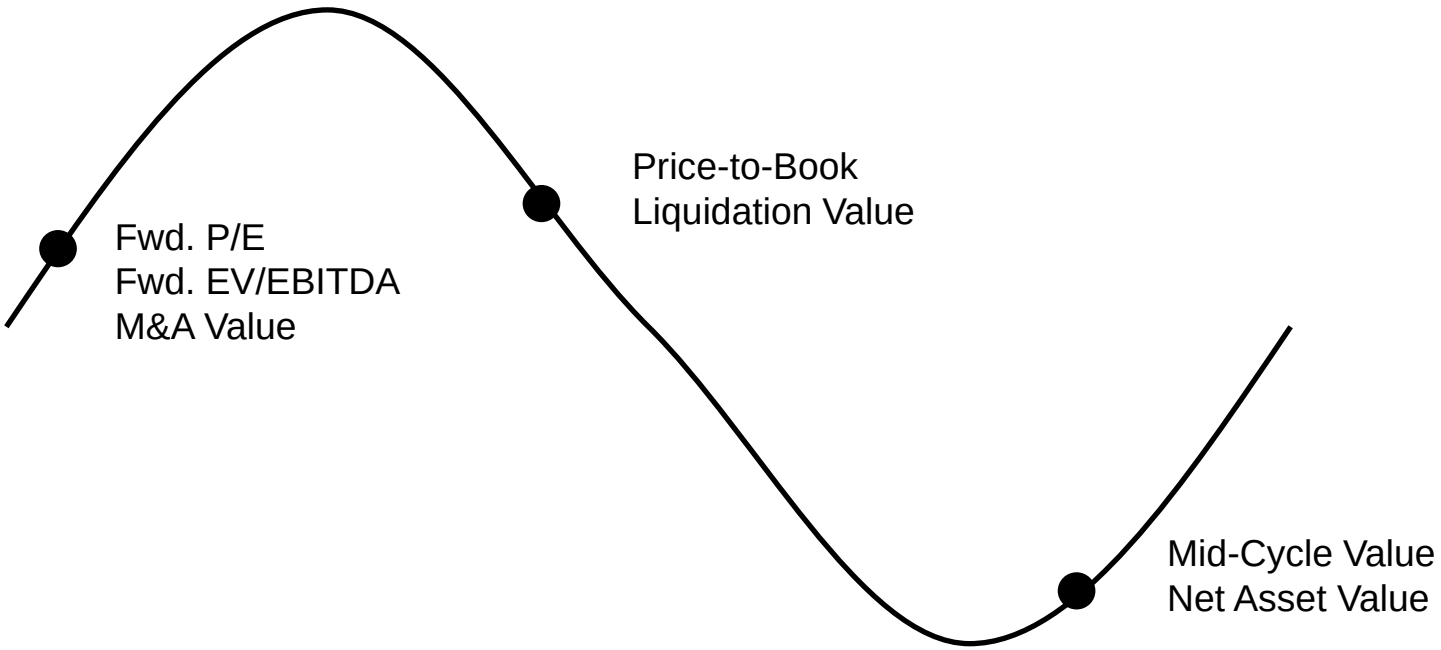
US Steel Market: Raw Material Integration by Company

Company	2015 Self Sufficiency			
	Iron Ore	Coking Coal	Coke	Scrap Processing****
AK Steel	25% (Up to 35%)*	Contracted at ~$110/t, ~0.5 mt/year production	100%	0%
Commercial Metals	NA	NA	NA	100%
Nucor	NA	NA	NA	35%
Schnitzer Steel	NA	NA	NA	700%
Steel Dynamics	100%**	Contracted at ~$110/t	NA	100%
US Steel	100%***	Contracted at ~$110/t	100%	0%

*Calculated with Magnetation JV that has now filed for Chapter 11 bankruptcy protection.
**Steel Dynamics can feed its iron nugget plant from in-house iron ore concentrate, but the plant is idled.
***US Operations Only. US Steel purchases approximately 5.5mn tons of iron ore in Europe.
****Integration is calculated as scrap consumed/scrap processed, even though this is not a perfect hedge.

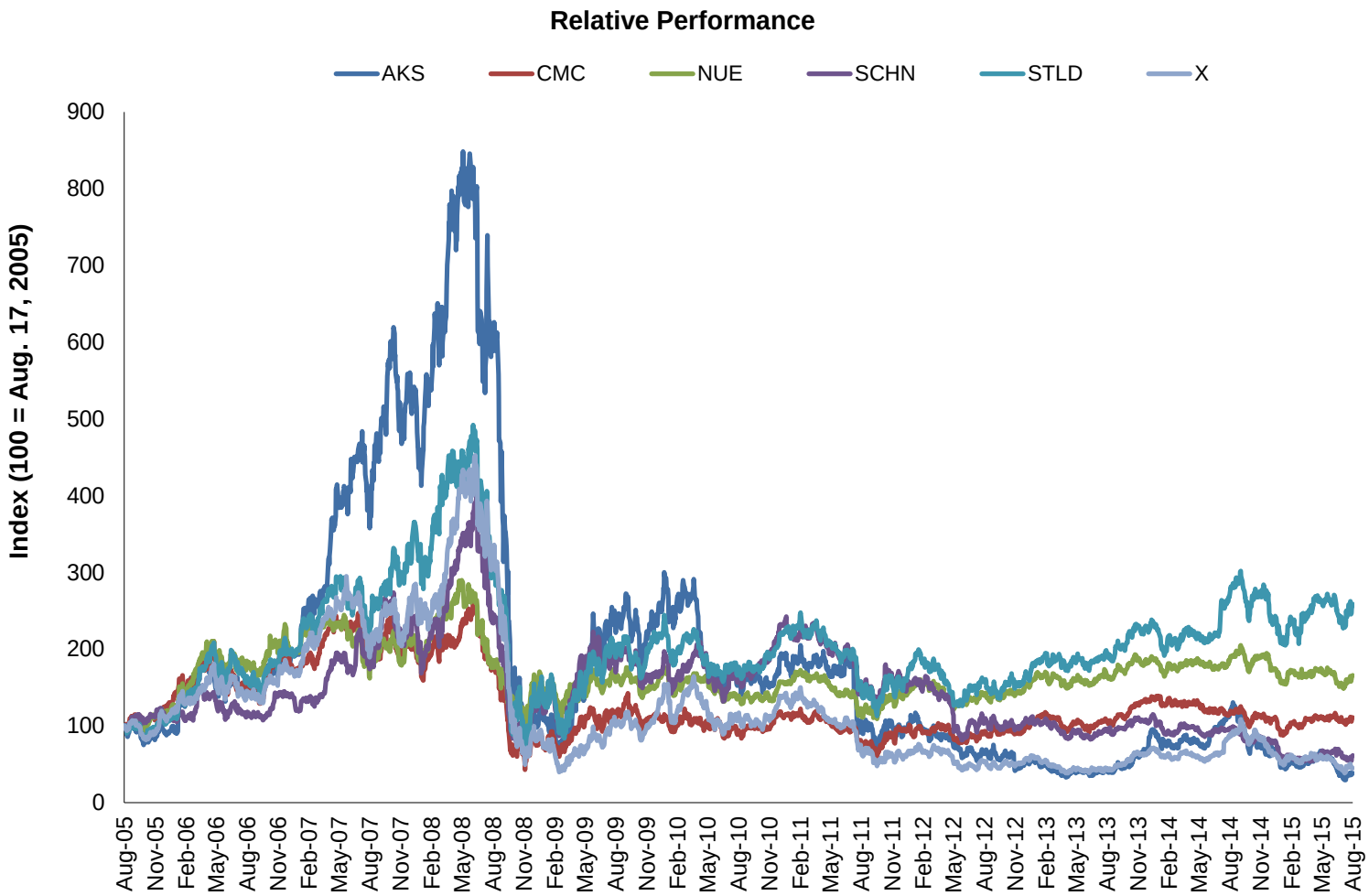
Source: Company Data, Morgan Stanley Research

US Steel Valuation: Cycle Valuation Methodology



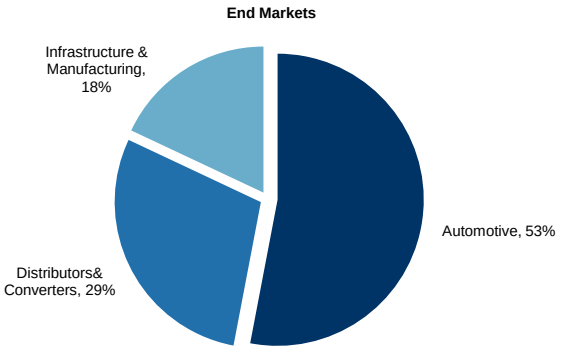
Source: Morgan Stanley Research

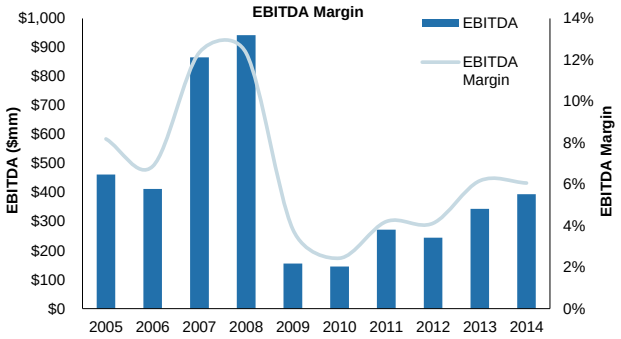
Relative Performance – Steel

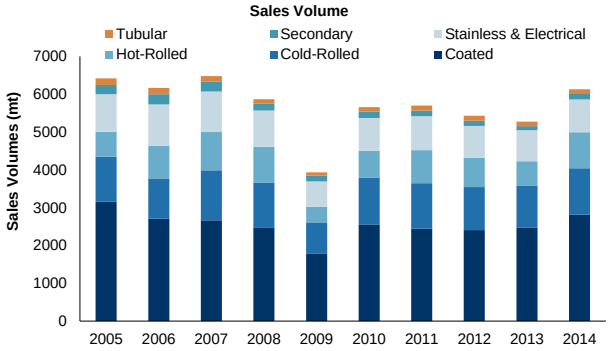


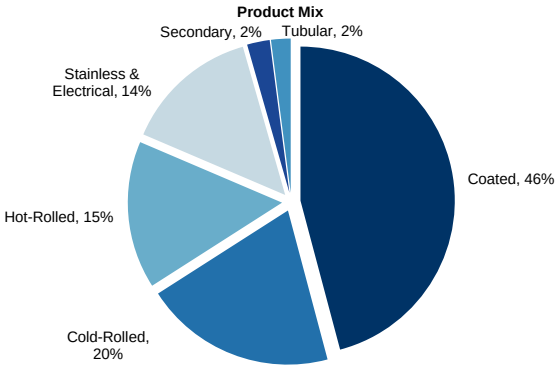
Source: Morgan Stanley Research

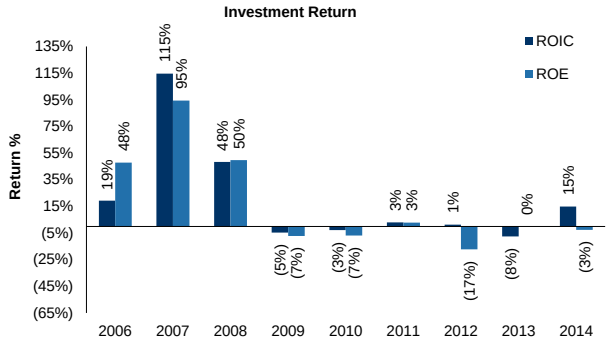
Company Profiles – AK Steel

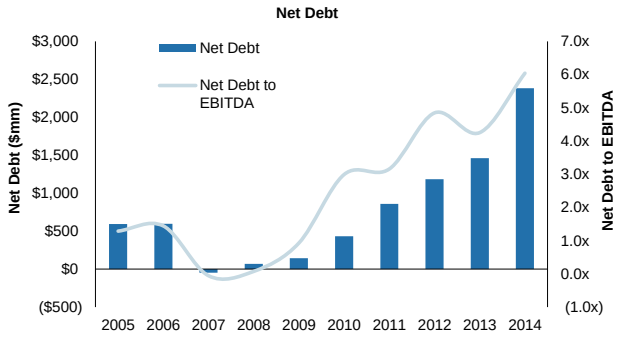






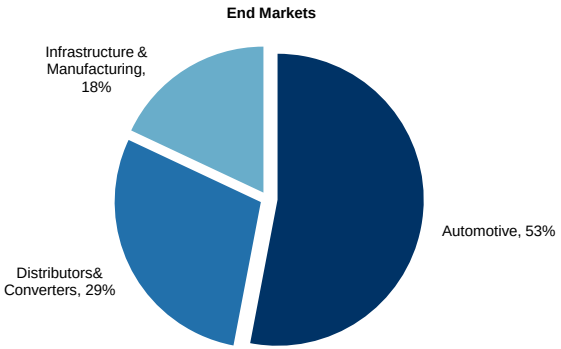


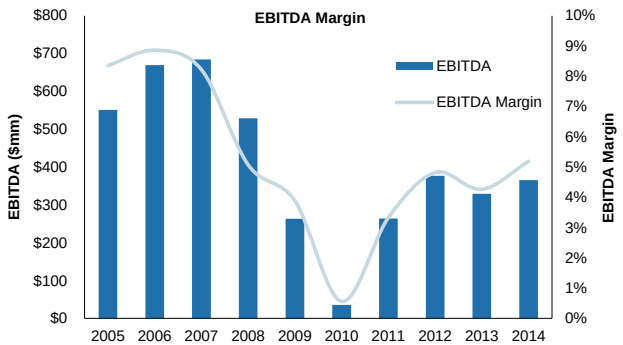


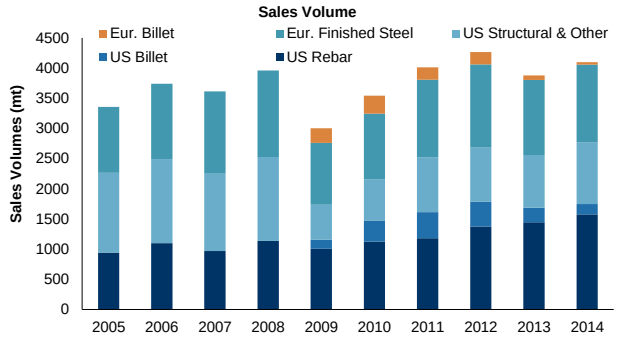


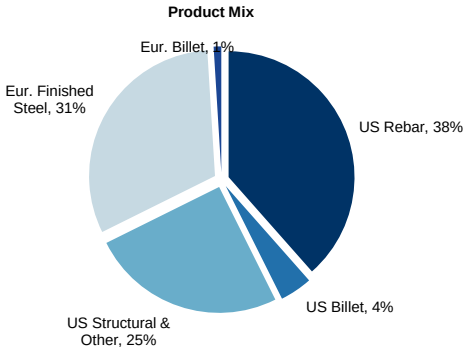
Source: Company Data, Morgan Stanley Research

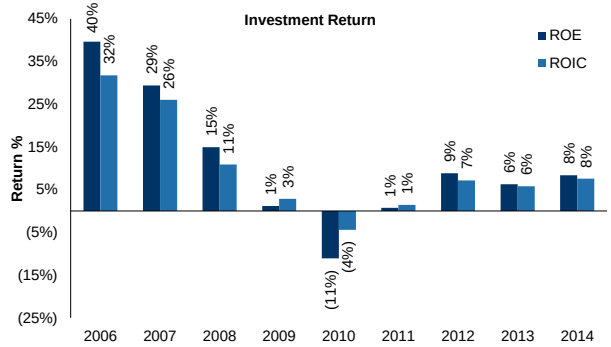
Company Profiles – Commercial Metals Company

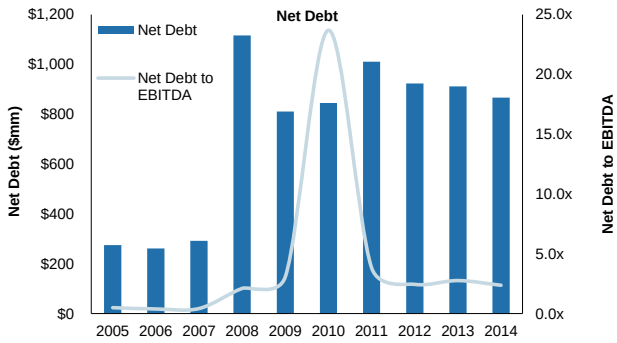






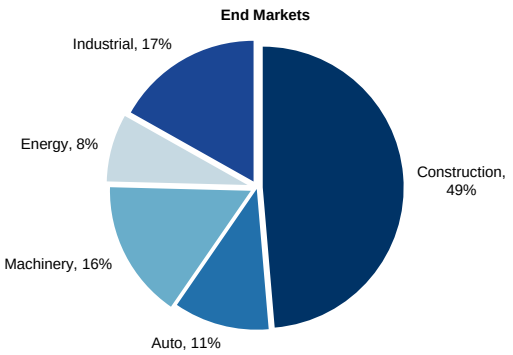


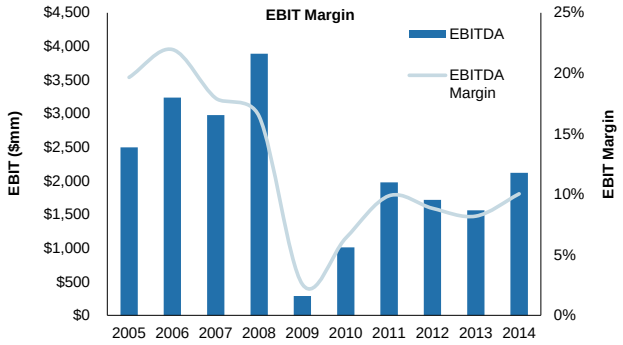


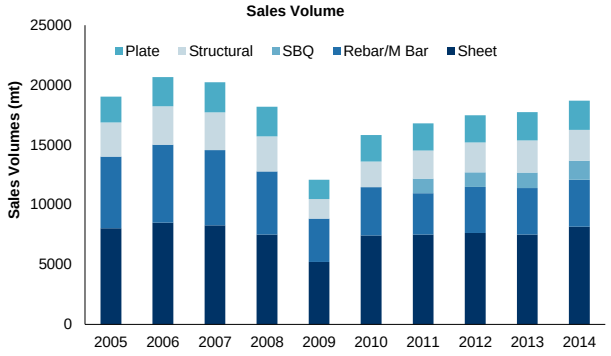


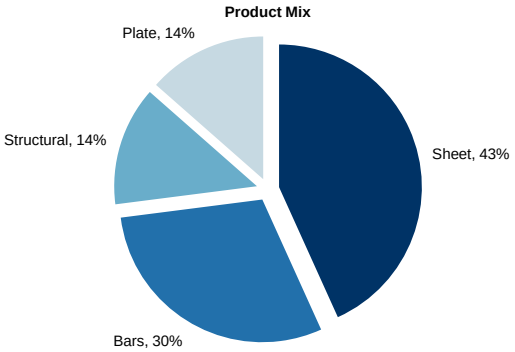
Source: Company Data, Morgan Stanley Research

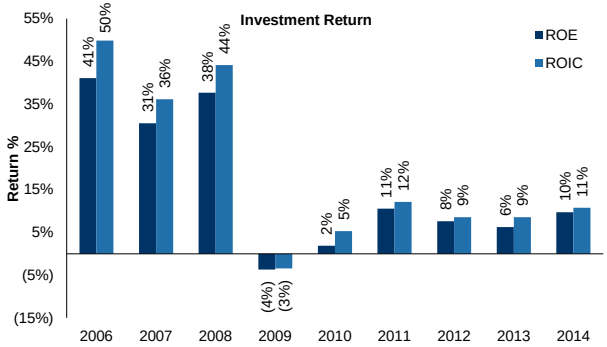
Company Profiles – Nucor

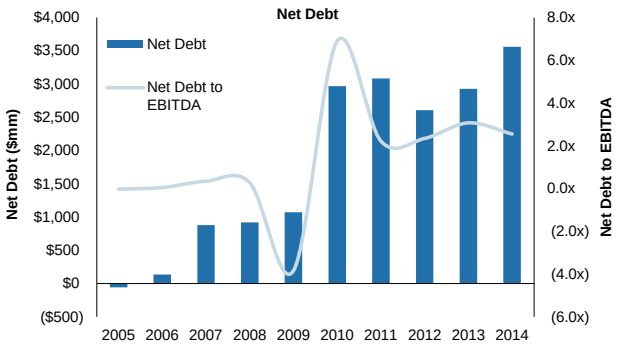






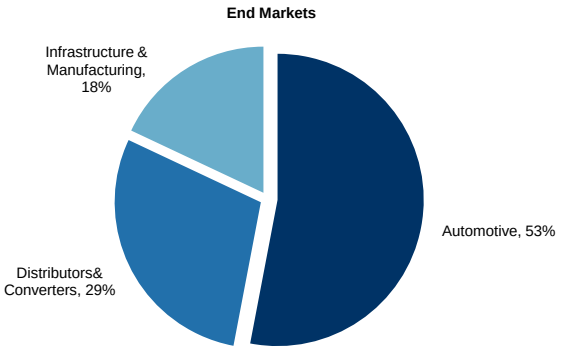


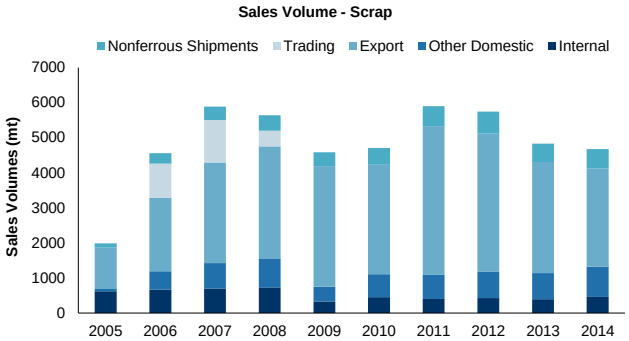


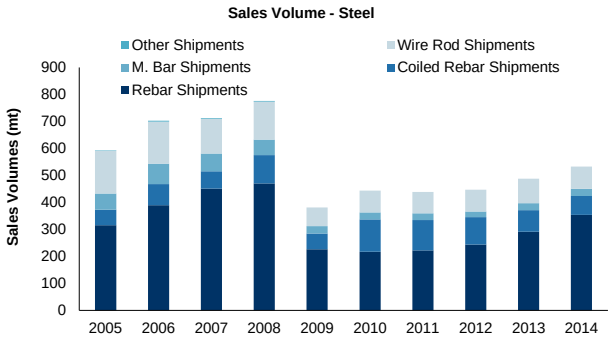


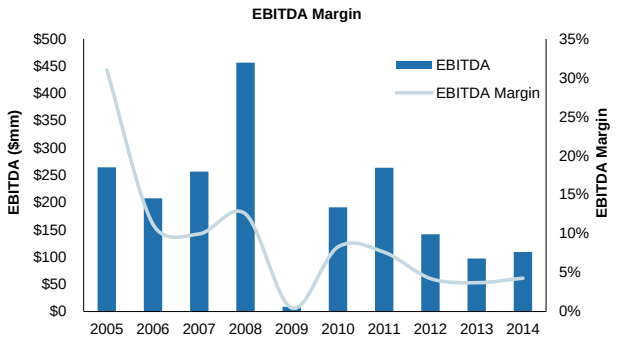
Source: Company Data, Morgan Stanley Research

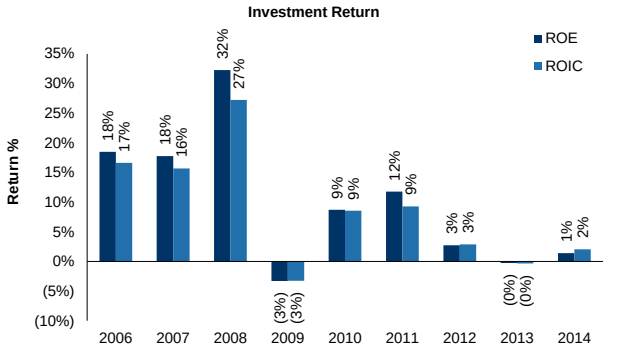
Company Profiles – Schnitzer Steel Industries

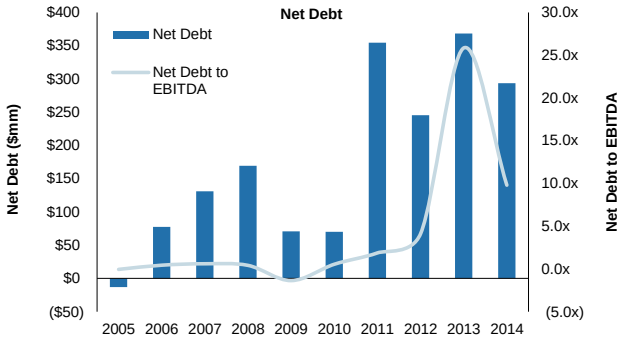






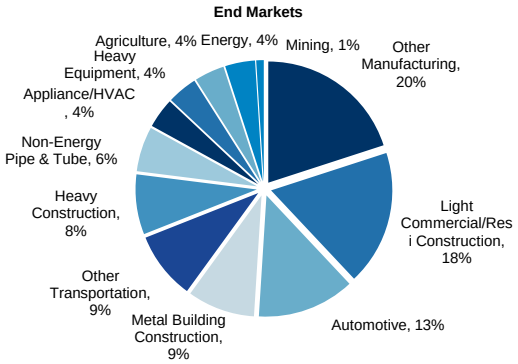


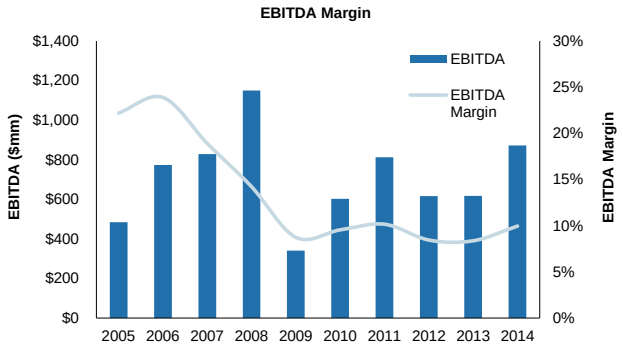


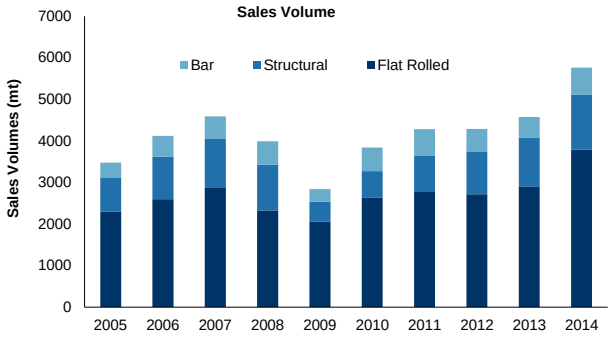


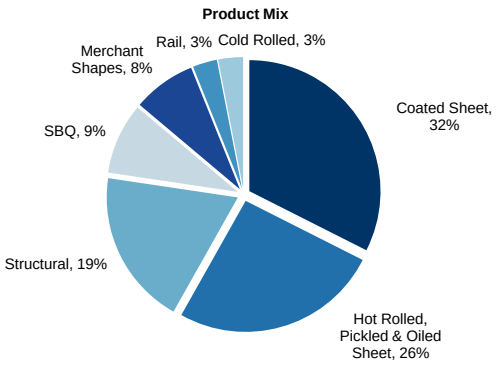
Source: Company Data, Morgan Stanley Research

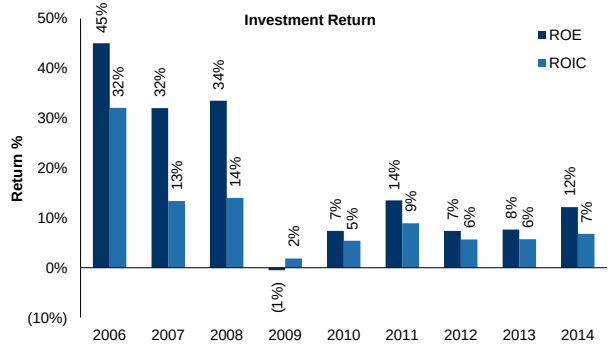
Company Profiles – Steel Dynamics Inc.

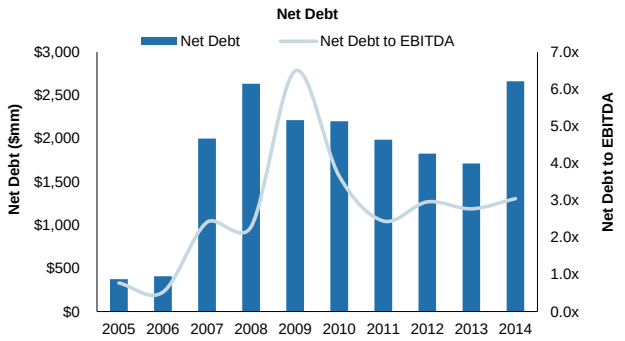






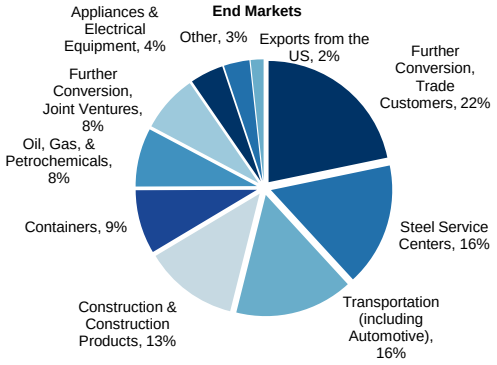


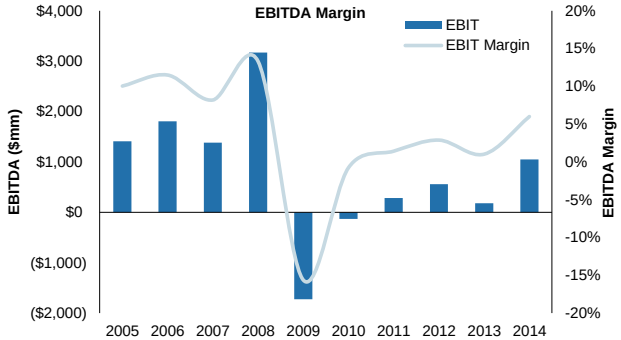


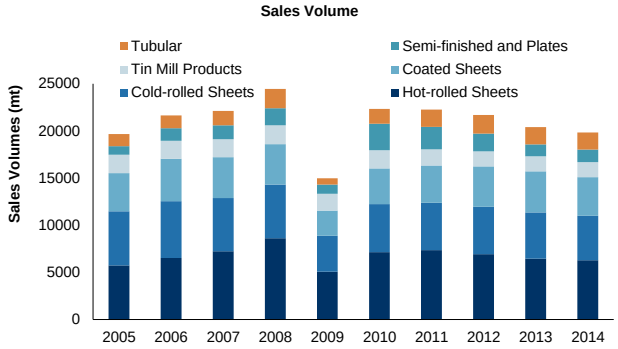


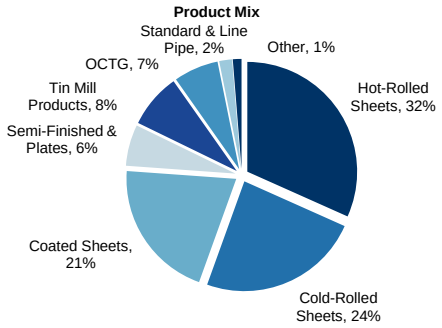
Source: Company Data, Morgan Stanley Research

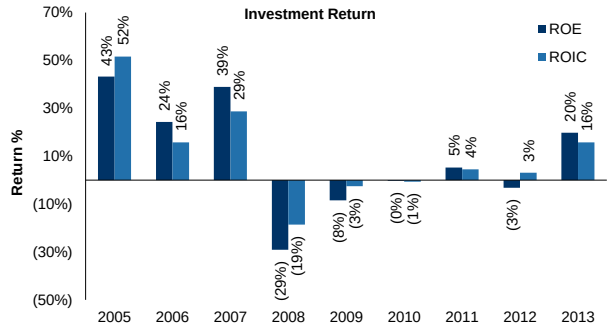
Company Profiles – United States Steel Corp

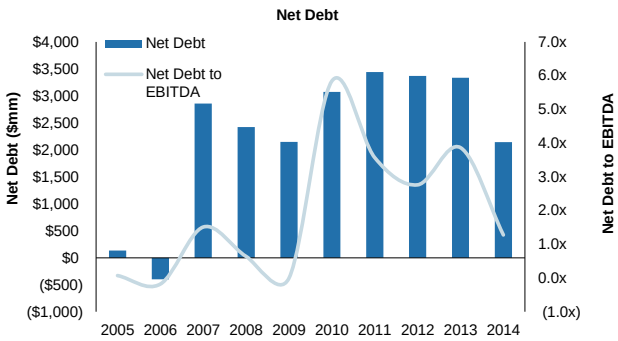












Source: Company Data, Morgan Stanley Research

Iron Ore Overview

Iron Ore Overview: Properties and Uses

General Iron Ore Characteristics

- Iron ore is present in iron-rich sedimentary rocks (banded iron formations)
- Mined in the form of iron oxide, and converted into iron ore during the steelmaking process
- Export market dominated by Brazil and Australia

Iron ore represents an integral component in the steelmaking process

Iron Ore Quality and Production Uses

- 98% of all iron ore is used in the steelmaking process
- "Pig iron" is an intermediate form of molten iron after the iron ore has been placed in the blast furnace





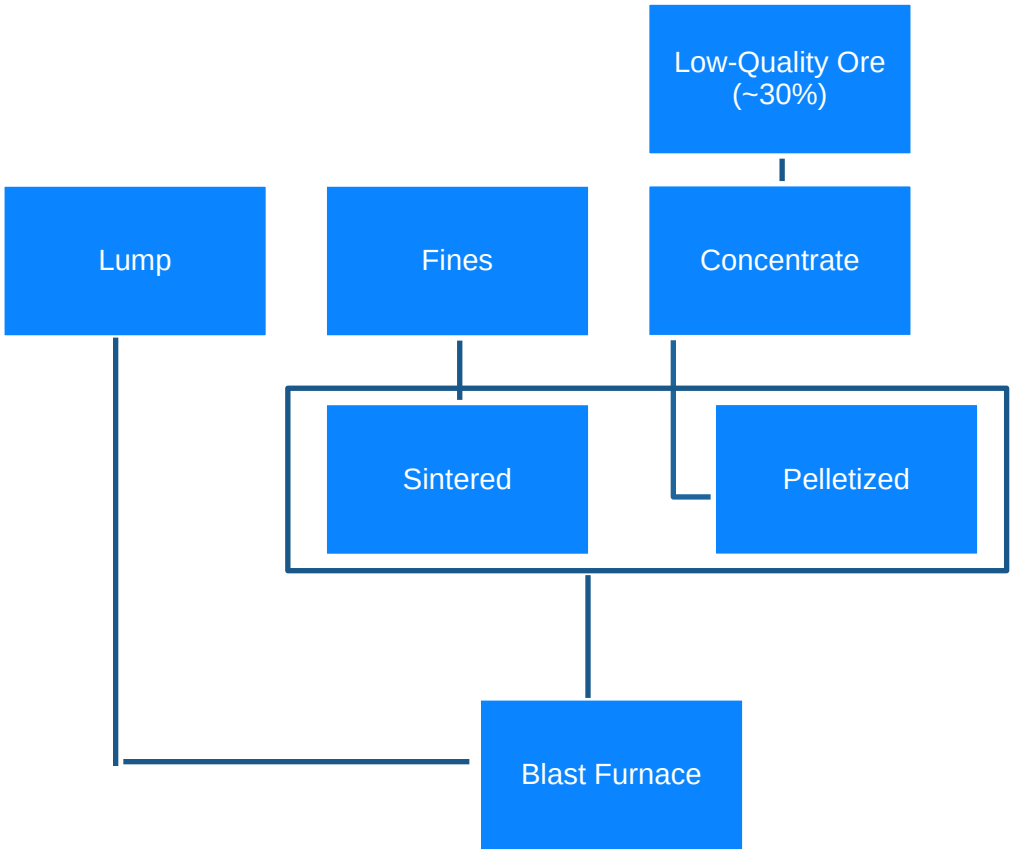




Iron ore is mined in the form of oxides and transported away from the mine → The rock containing the ore is then ground and extracted using magnetic rollers → Next, the ore is processed into clumps (above) and placed in a blast furnace with coke and limestone, yielding pig iron → The resulting pig iron (above) is then placed in an basic oxygen converter or electric arc furnace, resulting in the production of steel

Source: USGS, Australian Mines Atlas, ArcelorMittal, Morgan Stanley Research,

Iron Ore Overview: Product Mix and Flow Chart



Iron ore is limited in its uses according to its quality, which often needs to be altered in order to be used in the steelmaking process

- Lump and fines are considered “direct saleable ore” in that they only require crushing and sizing in order to create a sellable product
- Lump ore can be placed directly into the blast furnace without any alterations, allowing it to attract a price premium
- However, fines first need to be “sintered” and concentrates need to be “pelletized” in order for them to be placed into the blast furnace
- “Sintering” heats the iron ore fines with coke fines or coal to create a semi-molten form
- This form solidifies into pieces of sinter that can be placed in the blast furnace
- Either fines or crushed low-quality ore (concentrate) can be “pelletized” into a higher-grade ore that can be used in the blast furnace
- The process of pelletizing ore occurs when the ground ore is combined with binding or fluxing agents, sent to a balling area and then placed in a grate or kiln to dry
- From the kiln, the pellets are heated again to complete the induration process and then are cooled until suitable for transport

Source: Resource Capital Research, Metso, Morgan Stanley Research

Iron Ore Overview: Benchmark Prices and Premium Qualities

Commonly used benchmark price for iron ore spot price is the Platts Iron Ore Index (IODEX)

Platts' assessment has been used since the breakdown of annually negotiated prices in 2010. Their assessment is based on a standard specification of iron ore fines with 62% iron, 2% alumina, and 4.5% silica. The proportions of these elements vary according to the quality of the ore. Higher-quality ores, which command a higher price usually consist of 65% iron, while lower-quality and cheaper ores range from 30-58% iron content.

Higher-quality lump ore and pellets command a price premium in the spot market

For lump ore, Platts publishes a quarterly Australia Lump Premium Contract Price that represents lump contract price premiums agreed between suppliers and Chinese steelmakers for Australian lump. The premiums are not uniform and can vary by company, depending on the timing of the agreements, volume of the contract, and whether they are packaged with other products.

Iron ore blast furnace pellets also trade at a higher price than the benchmark

Usually priced in the form of provisional contract settlement prices for steel mills in Europe, pellets usually are priced higher than the quality-adjusted iron ore fines. Platts prices these contracts on a monthly basis. Additionally, US iron ore firms usually sell iron ore in the form of pellets.

Source: Morgan Stanley Research

Global Iron Ore Market

Global Iron Ore Market: Industry Trends and Headwinds

Chinese demand for steel remains critical for iron ore demand

Rapid pace of Chinese construction has driven iron ore demand in recent years, with China acting as the single largest consumer of iron ore globally. Levels of domestic steel consumption within China have become the key driver for iron ore demand growth.

Mine cost support remains a key determinant of prices

China has closed a number of its high-cost domestic mines in response to weaker iron ore prices. However, the major low-cost Australian and Brazilian firms have continued to ramp up production at the very bottom of the cost curve, which continues to depress prices.

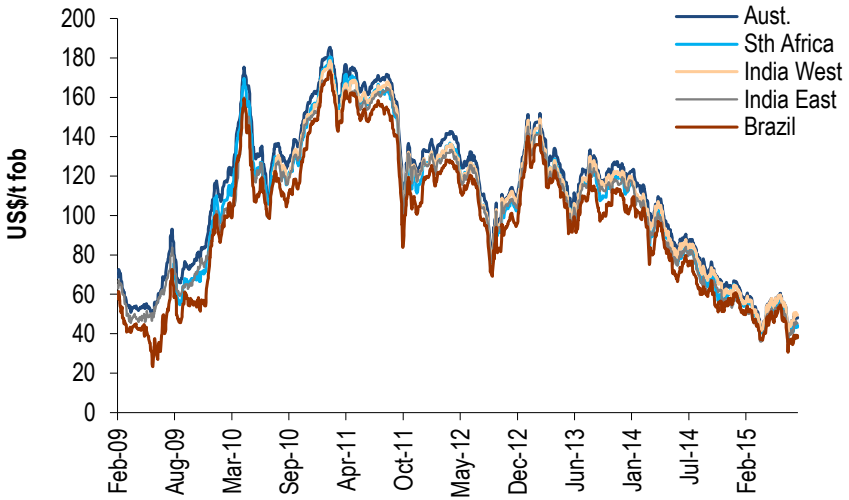
North American pellet market also facing oversupply

The North American pellet market is somewhat insulated from the global seaborne market since shipping costs in and out of the Great Lakes region, where most of the US blast furnaces are located, are expensive. However, new pellet supply from Essar Steel, Magnetation, and US Steel could push the market into oversupply at a time when blast furnaces are being shuttered in the US.

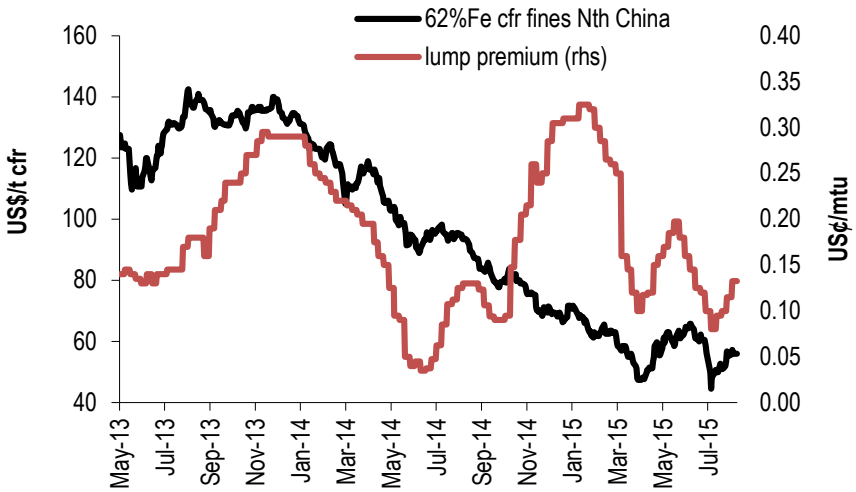
Source: Morgan Stanley Research

Global Iron Ore Market: Pricing Trends

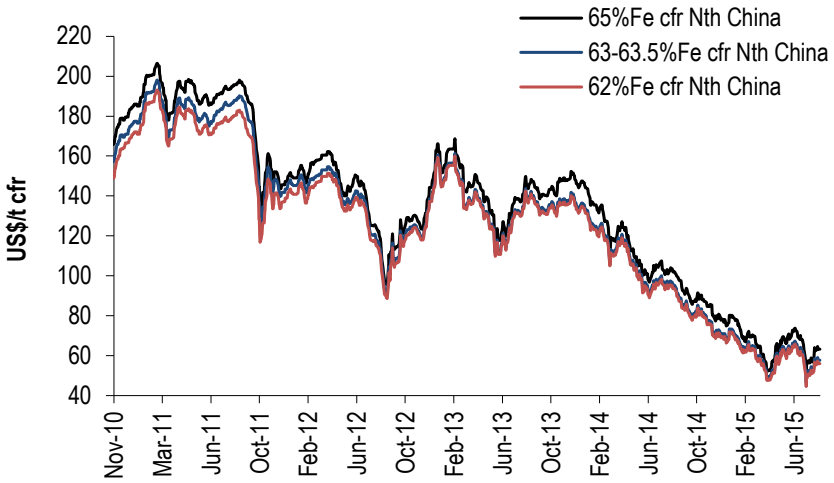
Iron ore spot indices (US$/t fob)



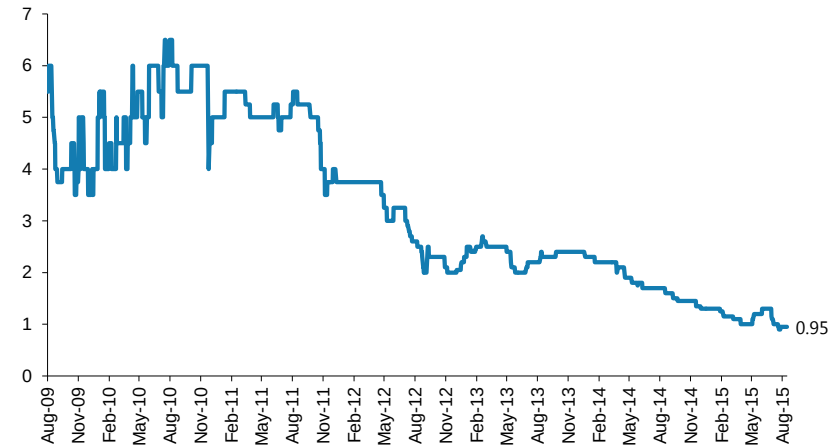
Iron ore spot fines vs. lump premium



China's iron ore spot indices (US$/t cfr)



Platts Iron Ore Premium for 1% Fe Differential (US$/dmt)

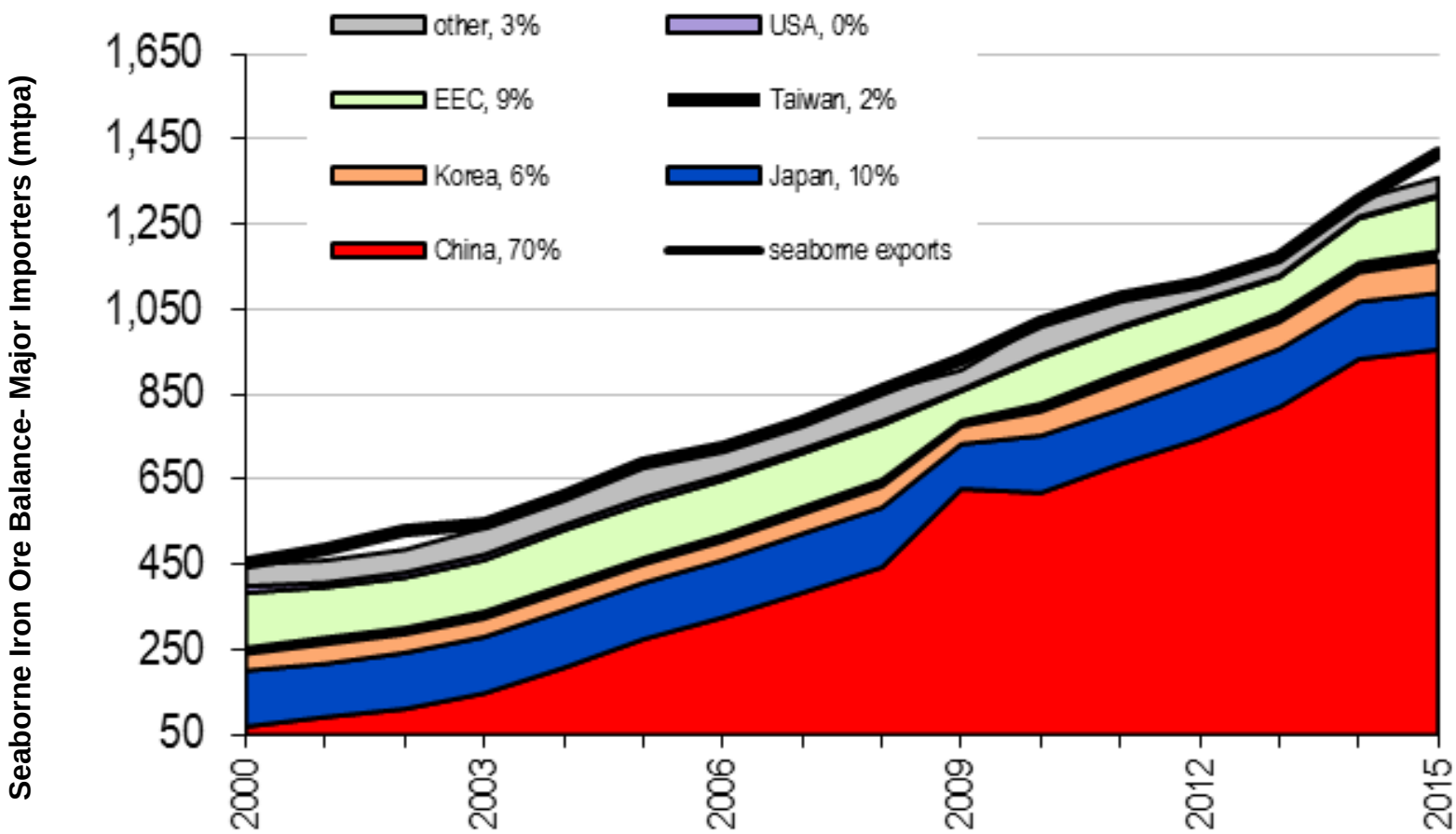


Source: Platts, Morgan Stanley Research

Global Iron Ore Market: It's Really All About China

China accounts for a majority of seaborne iron ore imports

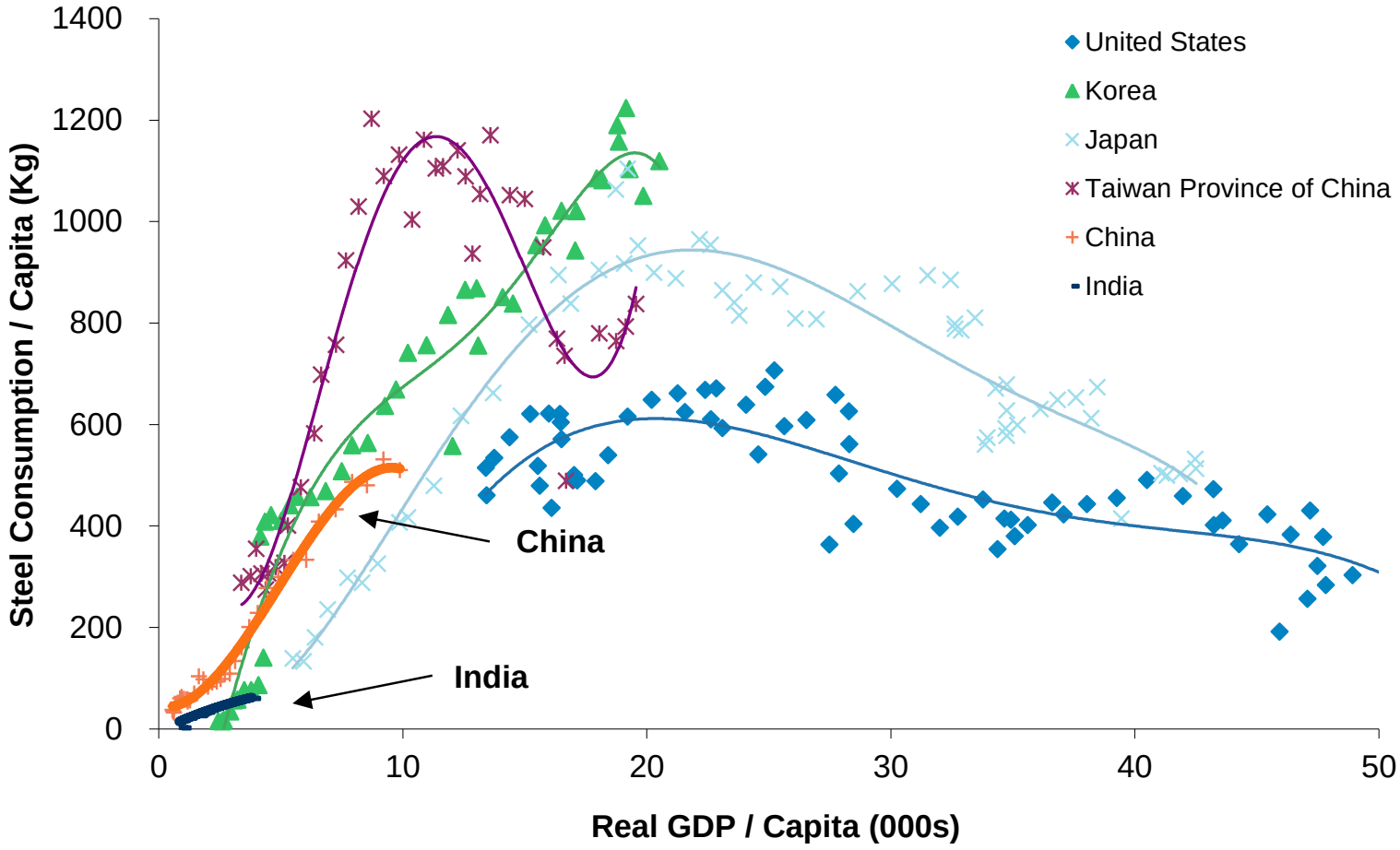
- Comprising roughly 70% of total seaborne imports, China is the clear import leader with the next largest importer, Japan, accounting for 10% of total imports



Source: Tex Report, Morgan Stanley Research

Global Iron Ore Market: China Steel Demand Is Key

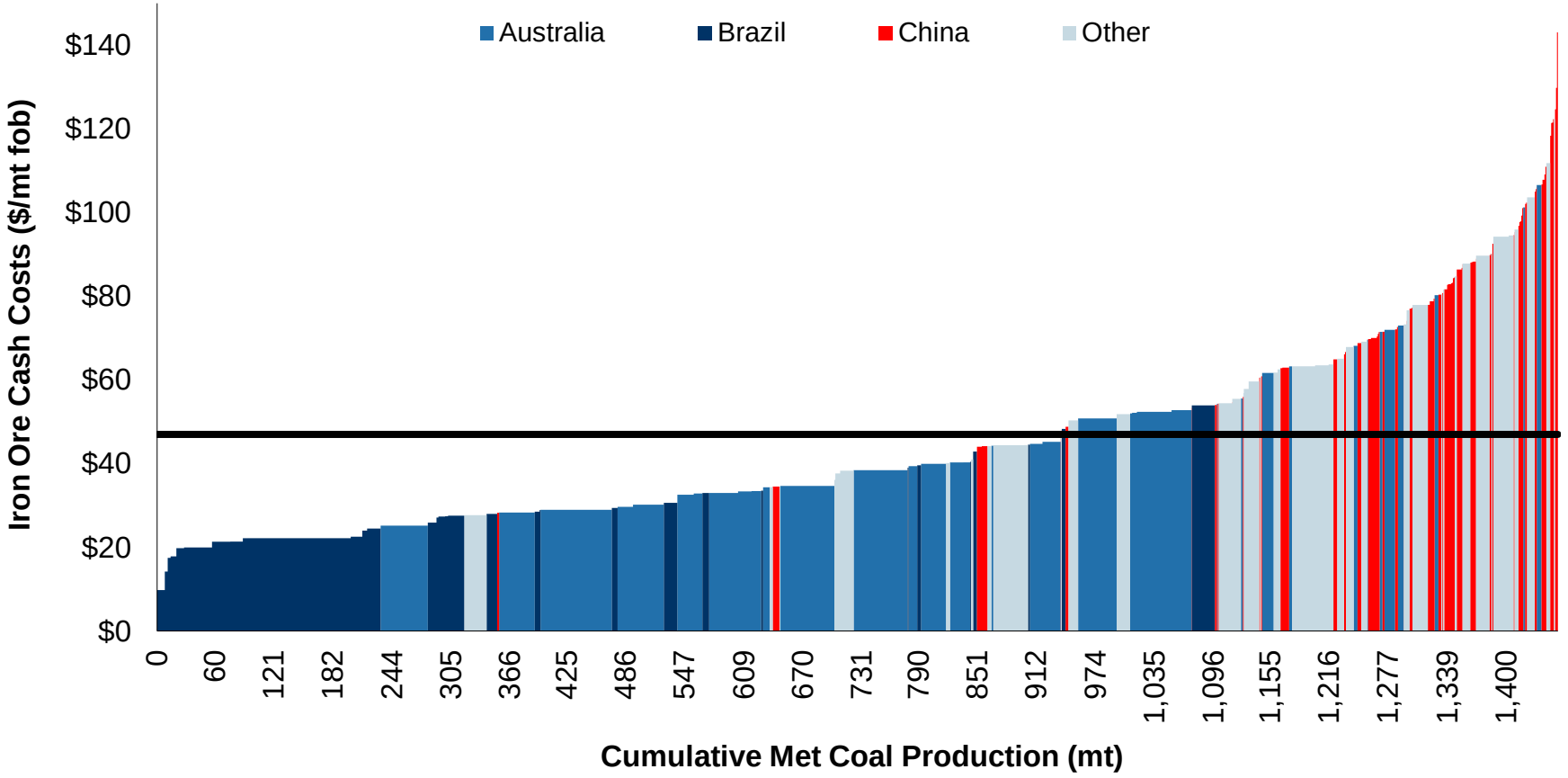
The initial ramp of China's steel intensive infrastructure build out may be plateauing, now that per capita consumption rates are close to US levels in a similar phase of its economic life-cycle.



Source: World Steel Association, IMF, Morgan Stanley Research

Global Iron Ore Market: Cost Curve

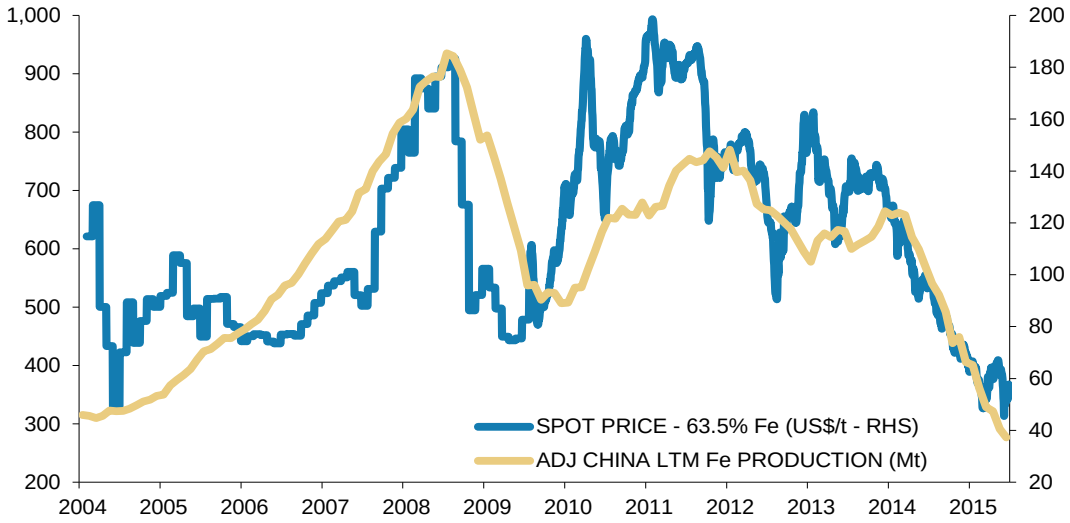
Brazil and Australia occupy the bottom half of the steep iron ore cost curve. Chinese domestic mines tend to be in the 4th quartile



Source: CRU, Morgan Stanley Research

Global Iron Ore Market: China Domestic Supply Is the Balancing Mechanism

China's Domestic Iron Ore Production Has Fluctuated with Price



China reliance on seaborne ore may grow

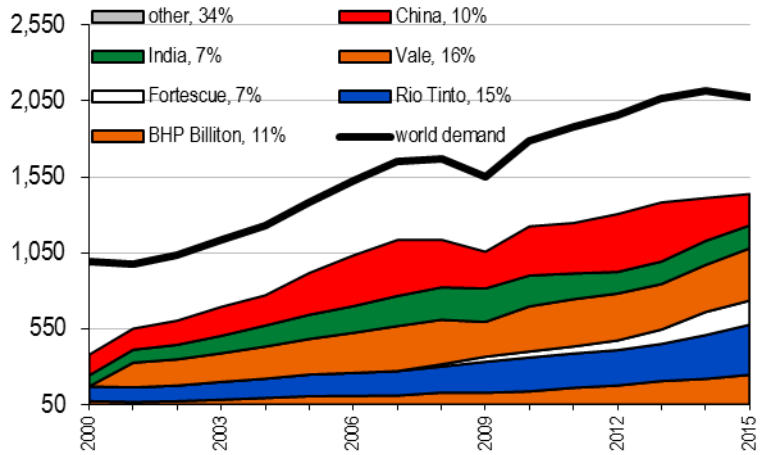
- Since Chinese mines tend to populate the 4th quartile of the cost curve, in theory, as low-cost Brazilian and Australian production ramps in a plateauing market, Chinese domestic mines should be displaced
- Chinese domestic production has been fairly responsive to iron ore prices, but we are concerned there may be ~200m mt that may not be economically rational as the mines are either state-owned and may run for employment, or are tied to backward-integrated steel mill located in Western China far from ports.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pig Iron Production	203	256	338	408	467	468	541	579	628	659	705	710
Fe Units Required	195	246	324	391	449	450	519	555	603	633	676	681
Sourced from Imports	93	131	174	203	234	273	392	386	419	484	510	580
Sourced domestically	101	115	150	188	214	177	127	170	185	149	166	101
Iron Ore Self Sufficency	52%	47%	46%	48%	48%	39%	24%	31%	31%	24%	25%	15%
Adjusted Grade	33%	33%	33%	31%	27%	23%	25%	25%	25%	25%	25%	25%
Adj Domestic ROM Production	**307**	**348**	**455**	**606**	**809**	**777**	**507**	**679**	**739**	**595**	**664**	**406**

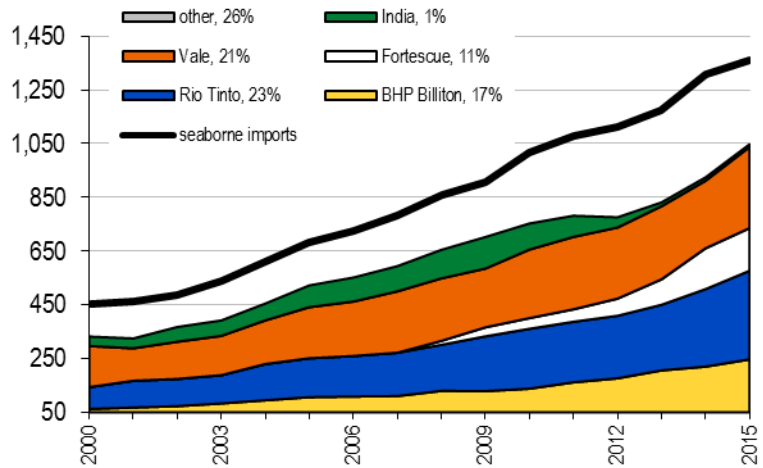
Source: MySteel, Platts, World Steel Associations, Morgan Stanley Research

Global Iron Ore Market: Major Players - Exporters

"Big Three" Exporters, Market Share of World Iron Ore Market



Seaborne Iron Ore Balance—Major Exporters (mtpa)



"Big Three" dominate the seaborne iron ore markets

- BHP Billiton, Rio Tinto, and Vale account for ~62% of the seaborne iron ore export market, with the next largest company, Fortescue, accounting for 11% of the market
- These exporters all possess relatively low-cost mining operations that have been able to weather the low-cost environment without having to make meaningful production cuts
- All three producers expected to set new production records in 2015, signifying that they are not yet ready to undertake production cuts in response to the weak pricing environment
- Forecasting a dip in production in 2016, with minimal increases in production resuming in 2017
- However, these three companies have begun to undertake meaningful cost reductions across their mining operations, with Vale recently achieving a sub-USD $20/ton cost for iron ore, reducing the likelihood of outright cuts from the majors.

Source: Tex Report, Morgan Stanley Research

Global Iron Ore Market: Seaborne Supply/Demand Balance

		2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	2025e
Global IP growth (adjusted PPP weights)		7.63	1.45	-6.36	10.92	5.49	3.75	3.36	4.50	4.95	5.13	5.07	5.05	5.03	4.97	4.20	4.10	3.80	3.10	3.00
Global crude steel production	Mt	1,346	1,330	1,234	1,418	1,515	1,554	1,638	1,660	1,667	1,702	1,733	1,761	1,783	1,807	1,752	1,775	1,798	1,824	1,850
YoY growth	%	*7.9%*	*-1.2%*	*-7.3%*	*14.9%*	*6.9%*	*2.6%*	*5.4%*	*1.3%*	*0.4%*	*2.1%*	*1.9%*	*1.6%*	*1.3%*	*1.3%*	*-3.0%*	*1.3%*	*1.3%*	*1.4%*	*1.4%*
China's crude steel production	Mt	489	500	574	627	684	730	815	823	824	827	835	843	848	853	860	865	871	876	882
YoY growth	%	*16.8%*	*2.2%*	*14.7%*	*9.3%*	*9.1%*	*6.7%*	*11.6%*	*0.9%*	*0.2%*	*0.3%*	*1.0%*	*1.0%*	*0.6%*	*0.6%*	*0.7%*	*0.6%*	*0.6%*	*0.7%*	*0.6%*
Global iron ore demand	Mt	1,654	1,668	1,552	1,786	1,881	1,960	2,064	2,118	2,036	2,038	2,056	2,077	2,094	2,113	2,138	2,162	2,188	2,215	2,242
Global iron ore supply	Mt	1,665	1,679	1,563	1,823	1,899	1,966	2,074	2,128	2,122	2,124	2,184	2,226	2,233	2,231	2,200	2,205	2,209	2,214	2,219
Global Balance	**Mt**	**11.5**	**10.5**	**10.6**	**37.5**	**18.1**	**5.8**	**9.6**	**9.9**	**85.8**	**85.7**	**127.8**	**149.3**	**138.3**	**117.7**	**61.7**	**42.6**	**21.7**	**-0.5**	**-23.6**
Total seaborne iron ore demand	Mt	783	858	907	1,017	1,078	1,110	1,174	1,313	1,340	1,406	1,446	1,471	1,488	1,501	1,513	1,524	1,536	1,548	1,559
YoY growth	%	*7.9%*	*9.6%*	*5.7%*	*12.1%*	*6.0%*	*3.0%*	*5.7%*	*11.9%*	*2.1%*	*4.9%*	*2.9%*	*1.7%*	*1.2%*	*0.9%*	*0.8%*	*0.7%*	*0.8%*	*0.8%*	*0.7%*
China iron ore import requirements	Mt	384	444	628	619	687	745	820	933	955	1,024	1,063	1,085	1,102	1,117	1,129	1,140	1,152	1,163	1,175
China as % of seaborne market	%	49%	52%	69%	61%	64%	67%	70%	71%	71%	73%	74%	74%	74%	74%	75%	75%	75%	75%	75%
Total seaborne iron ore supply	Mt	783	860	935	1,019	1,084	1,110	1,175	1,317	1,394	1,445	1,523	1,574	1,584	1,585	1,555	1,561	1,564	1,568	1,572
YoY growth	%	*7.6%*	*9.9%*	*8.7%*	*9.0%*	*6.4%*	*2.4%*	*5.9%*	*12.1%*	*5.8%*	*3.7%*	*5.3%*	*3.4%*	*0.6%*	*0.1%*	*-1.9%*	*0.4%*	*0.2%*	*0.2%*	*0.2%*
Seaborne Balance	**Mt**	**0.5**	**2.4**	**27.9**	**2.2**	**6.7**	**-0.4**	**1.8**	**4.3**	**54.1**	**39.7**	**76.5**	**103.3**	**95.8**	**84.6**	**41.7**	**36.5**	**28.7**	**20.4**	**12.6**
price CY fines cfr	**US$/t (62%Fe)**	**155**	**185**	**95**	**146**	**168**	**128**	**135**	**97**	**57**	**65**	**71**	**75**	**75**	**78**	**78**	**80**	**81**	**82**	**84**
price CY fines cfr	**US¢/mtu**	**250**	**298**	**153**	**235**	**270**	**207**	**218**	**156**	**93**	**105**	**115**	**121**	**121**	**126**	**126**	**128**	**131**	**133**	**135**
price CY lump cfr	**US$/t**	**89**	**137**	**98**	**167**	**189**	**137**	**147**	**108**	**70**	**76**	**81**	**92**	**103**	**103**	**86**	**88**	**89**	**91**	**92**
lump/fine differential	*US$/t*	*-66.5*	*-47.9*	*2.8*	*21.1*	*21.5*	*8.6*	*12.3*	*10.5*	*12.6*	*11.5*	*10.2*	*17.4*	*28.0*	*25.0*	*7.8*	*8.0*	*8.1*	*8.2*	*8.4*
YoY growth (fines)	%	77%	19%	-49%	54%	15%	-23%	5%	-28%	-41%	13%	10%	5%	0%	4%	0%	2%	2%	2%	2%
YoY growth (lump)	%	28%	54%	-29%	71%	13%	-27%	7%	-27%	-35%	9%	6%	13%	11%	0%	-17%	2%	2%	2%	2%
Imports																				
China	Mt	384	444	628	619	687	745	820	933	955	1,024	1,063	1,085	1,102	1,117	1,129	1,140	1,152	1,163	1,175
Japan	Mt	139	140	105	134	128	138	136	136	127	129	128	127	123	119	116	113	110	106	103
Europe	Mt	127	129	71	108	105	98	84	106	111	104	105	106	107	109	110	111	112	113	114
Exports																				
Rio Tinto	Mt	161	171	204	223	225	233	244	288	318	345	355	362	362	362	362	362	362	362	362
BHP Billiton	Mt	111	130	129	138	162	177	206	220	261	274	279	270	270	270	271	272	273	274	275
Fortescue	Mt	0	15	34	40	46	64	95	152	159	159	159	159	159	159	159	159	159	159	159
Vale	Mt	229	233	219	255	270	270	278	250	299	296	338	386	386	387	346	347	347	347	347
India	Mt	94	106	117	97	79	38	14	13	10	12	13	14	18	20	22	24	24	24	24

Source: Morgan Stanley Research

Global Iron Ore Market: Notable Production Cuts

Country	Company	Date	Reason/Impact	Prod (Mtpy)
Canada	Cliffs	14-Feb	Price/cost related mine closure	1.5
Sweden	Northland Resources	14-Jun	Price related production cut	2
Australia	IMX Resources	14-Jun	Placed into administration- likely	1.6
Australia	Shree Minerals	14-Jun	Price related mine closure	0.1
Australia	Kimberley Metals	14-Jul	Price related production cut	1.7
Australia	Noble Resources	14-Jul	Price related mine closure	1.5
Canada	Labrador Iron Mines	14-Jul	Price related mine closure	1.7
Russia	IRC	14-Aug	Lack of finance	1
Brazil	MMX	14-Aug	Price related, lack of finance	6
Guinea	Bellzone	14-Aug	Lack of finance	0.5
Australia	W Desert Resources	14-Sep	Price related mine closure	2
Chile	JSW/Minera Santa Fe	14-Oct	Price related mine closure	2
Sierra Leone	London Mining	14-Oct	Price related, lack of finance	5
Australia	Mt. Gibson	14-Oct	Technical failure	4
Australia	Pluton Resources	14-Nov	Price related mine closure	0.8
Canada	Cliffs	14-Nov	Price related mine closure	6
Australia	Iron Valley	14-Nov	Price related mine closure	0.2
Sierra Leone	African Minerals	14-Dec	Price related, lack of finance	20
Sweden	Dannemora	14-Dec	Price related, lack of finance	2.7
China	Various privately owned	rolling 12m	Price related closures	80
Drop in India's Exports	Various	rolling 12m	Price related	8.5
Drop in China's Imports from non-major producing c	Various	rolling 12m	Price related	46
Australia	Arrium	14-Jan	Price related mine closure	3.6
Australia	CITIC	14-Jan	Technical, commissioning issues	4
USA	US Steel	14-Mar	Price/demand related	5.5
Brazil	Ferrous	14-Mar	Price/demand related	2.2
			Total Annualized Output	**210.1**

Source: Morgan Stanley Research, Company Documents, WoodMackenzie

Global Iron Ore Market: Notable Capacity Additions

Mine	Country	Company	Add'n Capacity (MN MT/A)	First Production
Carajas Serra Sul (S11	Brazil	Vale	90	2016
Pilbara 360	Australia	Rio Tinto	70	2015
Tonkolili- Stage 2	Sierra Leon	African Minerals	35	2016
Jimblebar	Australia	BHP Billiton	60	2014
Sudeste System	Brazil	MMX	29	2015
Minas Rio- Stage 1	Brazil	Anglo American	27	2014
Sino Iron	Australia	Citic Pacific Mir	20	2013
Casa da Pedra	Brazil	CSN	20	2017
Nimba (Yekepa) Phase	Liberia	ArcelorMittal	15	2015
Marandoo	Australia	Hamersley Iron	15	2014

Source: Company Documents, Morgan Stanley Research

US Pellet Market Overview

US Iron Ore Pellet Market: Supply - Demand

The US pellet market is in surplus, and on track to get worse over time.

North American Great Lakes Iron Ore Pellet Supply-Demand

Pellet Supply/Capacity (mt)	2011	2012	2013	2014	2015e	2016e	2017e	Comments
ArcelorMittal Minorca	2.9	2.9	2.9	2.9	2.9	2.9	2.9	
Cliffs Hibbing	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Cliffs Empire	5.5	5.5	5.5	5.5	5.5	0.0	0.0	Assumes Empire retires as Essar ramps
Cliffs Northshore	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Cliffs Tilden	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Cliffs United Taconite	5.4	5.4	5.4	5.4	5.4	5.4	5.4	
US Steel - Keetac	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
US Steel - Minntac	16.0	16.0	16.0	16.0	16.0	16.0	16.0	
Rio Tinto - IOC	1.0	1.0	1.0	1.0	0.0	0.0	0.0	US imports, displaced by AKS JV in 2015
ArcelorMittal Mines Canada	1.0	1.0	1.0	1.0	0.0	0.0	0.0	US imports, displaced by AKS JV in 2015
Essar Minnesota (Phase I)			0.0	0.0	0.0	3.0	7.0	Project is expected to be completed in 2Q16
Essar Minnesota (Phase II)								Unlikely in the next 5 years
AK Steel (Magnetation JV)				0.5	2.0	3.0	3.0	Currently in chapter 11, but we expect the asset to survive
Total Capacity	**59.8**	**59.8**	**59.8**	**60.3**	**59.8**	**58.3**	**62.3**	1% CAGR 2013-2017

Pellet Demand (mt)	2011	2012	2013	2014e	2015e	2016e	2017e	Comments
Great Lakes BOF Capacity	63.7	63.7	60.8	58.4	58.4	56.0	56.0	Includes all US and Canadian BOFs that consume pellets from the Great Lakes region
BOF Operating Rate	74%	74%	78%	79%	74%	80%	82%	
Total Demand	**56.5**	**56.5**	**57.0**	**55.3**	**51.8**	**53.7**	**55.1**	-0.9% CAGR 2013-2017
Surplus/(Deficit)	**3.2**	**3.2**	**2.8**	**4.9**	**7.9**	**4.5**	**7.2**	Implies mines will run at sub-optimal levels going forward, since export netbacks are well below costs

Source: USGS, Morgan Stanley Research

US Iron Ore Market: New Supply Threats

Essar Steel Minnesota Concentrator Plant



Essar Steel Minnesota Pellet Induration Building



A handful of new supply threats could destabilize the US market.

- **Essar Steel Minnesota**: Essar steel is building a 7mtpy iron ore pellet plant, which is currently scheduled to come online in 2016. Half of the production will likely go to Essar Steel Algoma, while the other half will likely displace CLF pellets at an ArcelorMittal plant based on an MOU signed by both companies. There have been doubts that this project will reach completion, but financing is now fully in place and construction activity in 2015 has picked up sharply.

- **US Steel**: US steel has approximately 26mtpy of iron ore capacity in Minnesota. As the company retires the Fairfield, Alabama blast furnace they will have excess capacity that they may try to sell to a 3rd party.

- **Magnetation**: A joint venture between AK Steel and Magnetation LLC built a 3mtpy pellet plant that came online in 2014. The JV filed for chapter 11 in 2015, but the plant is still operating. The future of the plant depends on their ability to renegotiate a sustainable offtake arrangement with AK Steel, which we think is more likely than not.

- **ArcelorMittal Mines Canada**: The company is increasing pellet production by 8mtpy in 2015. While shipping costs are high into the Great Lakes, the company may be able to sell some of these pellets to its operations on Lake Erie.

Source: Essar Steel Website, Morgan Stanley Research

US Iron Ore: Price Negotiation Framework

Much of the 3rd party iron ore supply is sold on long-term contracts. As the contracts are renegotiated the range of outcomes can be determined by the price received by exporting Great Lakes to the seaborne market and the cost to import seaborne pellet into the Great Lakes region.

Since the floor set by the export net back is well below Great Lakes producers' costs, and the market is in surplus, the likely outcome will be an agreement near producer cash costs.

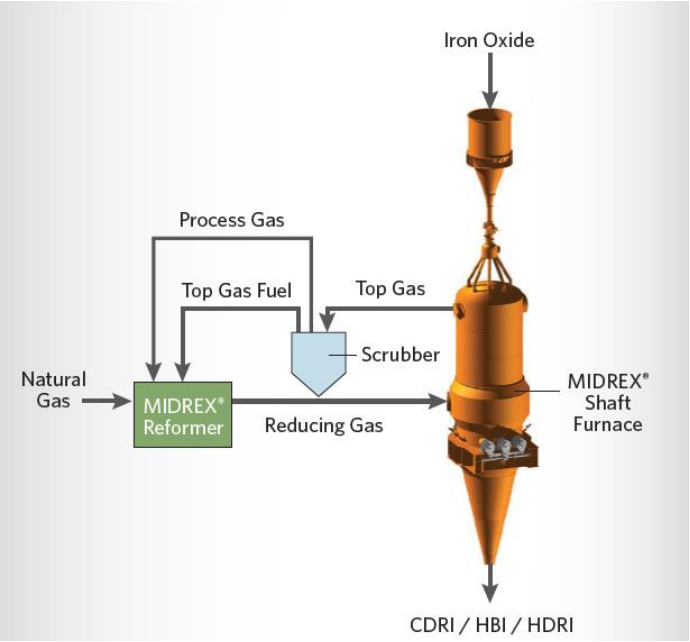
Floor Price Calculation @ $55/t iron ore	
China 62% CFR benchmark	$55
Less 7% moisture adjustment	($4)
Less seaborne freight	($20)
Plus value-in-use premium	$8
Plus pellet premium	$25
Less St. Laurence Seaway freight	($30)
Total	**$34**

Ceiling Price Calculation @ $55/t iron ore	
China 62% CFR benchmark	$55
Less 7% moisture adjustment	($4)
Less seaborne freight	($20)
Plus value-in-use premium	$8
Plus pellet premium	$25
Plus St. Laurence Seaway freight	$30
Total	**$94**

Source: Morgan Stanley Research

US Iron Ore Market: The DRI Hope

DRI Plants Convert Iron Ore and Gas Into EAF Feedstock Iron



DRI Delivered Costs are $235/t

DRI Cost Model	Quantity	Price	Cost/Ton
Iron Oxide (t)	1.5	75	112
Fe Delivery	1.5	20	30
Natural gas (mmbtu)	11	3	33
Electricity (kWh)	95	0.07	7
Oxygen (Nm3)	12	0.09	1
Water (m3)	1.2	0.7	1
Labor including administration (man-hour)	0.1	20	2
Maintenance & Supplies (US $)	1	5	5
Value-in-use discount vs. Pig Iron/prime scrap			20
Transport to Midwest Mill			25
Total Cost			**$235**

Direct Reduced Iron (DRI) plants could open up the electric arch furnace market to iron ore pellet makers

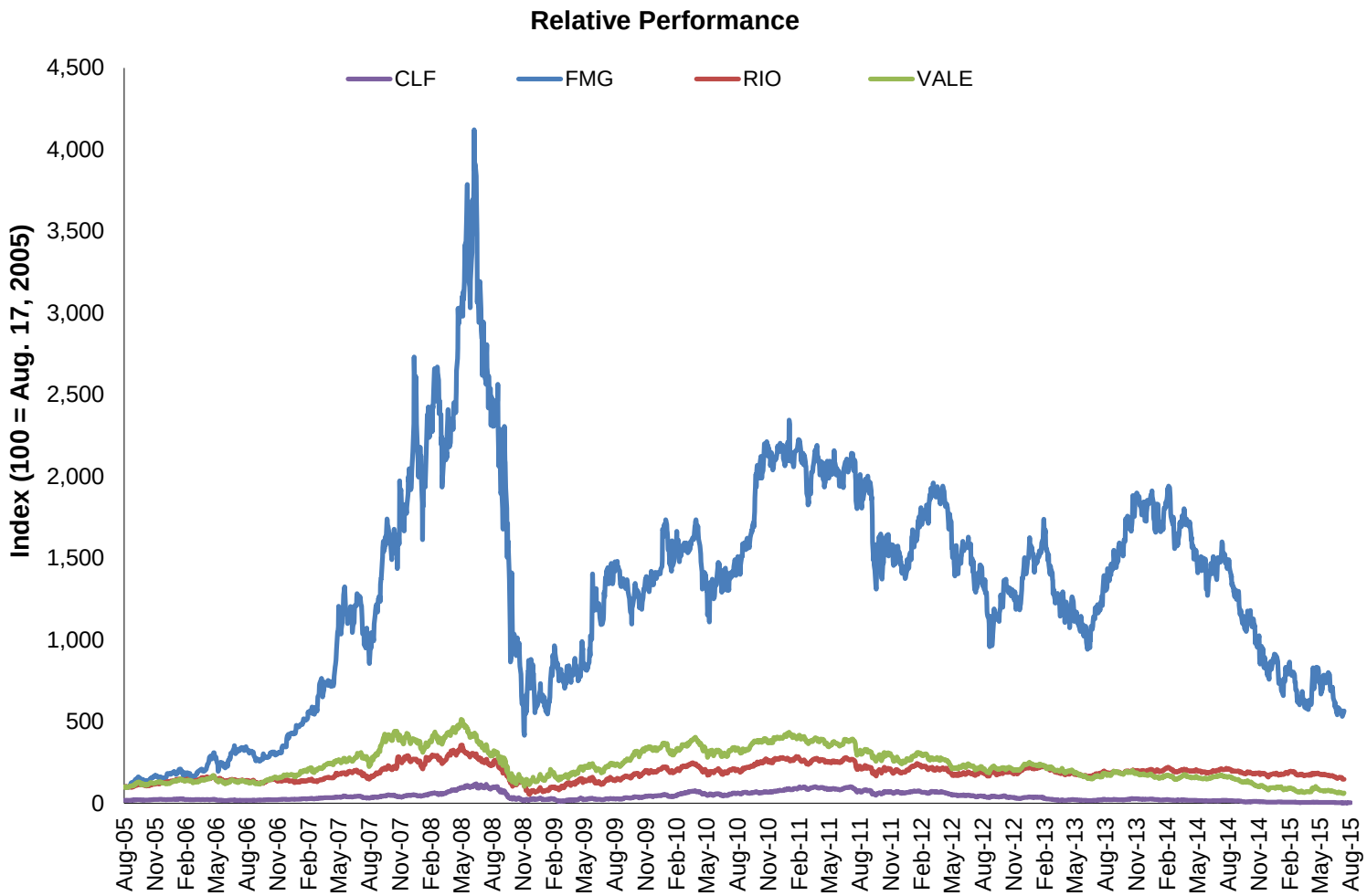
- **As the blast furnace market shrinks, both CLF and X have noted they are exploring the option of using DRI technology to expand the addressable market**: Electric arc furnaces make up over half of the steel production in the US. Generally these furnaces melt ferrous scrap and pig iron (from blast furnaces) to make steel. They can also melt “direct reduced iron” which is a substitute for prime scrap grades and pig iron. Direct reduced iron plants convert high-quality iron ore pellets and natural gas into iron. With EAFs continuing to gain share, iron ore producers are hoping that DRI could keep pellet demand from shrinking in the US.

- **DRI Economics**: At the moment, we do not believe it makes economic sense to build DRI plants on the Minnesota iron range. According to our math, the cash cost of production would be close to $235/t. While that would deliver a $15/t cash margin on today’s prices ($250/t for prime scrap), it would not justify the capital cost of $300/t. While some may argue that scrap prices are currently low, adding DRI capacity to the market would likely push them even lower.

Source: Midrex, Morgan Stanley Research

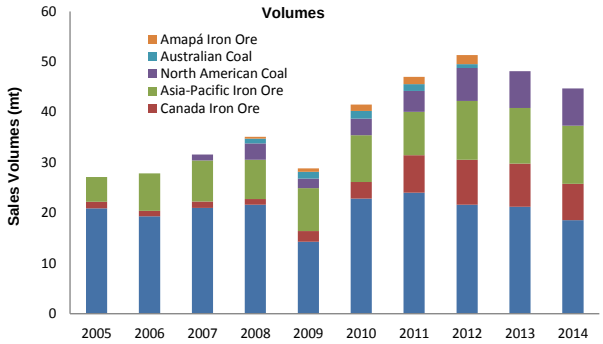
Iron Ore Company and Valuation

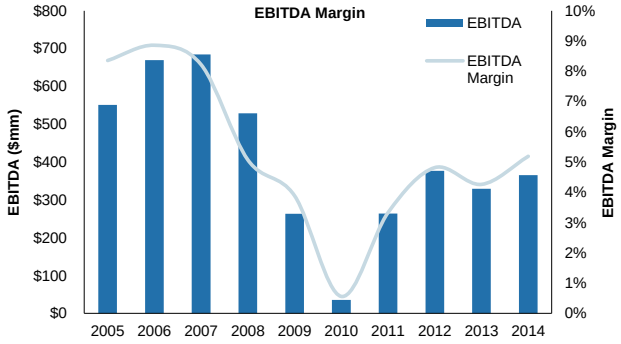
Relative Performance – Iron Ore

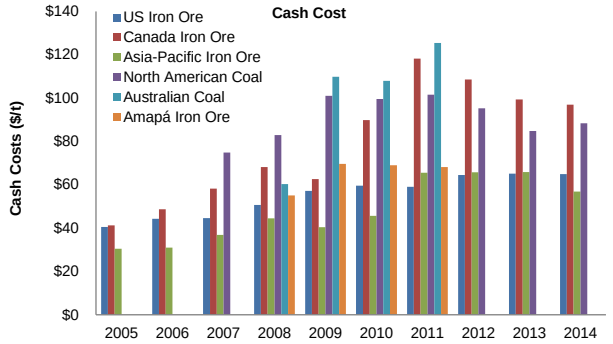


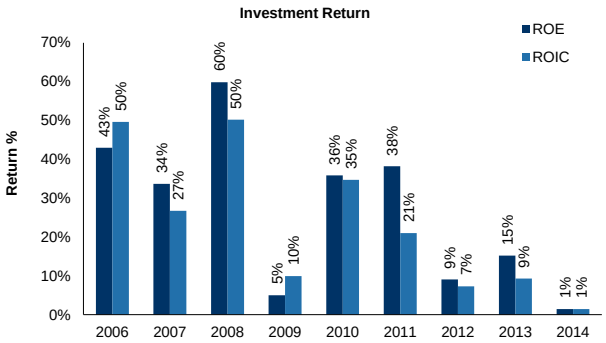
Source: Morgan Stanley Research

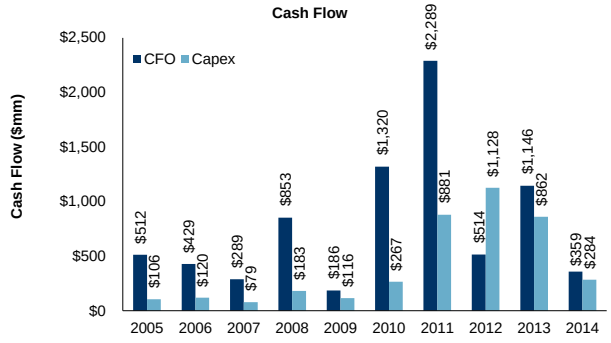
Company Profiles – Cliffs Natural Resources

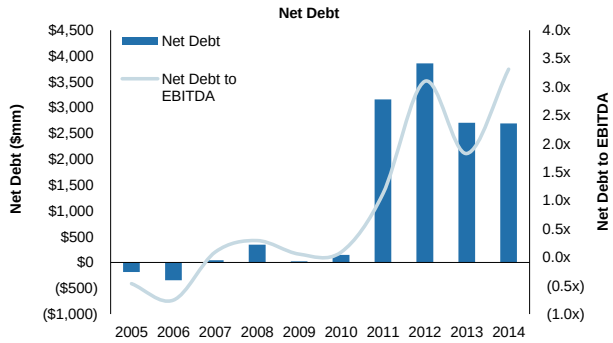












Source: Company Data, Morgan Stanley Research

Coal Overview

Coal Overview: Properties

General Coal Characteristics

- **Heat Content**: 6,000-15,000 British thermal units per pound
- **Moisture Content**: Water weight, no energy
- **Pollutants**: Sulfur dioxide (SO_2), Nitrogen oxide (NOX), Mercury, Carbon dioxide
- **Volatiles**: Inherent gases and other ignitable components
- **Ash Content**: Noncombustible residue, creates slag in boiler, lower level more desirable
- **Chlorine Content**: Too much produces hydrochloric acid in scrubbers

Coal Rank: Bituminous

- **Heat content**: +10,000 Btu/lb, including Anthracite +13,000 Btu/lb



Coal Rank: Sub-Bituminous

- **Heat content**: 8,000-10,000 Btu/lb



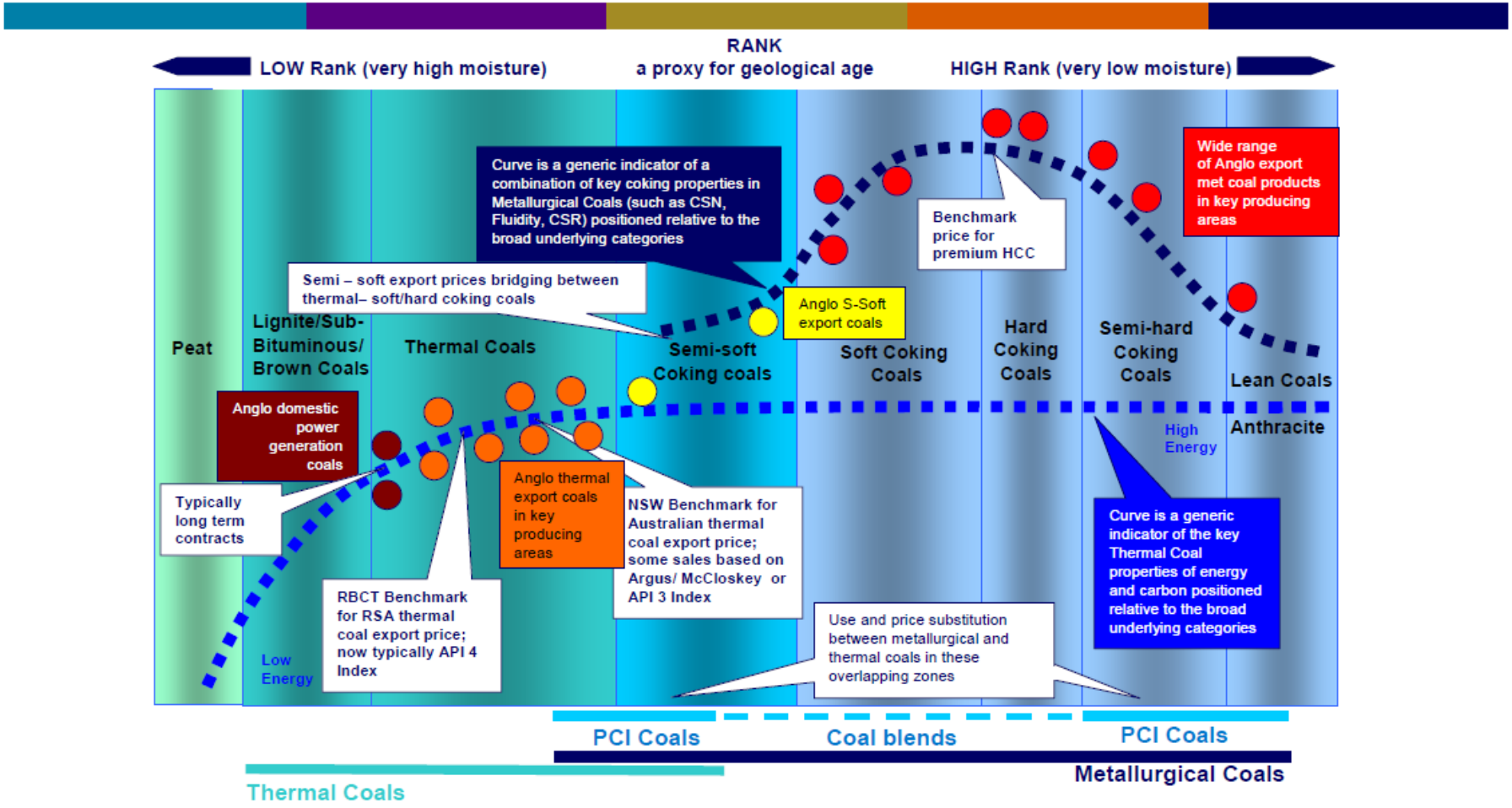
Coal Rank: Lignite

- **Heat content**: 6,000-8,000 Btu/lb



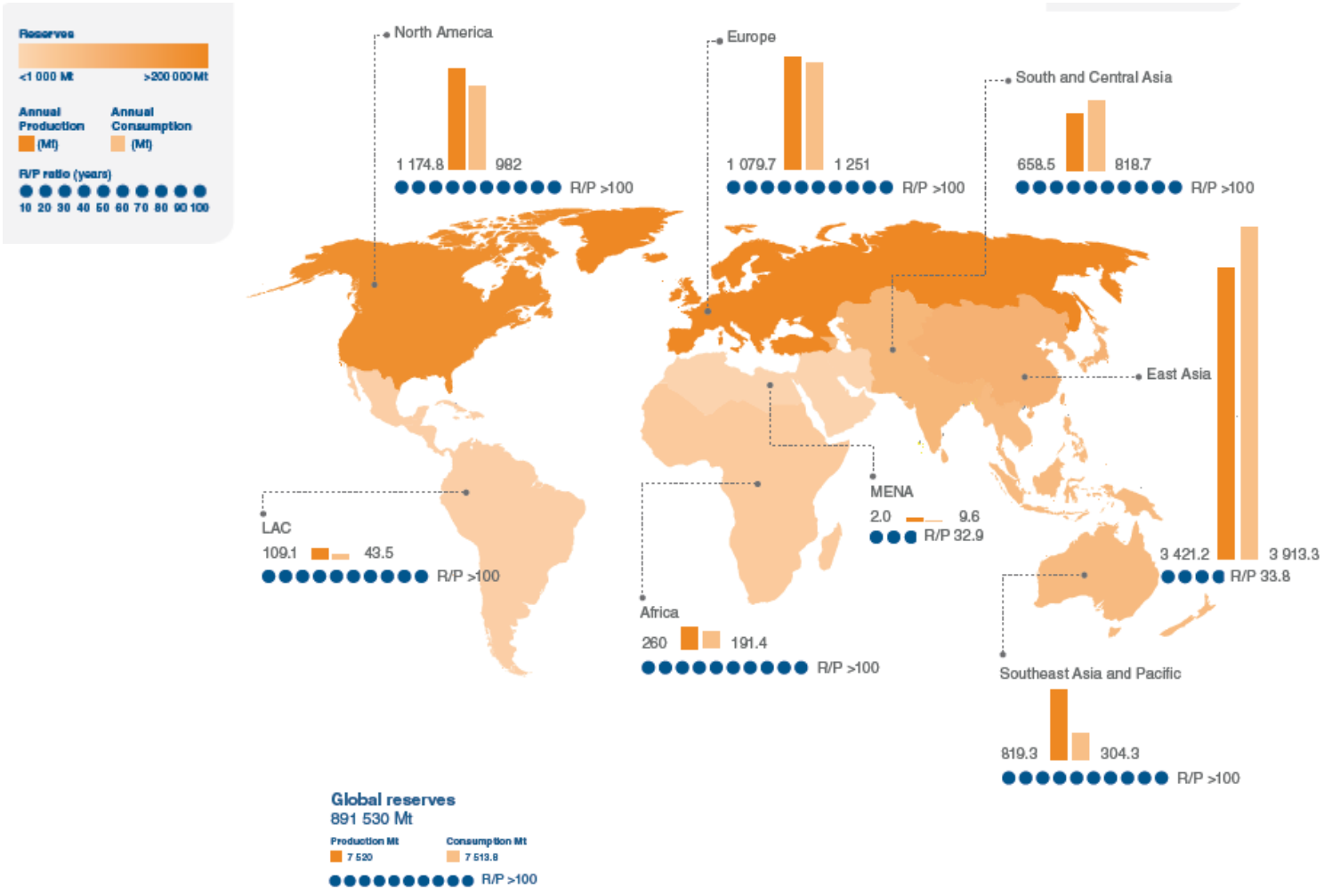
Source: Proteux, University of Kentucky, Movdata, Morgan Stanley Research

Coal Overview: Properties



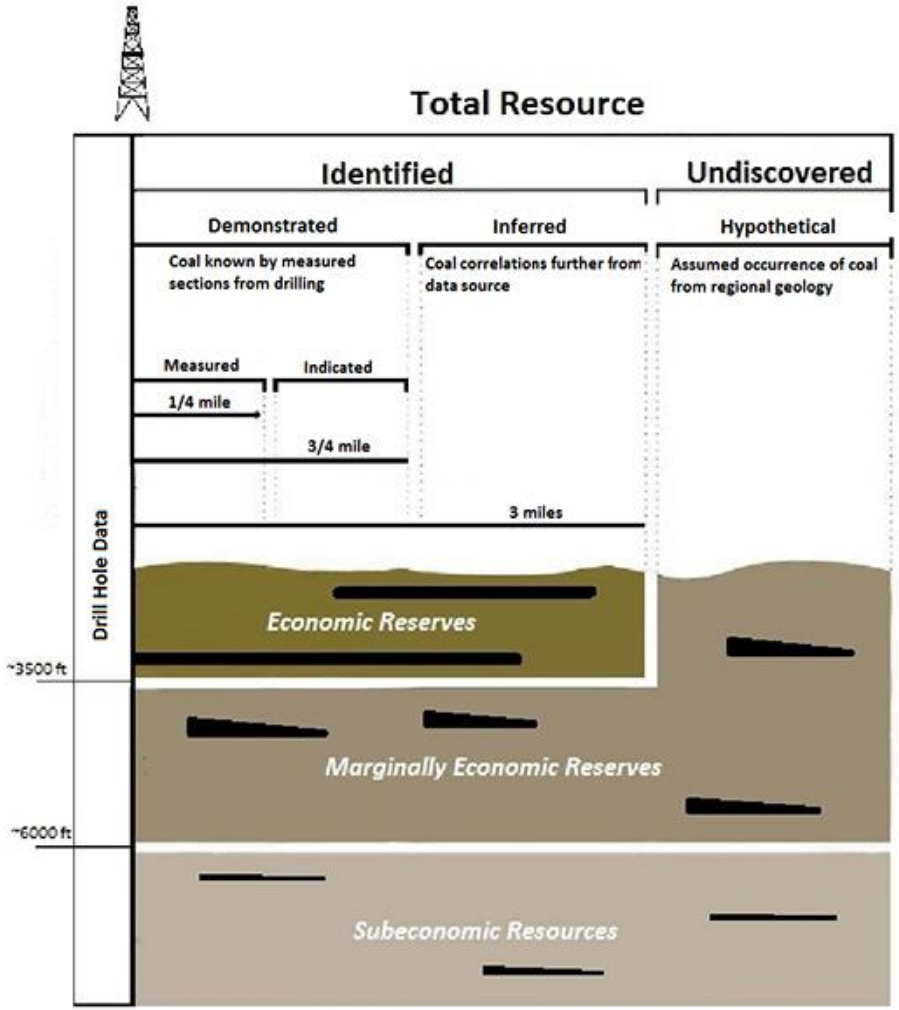
Source: Anglo American Coal Investor Conference, 2008

Global Coal Market: Proven Reserves



Source: BP Statistical Review of World Energy

Coal Overview: Reserve Identification



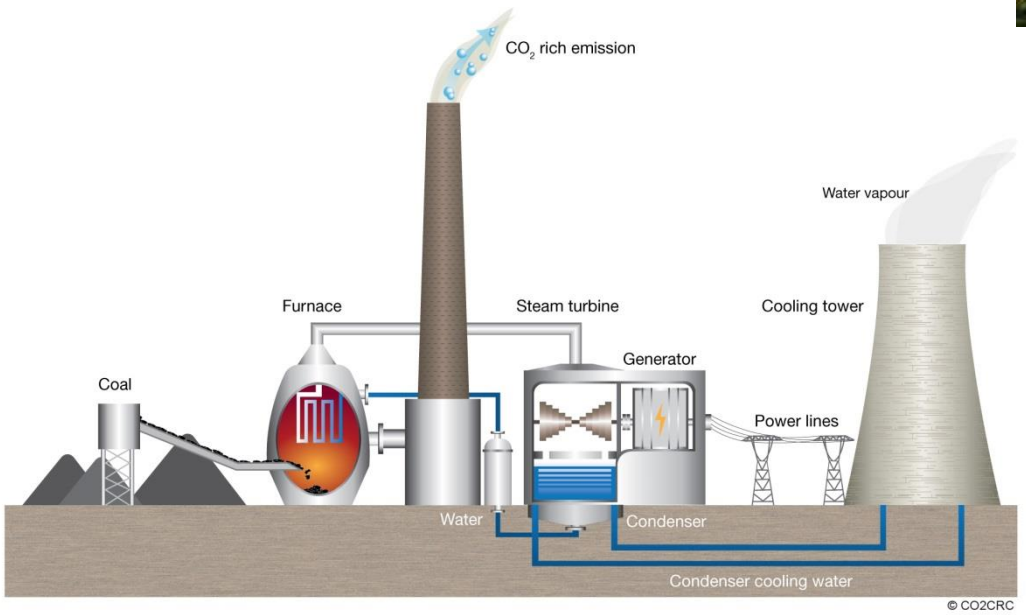
- Coal resources are more broadly defined as the total endowment of coal in the ground, limited by depth and a minimum thickness of the coal bed
- True coal reserves are generally classified as coal that can be economically produced
- Furthermore, reserves are just a subset of the resources, and often end up being a very small percentage of the total resources

Source: State of Wyoming, Morgan Stanley Research

Coal Overview: Applications – Electric Power Generation

- Electricity generation through coal-fired power plants
- Coal is ground into fine powder before being blown with air into the boiler, which burns the mixture to create steam
- Can use essentially any kind of coal, from lignite to most metallurgical coals





Source: The Guardian, Australian Solar, Morgan Stanley Research

Coal Overview: Applications – Steel Production

- The various types of coal used in the steel production process are called metallurgical coal, or “met”

- The primary met coal is coking coal, used to produce coke
  - Coking coal heated in an oven (coke battery) in the absence of oxygen
  - Volatilities and impurities are driven off to produce a near-pure form of carbon (coke)

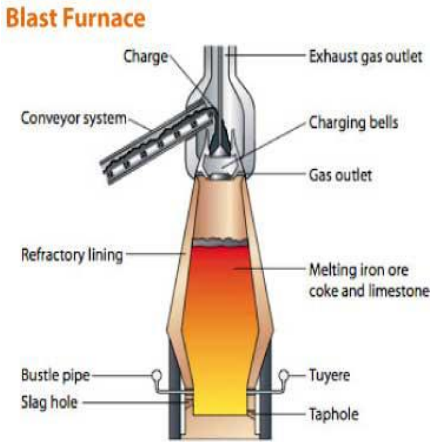
- Coke is charged into blast furnace with iron ore and limestone to make steel
  - Hot air blasted into lower section of furnace (tuyere) causing coke to gasify, producing carbon monoxide and carbon dioxide, which reacts with iron ore, breaking its iron-oxygen bonds and leaving 95% pure pig iron (solid)
  - Hot metal then transferred to a blast oxygen furnace (“BOF”) which burns off excess carbon, leaving nearly pure iron (steel)
  - Coke also provides structural strength to support ore burden

- The other type of met coal is pulverized coal injection (“PCI”) which makes use of a relatively new technology that uses lesser-grade coals

- This essentially lowers blast furnace coke requirements, provides heat in the blast furnace, some carbon content for use in the reduction process, and some structural strength for the ore burden







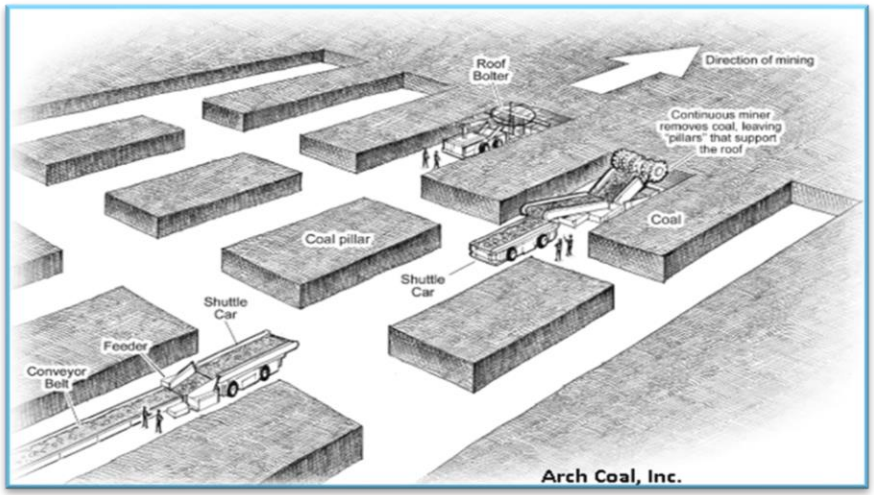
Source: West Cumbria Mining, IndiaMart, Morgan Stanley Research

Coal Overview: Mining Practice – Underground Room and Pillar Mining

- Majority of underground coal mines utilize the room and pillar method
- Most effective for small blocks of thin coal seams
- Continuous miners mine the panel, leaving pillars of coal to support the roof of the mine while creating a grid-like structure within the mine
- Can leave up to 40% of the total coal within the seam, unless retreat mining is implemented
- Retreat mining involves workers mining the coal from the pillars as they exit the mine, allowing the roof to collapse

Mining Practice Information

Typical Production (mmtpy)	**.1-3.0**
Seam Recovery Rates (%)	**35-50%**
Mining Costs (USD)	**~$50-100/ton**
Capital Intensity (USD)	**~$50-100m**



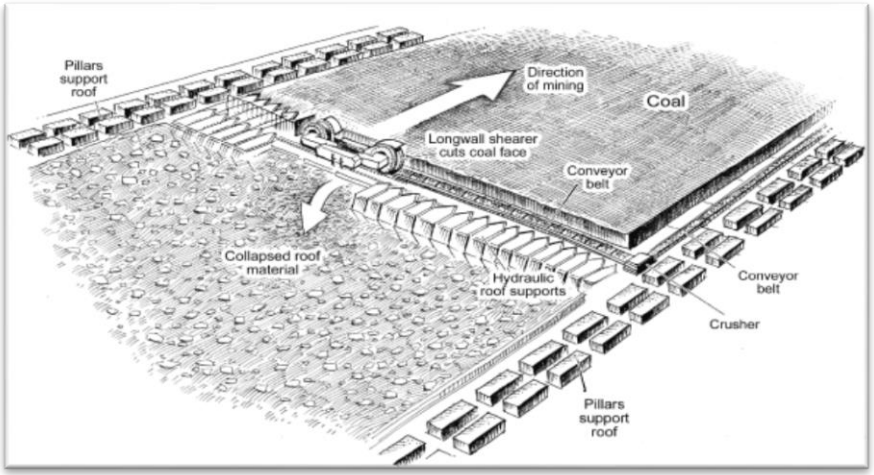
Source: Arch Coal 10-K, UMWA, Morgan Stanley Research

Coal Overview: Mining Practice – Underground Longwall Mining

- Accounts for roughly 30% of underground coal production
- Produce high seam recovery rates
- Continuous miners develop access to coal blocks; seam faces typically 4-7' tall and 300-1000' feet
- Shearer "shaves" face of the coal, which falls to conveyor belt and gets transported out of the mine
- Hydraulic roof supports between the shearer and the earth beneath it, which collapses as the panel is mined
- This practice often results in planned subsidence, causing the surface above the mine to drop

Mining Practice Information

Typical Production (mmtpy)	**2.0-10.0**
Seam Recovery Rates (%)	**>75%**
Mining Costs (USD)	**~$25-40/t**
Capital Intensity (USD)	**~$75-100m**



Source: Arch Coal 10-K, UMWA, Morgan Stanley Research

Coal Overview: US Longwall Mines

Company	Location	Production 2014	Production 2013	% Change
CONSOL Energy	Bailey	12,324,680	11,321,481	*8.9%*
CONSOL Energy	Enlow Fork	10,556,826	10,111,722	*4.4%*
Murray American Energy	Marshall Country	10,378,940	9,403,070	*10.4%*
Foresight Energy	Sugar Camp	9,091,628	6,493,536	*40.0%*
BHP Billiton	San Juan South	8,799,554	5,989,380	*46.9%*
Signal Peak Energy	Bull Mountains	7,901,784	8,682,884	*-9.0%*
Alpha Natural Resources	Cumberland	7,388,082	5,576,502	*32.5%*
Murray American Energy	Harrison County	6,703,392	5,700,956	*17.6%*
American Energy Corp.	Century Mine	6,684,695	8,039,546	*-16.9%*
Peabody Energy	Twentymile	6,659,492	7,235,627	*-8.0%*
Murray American Energy	Ohio County	6,584,921	5,619,263	*17.2%*
Murray American Energy	Mario County	6,567,666	5,307,709	*23.7%*
Bowie Resource Partners	Sufco No. 1	6,539,322	5,960,266	*9.7%*
Foresight Energy	Mach Mining	6,482,276	6,694,630	*-3.2%*
Arch Coal	West Elk	6,192,656	5,826,798	*6.3%*
AmCoal	New Future	5,744,296	5,450,222	*5.4%*
Alliance Resources Partners	Tunnel Ridge	5,627,411	3,694,046	*52.3%*
Foresight Energy	Deer Run	5,564,836	4,845,308	*14.8%*
AmCoal	New Era	5,509,709	4,419,659	*24.7%*
Walter Energy	Blue Creek no. 7	5,226,007	5,405,412	*-3.3%*
Ohio Valley Coal	Powhatan No. 6	4,696,014	5,550,146	*-15.4%*
Murray American Energy	Monongalia County	4,579,784	3,139,164	*45.9%*
Bowie Resource Partners	Skyline	4,170,162	4,170,162	*0.0%*
CONSOL Energy	Buchanan	4,041,701	4,783,655	*-15.5%*
Alpha Natural Resources	Emerald No. 1	3,951,247	3,584,579	*10.2%*
Pacific Minerals	Bridger	3,369,731	4,442,616	*-24.1%*
CONSOL Energy	Harvey	3,170,608	NA	*NA*
Patriot Coal	Federal No. 2	2,866,980	3,363,090	*-14.8%*
Arch Coal	Leer	2,822,295	569,488	*395.6%*
Cliffs Resources	Pinnacle No. 50	2,747,256	2,807,071	*-2.1%*
Patriot Coal	American Eagle	2,732,344	2,410,162	*13.4%*
Walter Energy	Blue Creek No. 4	2,720,653	2,622,528	*3.7%*
UtahAmerican Energy	West Ridge	2,513,571	2,629,495	*-4.4%*
Bowie Resource Partners	Bowie No. 2	2,407,598	3,320,696	*-27.5%*
Cliffs Resources	Oak Grove	2,331,168	2,269,014	*2.7%*
Energy West Mining	Deer Creek	2,089,158	2,810,298	*-25.7%*
Arch Coal	Mountaineer II	1,972,772	2,268,863	*-13.1%*
Alliance Resource Partners	Mountain View	1,920,877	2,328,708	*-17.5%*
Blue Mountain Energy	Deserado	1,882,024	1,861,494	*1.1%*
Drummond Co. Inc	Shoal Creek	1,803,117	1,328,724	*35.7%*
White Oak Resources	White Oak No. 1	1,736,928	NA	*NA*

Source: Mine Safety and Health Administration, CoalAge, Morgan Stanley Research

Coal Overview: Mining Practice – Surface Mining

Open Cut Surface Mining

- Overburden removed from the above coal seam using draglines and power shovels
- Seams exposed underneath
- Very large-scale mines with capacity of up to 100 mmtpy operating in several pits

"Mountaintop-Removal" Mining

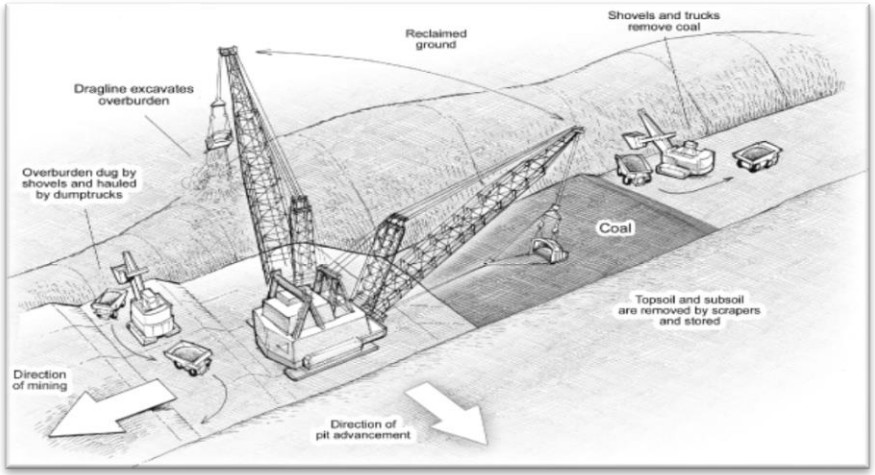
- Tops of mountains blasted off
- Exposed coal seam mined at very high recovery rate
- Overburden typically placed in adjacent valleys, these are called "valley fills"

Highwall Mining

- Highwall is the final boundary formed when a surface mine reaches its greatest extent in any direction, which typically occurs when no longer economic to strip mine
- Unmanned continuous mining machine driven via remote control into highwall

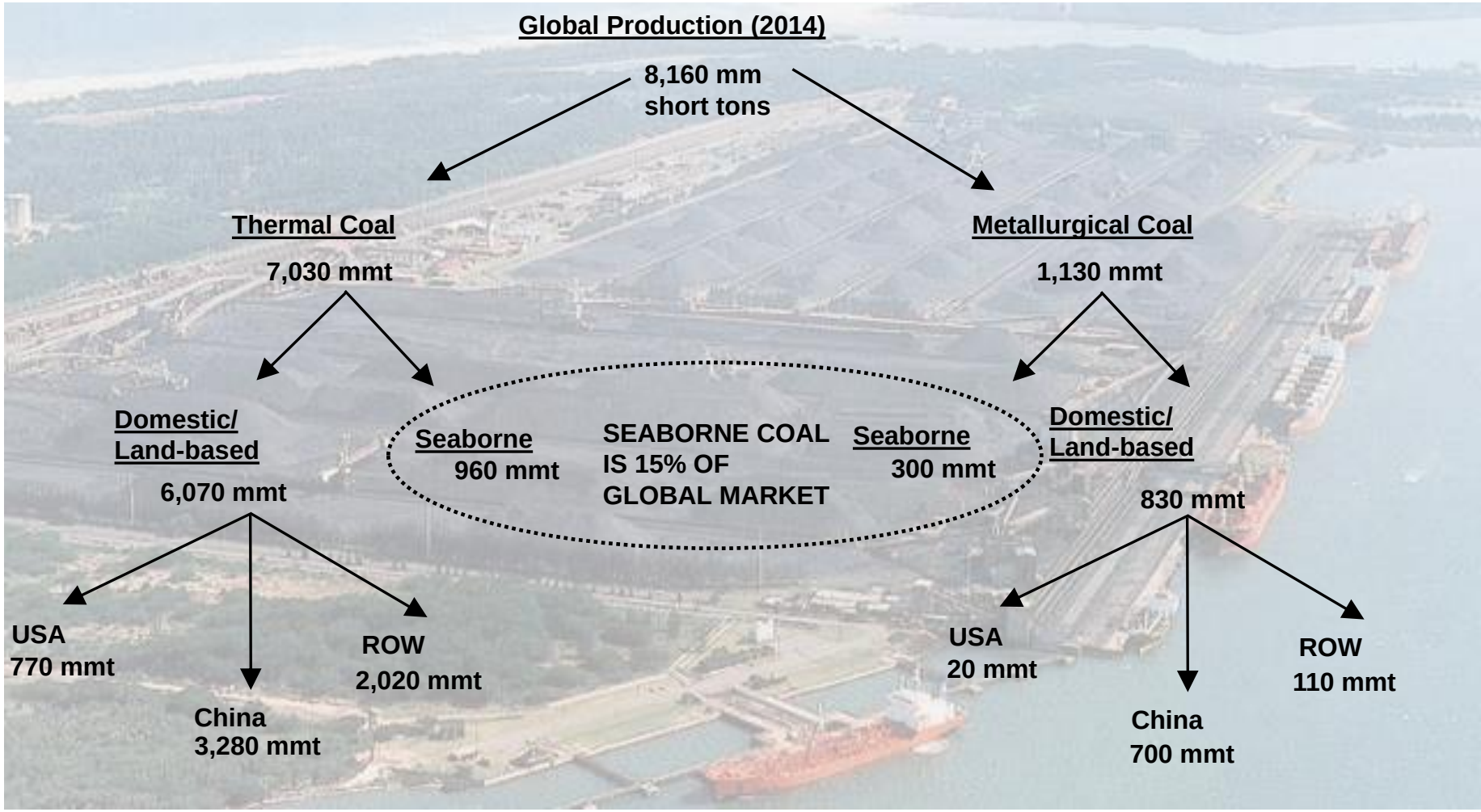
Mining Practice Information

Typical Production (mmtpy)	Up to 100
Seam Recovery Rates (%)	N/A
Mining Costs (USD)	$6-7/ton in PRB, $30/t in Midwest ~$40-50/t in East
Capital Intensity (USD)	~$30-50m



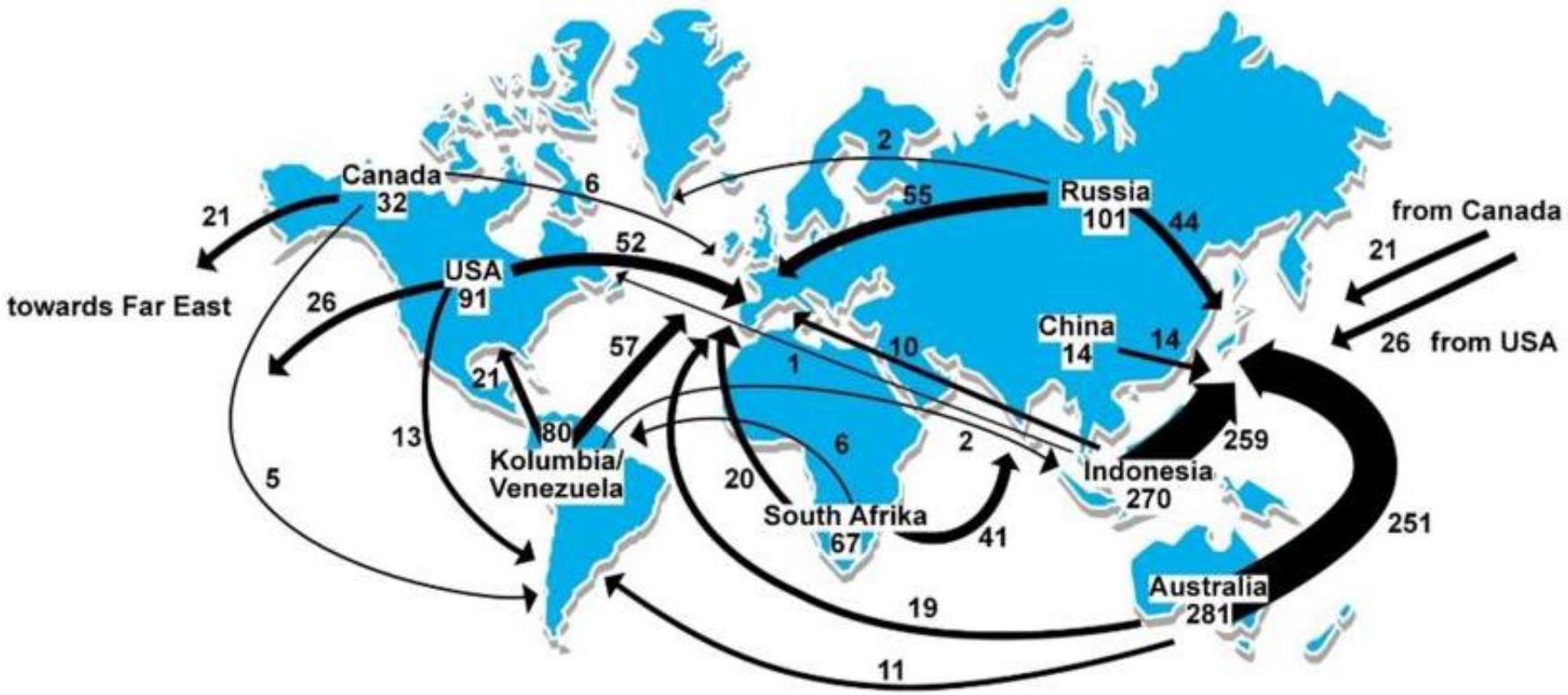
Source: Arch Coal 10-K, UMWA, Morgan Stanley Research

Global Coal Market: Seaborne Coal Is a Relatively Small Piece



Source: Wood Mackenzie, Morgan Stanley Research

Coal Overview: Seaborne Trade Flows



Note: 2011 Hard Coal Volumes (mmt)

Source: VDKI, Morgan Stanley Research

Global Coal Market: Coal Investment Divestitures

Major Companies at Risk	Location of Lising	Thermal Coal (% of revenues) 2014	Thermal Coal (% of revenues) 2015e	Metallurgical Coal (% of revenues) 2014	Metallurgical Coal (% of revenues) 2015e
Vale	New York	0%	2%	0%	2%
Peabody	New York	74%	77%	24%	21%
Alpha Natural Resources	New York	63%	64%	37%	36%
Arch Coal	New York	81%	83%	19%	17%
Foresight Energy	New York	100%	100%	0%	0%
Consol Energy	New York	46%	46%	10%	9%
Cloud Peak	New York	100%	100%	0%	0%
Anglo American	London/South Africa	9%	10%	10%	10%
BHP Billiton	London/Australia	5%	6%	9%	9%
Glencore group sales	London/South Africa	7%	9%	1%	1%
Glencore industrial only	London/South Africa	20%	18%	3%	2%
Rio Tinto	London/Australia	3%	3%	4%	4%
Teck Resources	New York	2%	2%	37%	34%
Shenhua	Hong Kong/Shanghai	40%	35%	0%	0%
China Coal	Hong Kong/Shanghai	83%	74%	1%	2%

- In late May 2015, one of the world's largest asset managers, Norges Bank Investment Management (USD $916bn of assets under management), announced plans to divest companies with involvement in coal (defined as greater than 30% of revenues from coal, or 30% of electricity generation from coal-fired generation)
- Although this decision may not directly affect the listed companies at risk, further divestments by governments, pensions, and endowments may place pressure on corporate strategy, and incentivize companies to diversify away from coal-related investments
- Local energy policy still unlikely to change, as developing economies are unlikely to pass up cheap coal as an energy source, with coal still expected to comprise greater than 50% of China's energy mix through the next five years
- In June 2015, California passed legislation requiring state pension funds to sell their investments in companies that generated greater than 50% of their revenue from coal mining
- The pension funds disclosed that they invested in 20-30 thermal coal mining companies, owning 1-3% of the total shares outstanding for several US mining companies

Source: Morgan Stanley Research

Metallurgical Coal Market

Global Met Coal Market: From Boom to Bust

A series of floods in 2008 and 2011 led to an incredibly tight market

Severe rainy seasons in 2008 and 2011 caused major flooding in Australia, the largest supplier to the seaborne market with more than half of the global market share. Mine pits filled and took many months to dewater, severely impacting export volumes at a time when China import demand grew sharply. Spot prices skyrocketed to near $370/t from the pre-flooding range of $40-125/t.

High prices attracted a huge amount of capital, which resulted in strong supply growth

High prices for met coal led to heavy investment to reopen older CAPP met mines, and US export growth surged 116% from 2007 to 2012 to fill the void post flooding. Large amounts of capital were also invested in Australia, Canada, Mongolia, and Mozambique. In 2012, many new projects hit the market, supply disruptions in Australia ceased, and met coal prices began to slide.

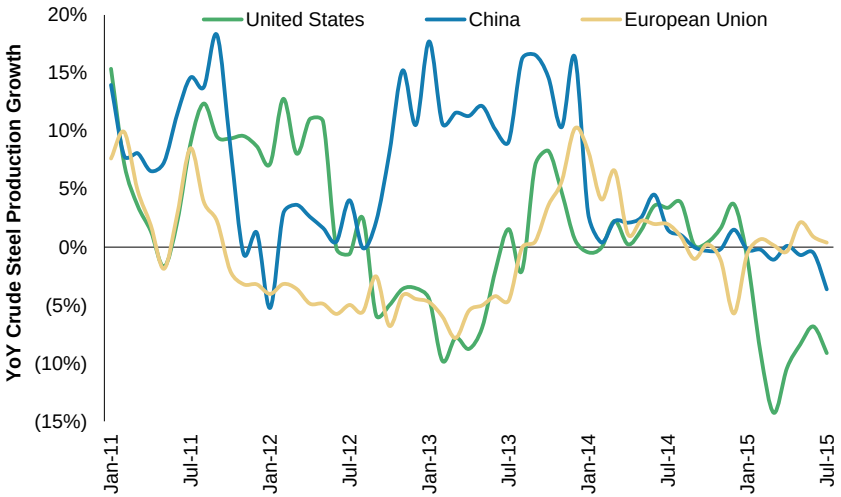
Since 2012, efforts to re-balance the market have fallen short

Despite falling pricing, production cuts have been slow to materialize as a result of several factors, including falling mining currencies, take-or-pay commitments with ports and rails, efforts to spread fixed costs over more tons, readjustments of mine plans ("high-grading"), elimination of high-cost contract mining, and, most importantly, hope. At the same time, Chinese met coal import demand began shrinking after 2013, so the goal line for production cuts keeps moving farther away.

Source: Morgan Stanley Research

Global Met Coal Market: Industry Trends and Headwinds

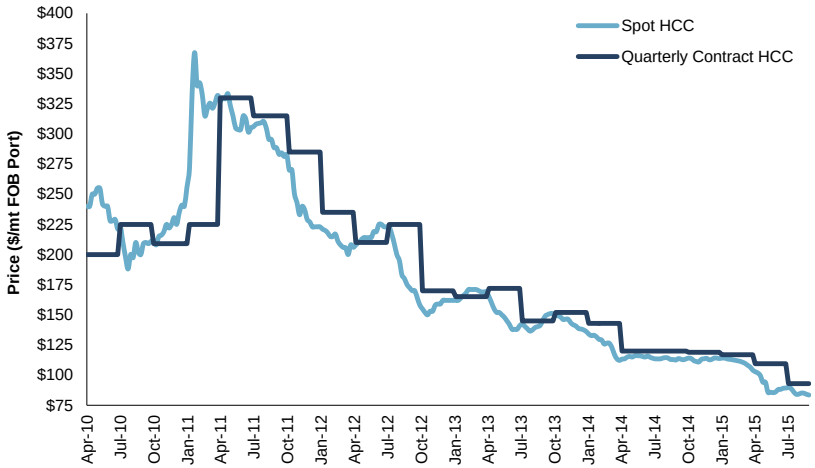
Global Steel Production



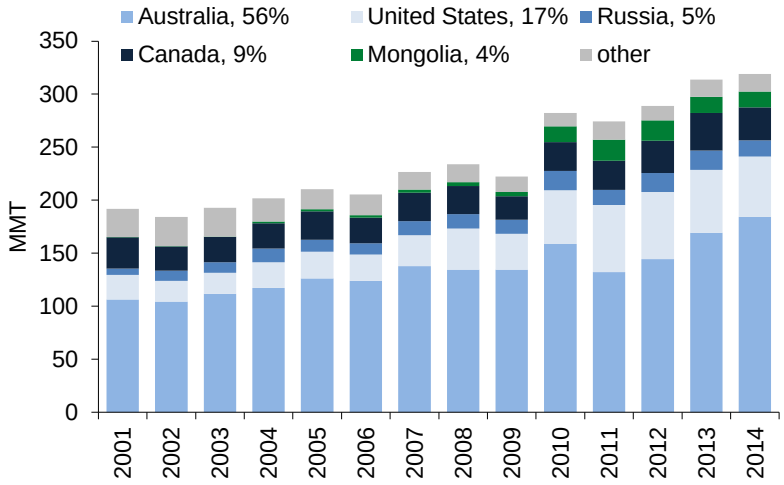
Global steel production stagnating as Chinese demand drops and producers recognize overcapacity

- Met coal exports should begin to flatten with a stagnation in world steel production growth
- Coking coal prices continue to fall as global oversupply grips the seaborne market
- Low cost Australian production has recovered since the floods, and now high cost mines from other regions need to close to balance the market

Hard Coking Coal Prices



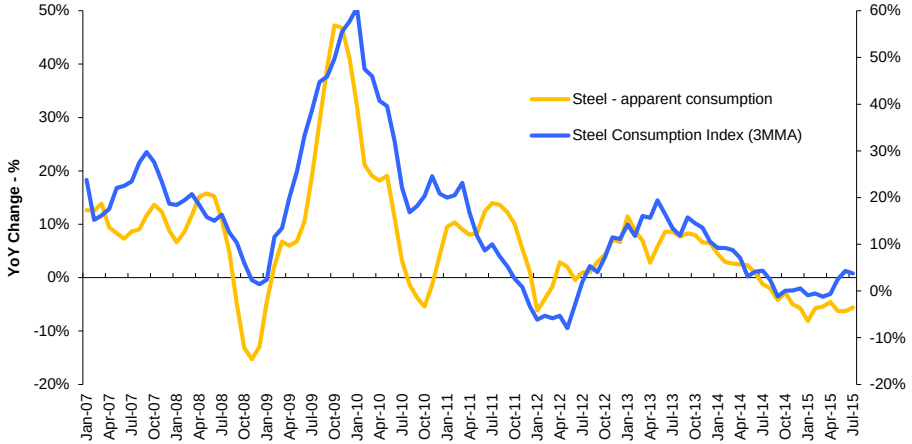
Metallurgical Coal Exports by Origin



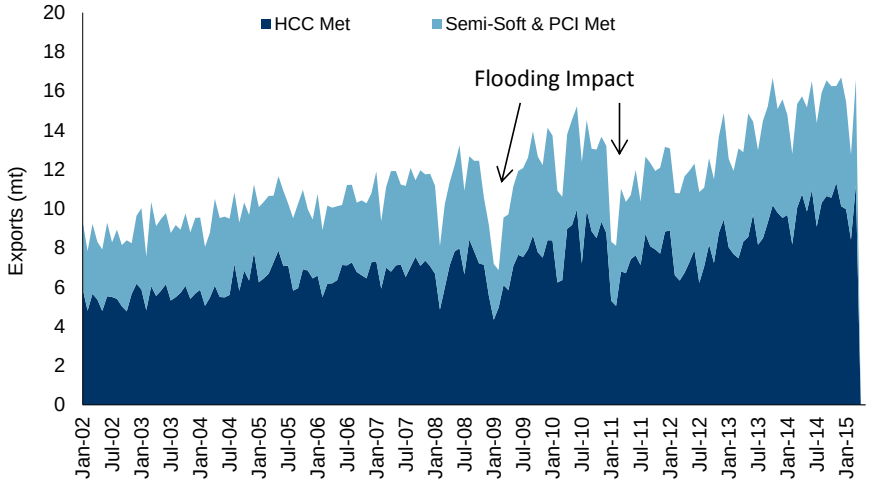
Source: World Steel Association, Platts, McCloskeys, Tex Report, Morgan Stanley Research

Global Met Coal Market: Industry Trends and Headwinds

Chinese Steel Consumption Index



Australian Coal Exports



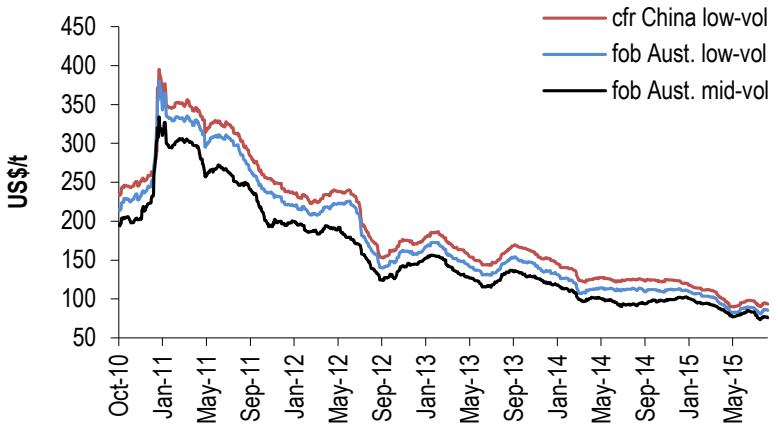
China Steel Demand Drivers

Key Drivers & Weightings	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	2014	2015e
(YoY chg)														
Res Property (GFA Sold) - 24%	-13%	-12%	-3%	-13%	-4%	-18%	-18%	-1%	8%	16%	18%	21%	-14%	-10%
Other Property (GFA Sold) - 18%	-4%	4%	13%	5%	-4%	-3%	-3%	-6%	2%	3%	3%	2%	-1%	0%
Infrastructure (FAI) - 25%	0%	14%	20%	5%	24%	21%	21%	20%	19%	18%	19%	5%	14%	5%
Machinery Sales -15%	-5%	-8%	-8%	-15%	-23%	-2%	-50%	-28%	-25%	-22%	-24%	-24%	-4%	3%
Auto sales - 6%	4%	2%	3%	2%	13%	8%	0%	3%	0%	0%	-2%	-7%	7%	5%
Ship building - 3%	-9%	-17%	-14%	-45%	-13%	8%	124%	-22%	-19%	10%	-52%	-52%	-19%	-15%
White goods sales - 2%	0%	-1%	3%	1%	2%	0%	-5%	0%	0%	-3%	-5%	-5%	2%	0%
Other Industrial (PMI) - 7%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Steel Consumption Index	**2%**	**-1%**	**0%**	**0%**	**1%**	**-1%**	**-1%**	**-1%**	**-1%**	**3%**	**4%**	**4%**	**-1%**	**-1%**
Steel Appt. Consumption	**-3%**	**-5%**	**-1%**	**-9%**	**-7%**	**-8%**	**-2%**	**-6%**	**-5%**	**-7%**	**-6%**	**-3%**	**-2%**	

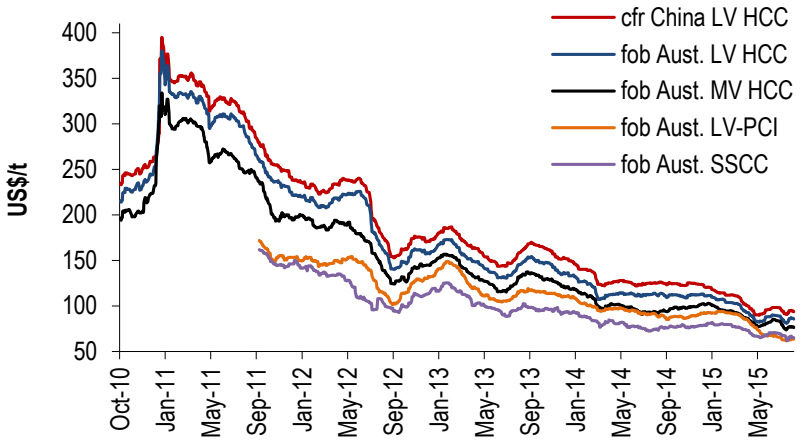
Source: Morgan Stanley Research

Global Met Coal Market: Pricing Trends

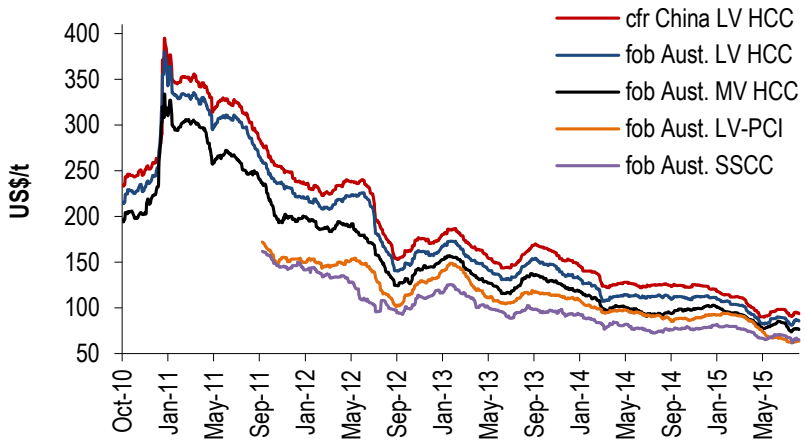
Hard Coking Coal Price Indices ($USD/t)



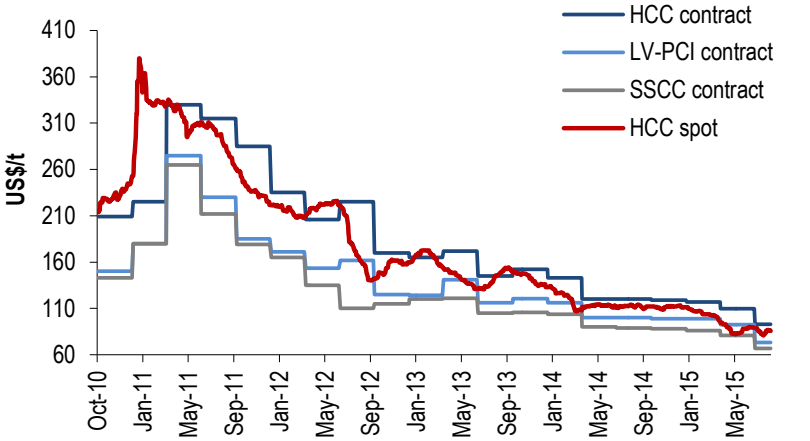
Met Coal Prices ($USD/t)



Met Coal Prices ($USD/t)



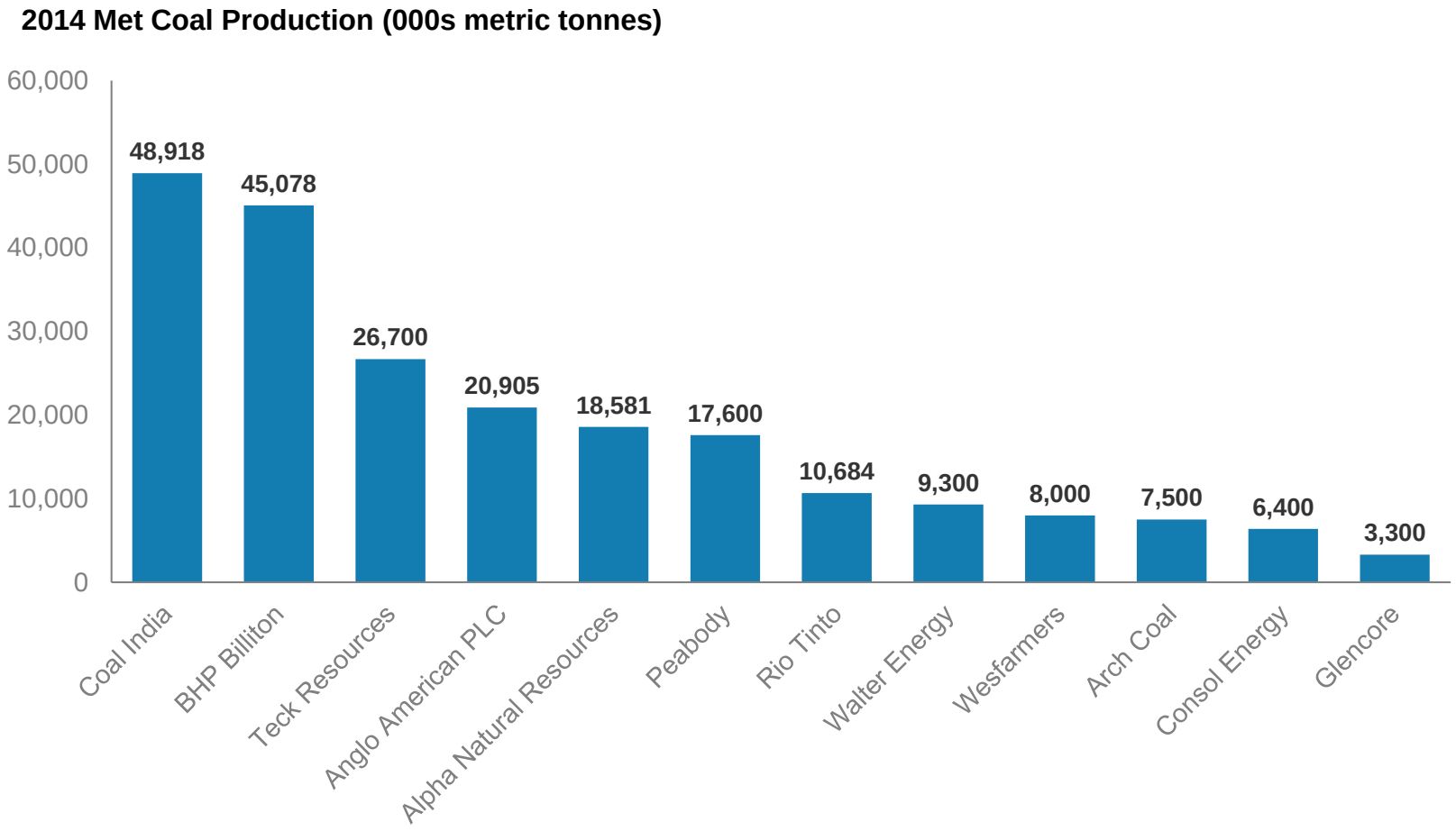
Hard Coking Coal Prices: Contracts vs. HCC Spot ($USD/t)



Source: Morgan Stanley Research

Global Met Coal Market: Global Met Coal Producers

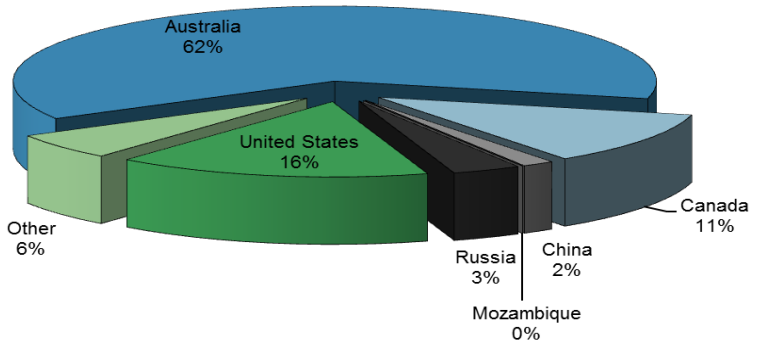
Chinese domestic producers, not listed on this chart, produced upwards of ~500mt of met coal in 2014. This amount far exceeded any individual producer listed here.



Source: Company Data, World Coal Association, Morgan Stanley Research

Global Met Coal Market: Supply Analysis

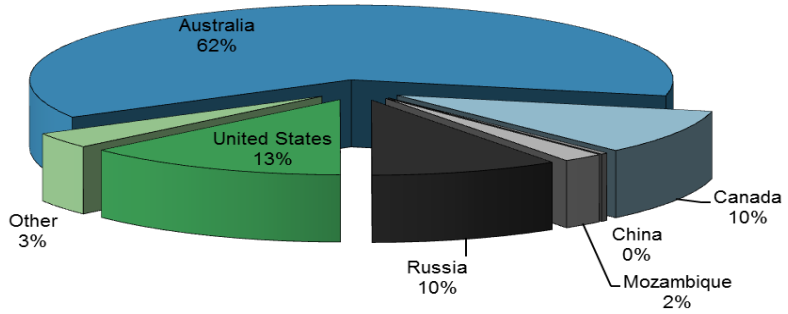
Met Export Supply Mix 2008



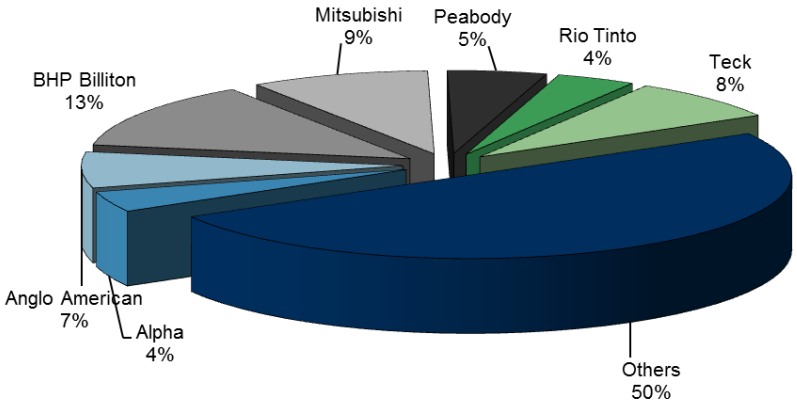
Met export supply mix dominated by Australia

- Assuming persistently high production levels from Rio Tinto and BHP Billiton, Australia is expected to dominate the supply mix in the long term
- Russia could potentially gain some market share in the distant future
- Canadian exports should remain relatively strong given their position on the cost curve

Met Export Supply Mix 2015



Met Export Supply by Company



Source: WoodMackenzie, Morgan Stanley Research

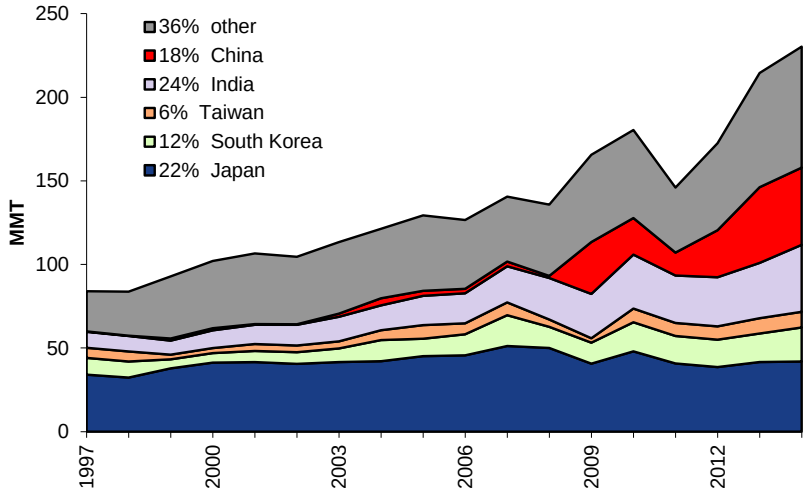
Global Met Coal Market: Notable Production Cuts

2014-15 Metallurgical Coal Production Cuts							
Announced	Timing	Company	Mine	Action	Location	Quality	Est. Production
3/27/2014	9/1/2014	Glencore	Ravensworth UG	Idle	Australia	Semi-Soft	2.1 mt
4/15/2014	4/15/2014	Walter	Wolverine	Idle	Canada	Mid-Vol HCC	1.7 mt
4/15/2014	7/1/2014	Walter	Brule	Idle	Canada	PCI	1.8 mt
4/22/2014	2014	Arch	Various	Reduction	CAPP	Various	1.2 mt
4/23/2014	6/22/2014	Patriot	Wells	Idle	CAPP	High-Vol "A"	1.3 mt
4/29/2014	No info	Mechel Bluestone	Various	Idle	CAPP	Various	1.8 mt
1/5/2014	2014	Alpha	Various	Reduction	CAPP	Various	1.5 mt
5/16/2014	No info	Vale	Integra	Idle	Australia	Semi-Soft/Semi-Hard	1.4 mt
6/1/2014	Immediate	Beacon Hill	Minas Moatize	Idle	Mozambique	HCC	1.8 mt
6/6/2014	FY15 (June 2015)	Solid Energy	Stockton	Reduction	New Zealand	Semi-Hard	0.5 mt
6/27/2014	Sep-14	Alpha	Cherokee	Close	CAPP	HCC	0.3 mt
7/14/2014	Aug-14	Centennial Coal	Newstan	Idle	Australia	Semi-Soft	0.2 mt
7/29/2014	2014	Consol	Buchanan	Reduction	CAPP	Low-Vol HCC	0.9 mt
7/29/2014	2014	Consol	Bailey, Enlow Fork	Reduction	NAPP	High-Vol	0.8 mt
10/15/2014	2014	Rio Tinto	Various	Reduction	Australia	HCC	1.2 mt
7/21/2014	2014-2015	Arch	Cumberland River	Idle	CAPP	High-Vol	0.6 mt
9/26/2014	9/26/2014	Alpha	3 Mines	Idle	CAPP	High-Vol	1.5 mt
8/5/2014	2014-2015	Peabody	Burton	Reduction	Australia	Semi-Hard	1.2 mt
8/26/2014	No info	Wollongong	Wongawilli	Idle	Australia	HCC	0.6 mt
9/11/2014	End of 2014	Anglo American	Peace River	Idle	Canada	HCC	1.5 mt
9/29/2014	Early 2015	Vale/Sumotomo	Isaac Plains	Idle	Australia	Semi-Soft/PCI	1.2 mt
11/11/2014	11/11/2014	Alpha	Cucumber	Idle	CAPP	Vaious	0.3 mt
12/15/2014	Immediate	Suncoke	Various	Reduction	CAPP	Mid-Vol HCC	0.6 mt
1/9/2015		Corsa Coal	Various	Idle	NAPP	Low-Vol	0.4 mt
1/8/2015	Feb	Grand Cache	Surface Mine No. 8	Idle	Canada	Low-Vol	1.4 mt
1/30/2015	Jan	SunCoke	Dominion 30	Idle	CAPP		0.2 mt
1/30/2015	Feb	SunCoke	Dominion 7	Idle	CAPP		
1/30/2015	Feb	SunCoke	Dominion 34	Idle	CAPP		
2/27/2015	Jan	Yancoal	Various	Cut	Australia		*0.7 mt*
	3-4 Weeks	Patriot	Samples	Temp. Idle	CAPP	High-Vol	*0.2 mt*
	3-4 Weeks	Patriot	Winchester	Temp. Idle	CAPP	High-Vol	0.9 mt
4/30/2015		Patriot	Wells	Idle	CAPP		1.3 mt
5/28/2015		Glencore	Collinsville	Cut	Australia	High-Vol "A"	0.5 mt
5/28/2015	3Q15	Teck	Various	Temp. Idle	Canada	Low-Vol	1.5 mt
6/2/2015		Rhino	Various	Temp. Idle	CAPP	High-Vol "A"	0.4 mt
6/3/2015	Over next 9 months	Peabody	North Goonyella	Cut	Australia	Low-Vol	1.4 mt
Total							**34.7 mt**

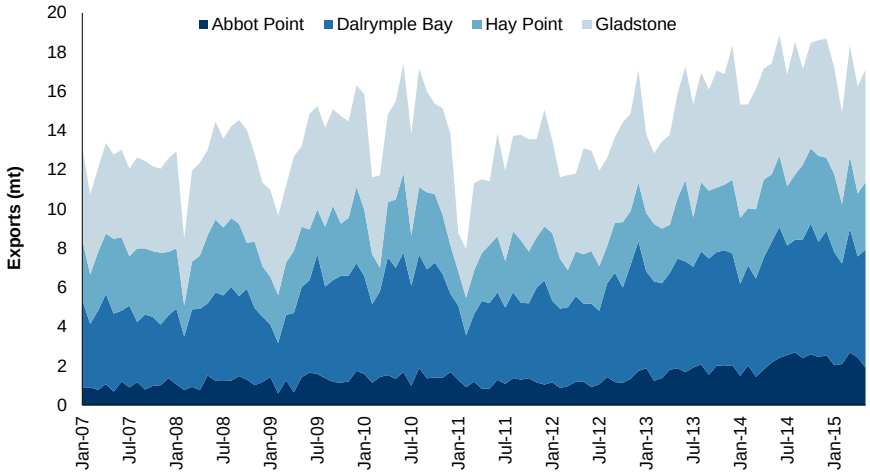
Source: Company Press Releases, DTC, Morgan Stanley Research

Global Met Coal Market: Significant Exporters – Australia

Australia's annual met-coal exports, by destination



Australia's met-coal exports from major terminals



Australia serves as the primary exporter of met coal

- Major producer BHP Billiton not expected to drastically increase or decrease production targets over the next calendar year, implying relatively constant export volumes
- Australian coal producer Whitehaven Coal unlikely to ramp up met production at their new Maules Creek mine given the pricing environment
- Peabody has cut a small amount of production at their Australian met coal mines
- Queensland exports have fallen 1.8% year-on-year, with exports relatively flat on a year-to-date basis

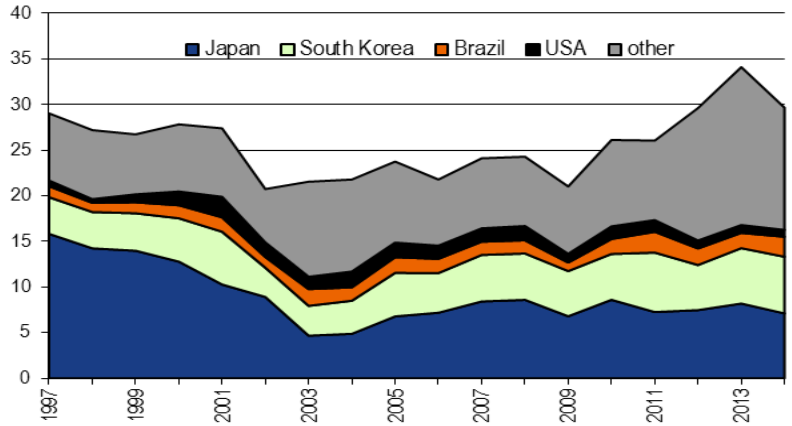
Export Drivers

- Continued demand from China and India must remain high in order for Australia to maintain and increase their met coal exports
- In the absence of price stabilization, exports may only marginally increase in absolute terms over the next few years as demand in China falls, coupled with production cuts by the major Australian producers

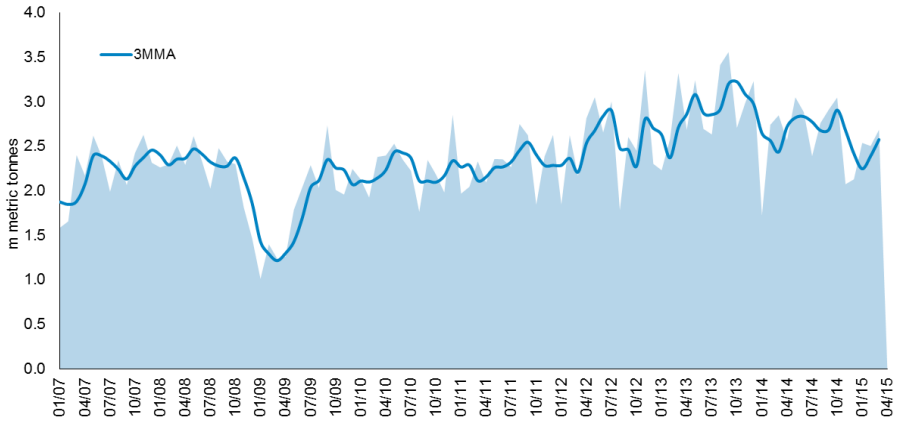
Source: McCloskey, Tex Report, Morgan Stanley Research

Global Met Coal Market: Significant Exporters – Canada

Canada's annual met-coal exports, by destination (kt)



Canada's monthly met-coal exports, aggregate



Canadian—Chinese Trade Relationship

- Canada felt the brunt of a decrease in Chinese demand, with nearly all of a 4,000 ton decrease in exports coming from China
- China was almost solely responsible for the initial uptick of Canadian exports to begin with, implying a strong reliance on China to maintain its current level of exports

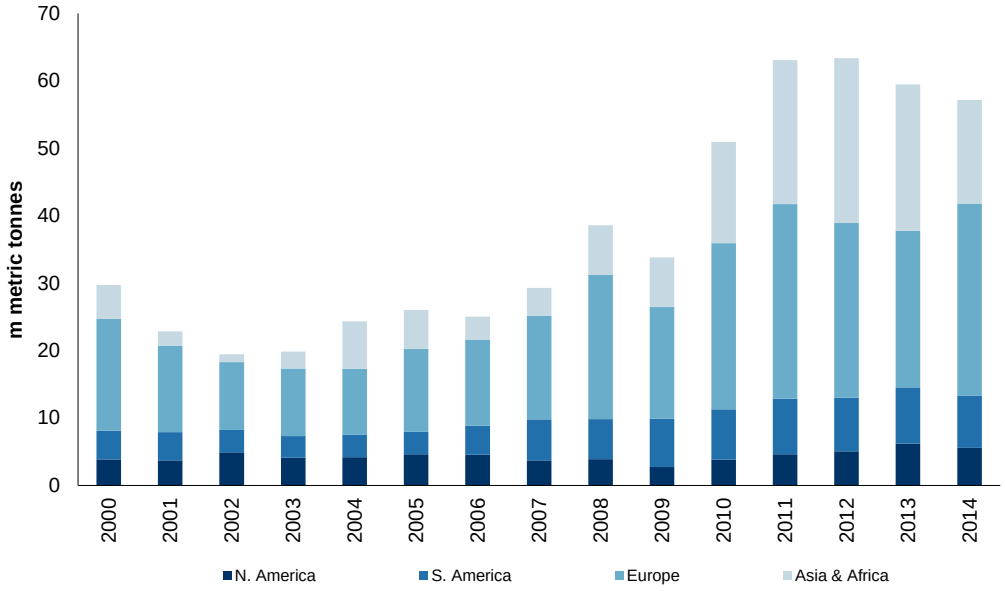
Looking elsewhere…

- Canada continues to export a majority of its coal to Japan, South Korea, and Brazil, although Canada has been unable to meaningfully increase exports to any of these countries over the past five years

Source: McCloskey, Tex Report, Morgan Stanley Research

Global Met Coal Market: Significant Exporters – Australia

US Metallurgical Coal Exports by Destination



US Exporters Are the World's Swing Suppliers

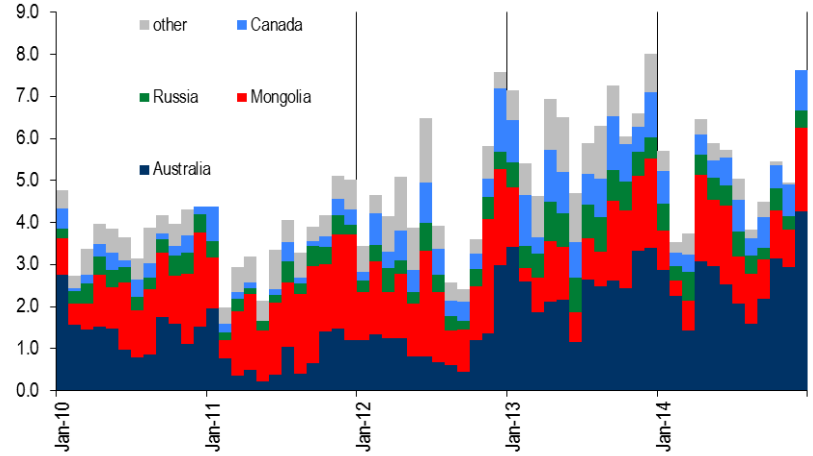
- When Australian floods cut off supply in 2008 and 20011, US producers ramped up met coal production for export
- However many of these high cost mine are now cash lossmaking, and gradually shutting down
- We believe exports will eventually reach levels similar to those before the Australian supply issues

Source: xxxx

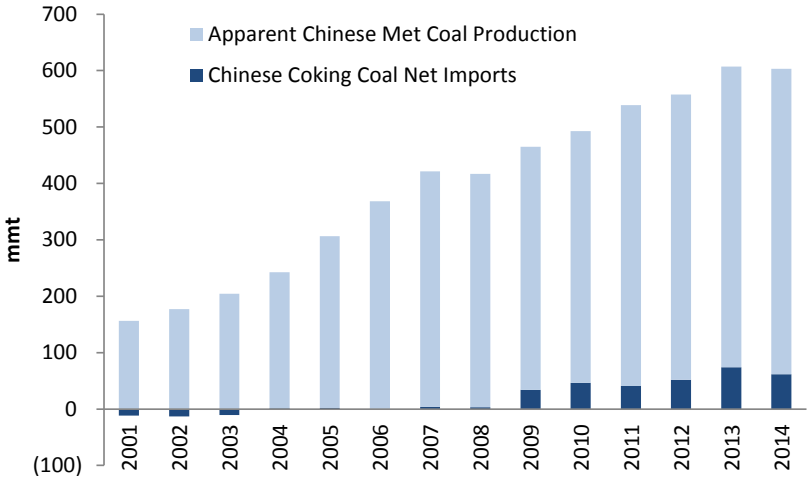
Source: World Steel Association, Platts, McCloskeys, Morgan Stanley Research

Global Met Coal Market: Significant Importers – China

China's met-coal imports, by source (Mt/month)



China is largely self-sufficient



China imports can be highly volatile

- China's domestic met coal industry is twice the size of the entire global seaborne market. The country is close to self-sufficient on met coal, and small changes to the domestic supply-demand balance can profoundly impact the global seaborne market.

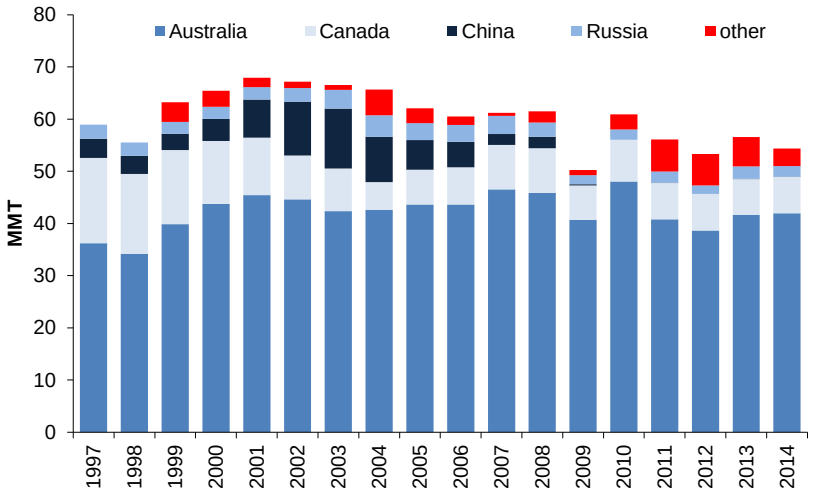
Steadily dependent on Mongolian imports

- Mongolian imports ramped in recent years as China became modestly short met coal. With the recent collapse of met coal prices, we would expect supply growth out of Mongolia to level off.

Source: McCloskey, Tex Report, Morgan Stanley Research

Global Met Coal Market: Significant Importers – Japan, South Korea, Taiwan

Japan's annual met-coal imports, by source (Mt)



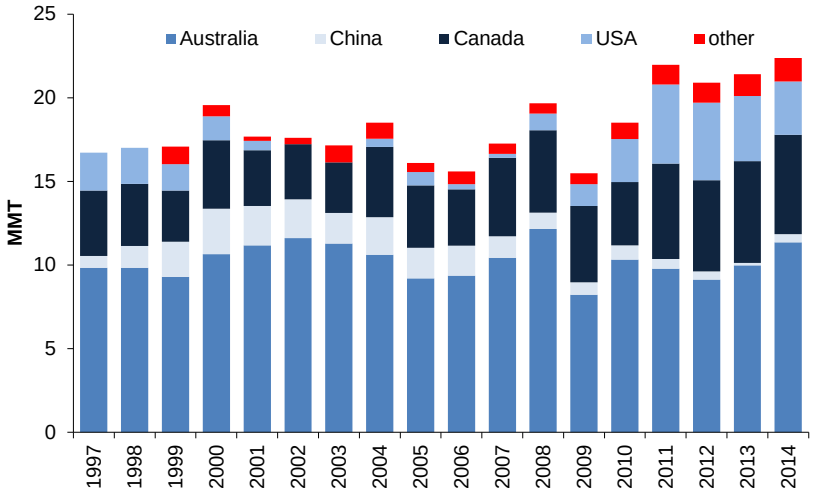
Import volumes still recovering in Taiwan

- Coming off a peak in 2003, Taiwan has slowly been increasing its imports of met coal since hitting a trough in 2005

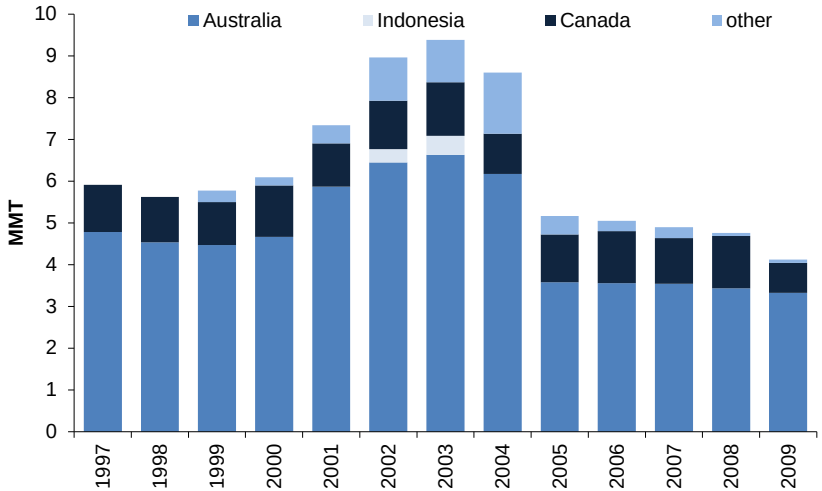
Three nations have a large impact on demand

- Account for roughly 30% of worldwide import volume
- However, volumes expected to remain relatively flat over the next 20 years, with no meaningful catalysts affecting demand

South Korea's annual met-coal imports, by source (Mt)



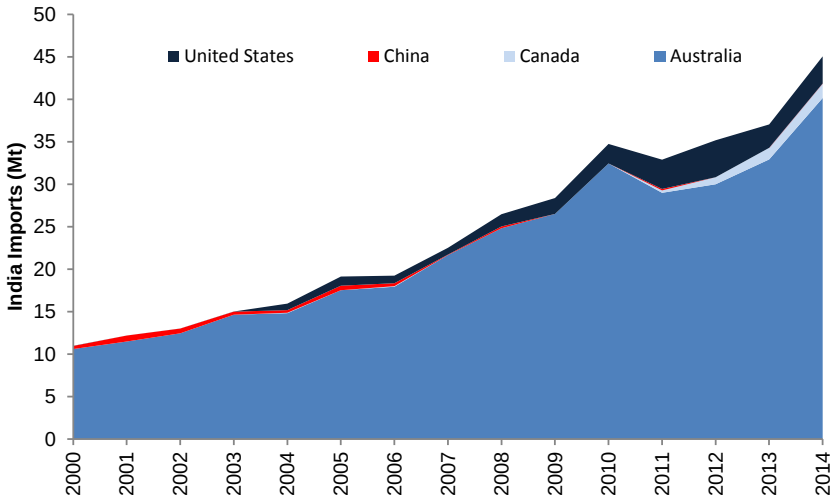
Taiwan's annual met-coal imports, by source (Mt)



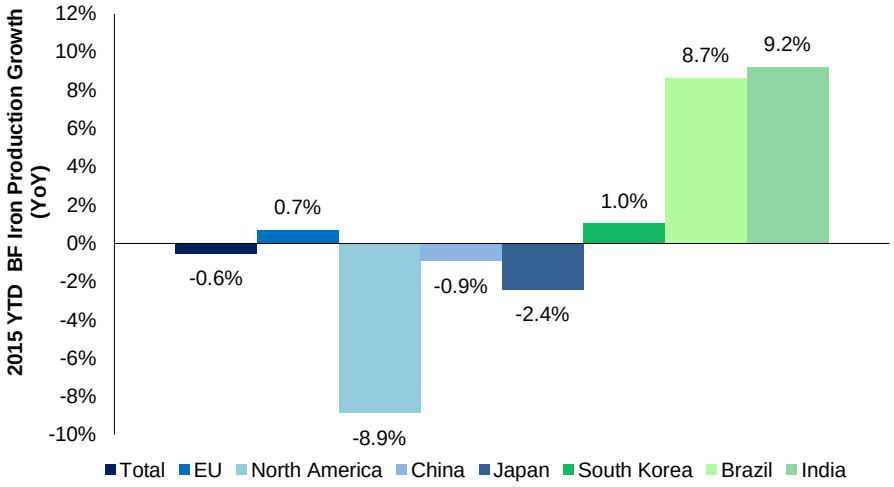
Source: McCloskey, Tex Report, Morgan Stanley Research

Global Met Coal Market: Significant Importers – India

India's annual met-coal imports, by source (Mt)



Country Iron/Steel Production Growth



Soon to overtake China?

- We believe that India will overtake China in 2015 and become the 2nd largest seaborne importer behind Japan. As the economy expands and drives steel production growth, India will likely turn towards the seaborne market since it does not have high-quality met-coal reserves at home

Dependence on Australia

- India is relying almost exclusively on Australia to fulfill its increasing met-coal needs

Steel production growth accelerating

- India is second only to Brazil in iron/steel production growth on a YTD basis, explaining the strong increase in met-coal imports

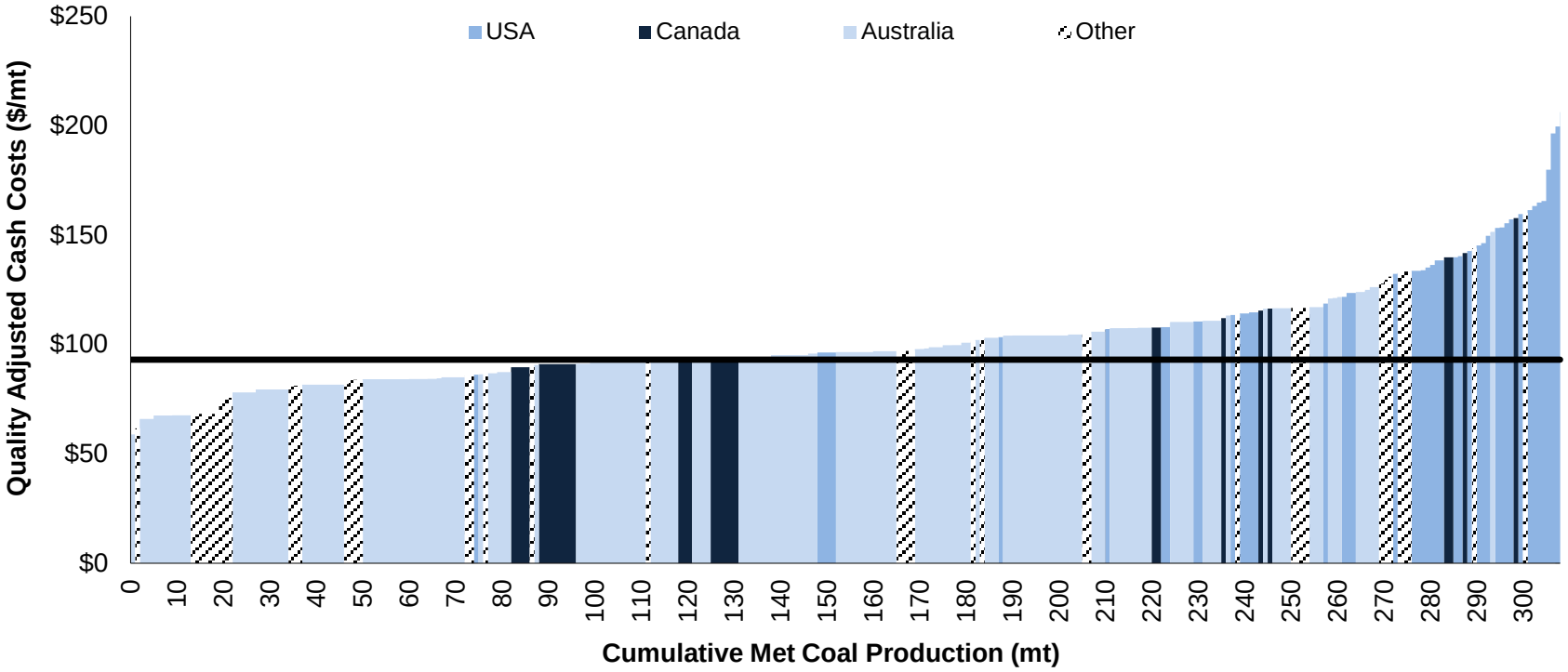
- Trend likely to continue as India increases urbanization and continues its current trajectory of steel production growth

- Expected to account for ~10% of seaborne import demand by 2020, possibly up to ~18-20% by 2035

Source: McCloskey, Tex Report, Morgan Stanley Research

Global Met-Coal Market: Seaborne Met-Coal Cost Curve

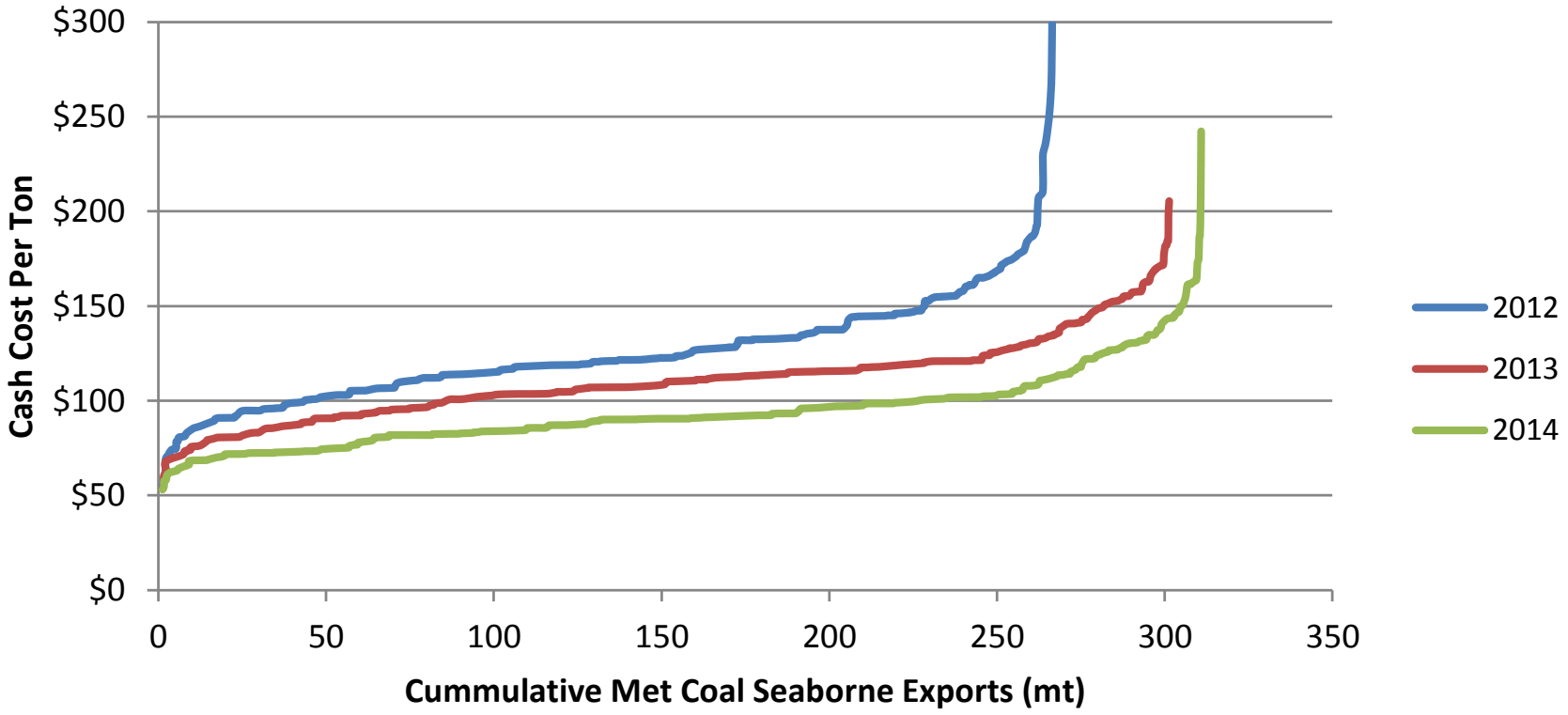
A large portion of global producers are cash loss-making today, especially those in the US



Source: WoodMackenzie, Morgan Stanley Research

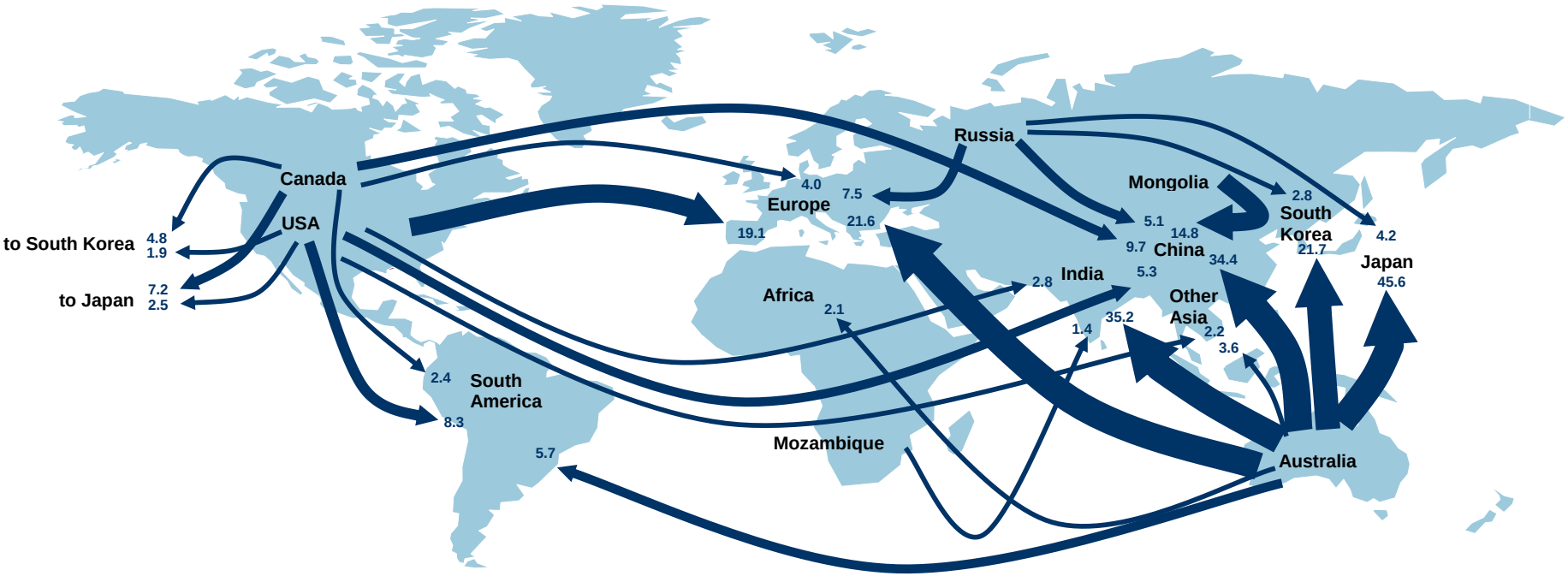
Global Met-Coal Market: Seaborne Met-Coal Cost Curve

The cost curve has deflated as producers scramble to cut costs and the USD rises against the AUD and CAD



Source: WoodMackenzie, Morgan Stanley Research

Global Met-Coal Market: Seaborne Met-Coal Trade Flows (2014)



Source: Wood Mackenzie, Morgan Stanley Research

Global Met Coal Market: Met Coal Supply/Demand Balance

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	2025e
Global IP growth (adjusted PPP weights)	%	7.63	1.45	-6.36	10.92	5.49	3.75	3.36	4.50	4.95	5.13	5.07	5.05	5.03	4.97	4.20	4.10	3.80	3.10	3.00
Global Crude Steel Production	Mt	**1,346**	**1,330**	**1,234**	**1,418**	**1,515**	**1,554**	**1,638**	**1,656**	**1,665**	**1,700**	**1,732**	**1,759**	**1,782**	**1,810**	**1,837**	**1,864**	**1,894**	**1,924**	**1,955**
Global Pig Iron Production	Mt	**961**	**950**	**934**	**943**	**1,103**	**1,154**	**1,245**	**1,262**	**1,272**	**1,301**	**1,328**	**1,352**	**1,372**	**1,397**	**1,421**	**1,445**	**1,471**	**1,498**	**1,526**
Metallurgical Coal usage in steel-making	Mt	**901**	**889**	**880**	**900**	**1,037**	**1,076**	**1,151**	**1,162**	**1,177**	**1,205**	**1,221**	**1,242**	**1,262**	**1,287**	**1,311**	**1,335**	**1,361**	**1,388**	**1,416**
Requirement for metallurgical coal for coke-making	**Mt**	**805**	**794**	**785**	**795**	**924**	**961**	**1,032**	**1,036**	**1,046**	**1,071**	**1,084**	**1,103**	**1,122**	**1,144**	**1,166**	**1,188**	**1,212**	**1,236**	**1,262**
Metallurgical Coal Exports																				
Australia	Mt	137.7	134.5	134.5	158.5	132.3	144.4	169.2	184.1	172.9	181.8	184.6	188.3	190.1	192.0	192	192	192	192	192
Canada	Mt	26.7	26.6	22.1	27.0	27.6	30.7	35.3	31.1	31.4	31.4	31.4	31.4	31.4	31.4	31	31	31	31	31
United States	Mt	29.3	38.7	33.8	50.9	63.1	63.4	59.5	57.2	48.0	43.2	39.7	37.8	35.9	34.1	32	31	29	28	26
Colombia	Mt	2.3	2.1	2.0	1.8	2.1	1.6	2.8	2.8	2.8	2.8	2.9	2.9	2.9	2.9	3	3	3	3	3
Venezuela	Mt	2.1	2.1	2.2	1.1	2.5	2.6	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3	3	3	3	4
China	Mt	2.5	3.5	0.6	1.1	3.6	1.3	1.1	0.8	0.9	1.0	1.1	1.2	1.3	1.4	2	2	2	2	2
Indonesia	Mt	5.1	5.0	4.9	4.1	3.8	2.2	3.8	5.2	5.9	5.9	6.0	6.0	6.0	6.0	6	6	6	6	6
Mongolia	Mt	3.1	3.6	4.0	15.0	20.0	19.1	15.4	14.8	13.4	13.6	13.9	14.2	14.5	14.8	15	15	16	16	16
Vietnam	Mt	1.1	1.1	1.1	1.2	1.2	0.9	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1	1	1	1	1
New Zealand	Mt	2.7	2.6	2.6	1.6	1.9	1.6	2.4	2.1	2.4	2.5	2.5	2.5	2.5	2.6	3	3	3	3	3
Russia	Mt	13.3	13.6	13.2	18.2	14.2	17.7	18.1	15.2	14.9	14.6	14.3	14.0	15.4	15.7	16	16	17	17	17
other	Mt	6.8	6.6	7.2	6.8	7.5	10.2	11.1	12.0	13.7	16.6	17.7	17.8	17.8	18.9	20	21	22	23	24
Total		**233**	**240**	**228**	**288**	**280**	**296**	**323**	**330**	**311**	**318**	**319**	**321**	**323**	**325**	**325**	**325**	**325**	**326**	**327**
Metallurgical Coal Imports (all coking + direct injection coals)																				
Japan	Mt	61.2	61.5	50.2	60.9	56.1	53.3	56.6	54.3	51.0	53.7	52.9	52.7	51.1	50.2	49	48	47	46	45
China	Mt	6.2	6.9	34.5	47.3	44.7	53.6	75.4	62.4	44.0	43.1	42.3	41.4	40.6	39.8	39	38	37	37	36
South Korea	Mt	19.8	22.6	21.9	26.0	30.8	28.8	29.7	32.5	35.8	31.4	32.0	32.7	33.6	34.1	35	35	36	37	37
India	Mt	21.3	24.5	20.8	22.4	26.9	32.3	37.1	45.0	50.2	53.2	56.4	59.2	62.1	65.2	68	72	76	79	83
Brazil	Mt	15.3	15.7	11.3	14.3	16.1	14.8	14.0	20.7	21.3	21.7	22.2	22.6	23.1	23.5	24	24	25	25	26
EU-25*	Mt	74.7	75.6	55.6	69.6	65.3	68.5	66.7	72.3	67.5	68.5	69.5	70.6	71.6	72.7	75	77	79	81	83
other	Mt	34.3	33.4	33.8	47.2	40.2	44.3	44.3	42.3	39.0	40.6	41.0	41.4	41.9	42.3	44	45	47	48	50
Total		**232.8**	**240.1**	**228.2**	**287.6**	**280.1**	**295.5**	**323.9**	**329.5**	**308.8**	**312.2**	**316.3**	**320.7**	**324.0**	**327.9**	**334**	**340**	**347**	**354**	**361**
Traded Balance		**0**	**0**	**0**	**0**	**0**	**0**	**-1**	**0**	**2**	**6**	**2**	**0**	**-1**	**-3**	**-9**	**-15**	**-22**	**-28**	**-34**
Annual Average Prices (JFY set price, prior 2010; quarterly set price, post 2010)																				
Hard Coking Coal (spot; premium)	US$/t fob					292	191	148	115	94	114	118	118	123	128	128	131	133	135	138
Hard Coking Coal (contract; premium)	US$/t fob	101	305	129	191	289	209	159	126	106	116	118	118	123	128	128	131	133	135	138
Low-vol PCI (contract)	US$/t fob	64	235	80	136	218	153	125	104	89	97	98	98	98	99	99	101	102	104	106
Semi-soft coking coal (contract)	US$/t fob	67	260	90	147	209	131	113	93	77	84	85	85	86	87	86	88	89	91	92
China's Metallurgical Coal Supply-Demand																				
Domestic requirement	Mt	310	310	356	385	413	431	463	465	463	463	467	470	473	478	483	488	493	497	502
Imports	Mt	6	7	34	47	45	54	75	62	44	43	42	41	41	40	39	38	37	37	36
Implied domestioc production	Mt	304	303	321	338	368	377	387	402	419	420	424	429	433	439	444	450	455	461	466

Source: Morgan Stanley Research, World Steel Association, McCloskey, Tex Report, Wood Mackenzie

Seaborne Thermal Coal Market

Global Thermal Coal Market: Another Boom Bust Story

China was the key driver of the seaborne thermal boom

China had historically been self-sufficient on thermal coal, but strong demand growth in 2007-2013 caused imports to surge to 252mt from 46mt. Demand also grew sharply in Europe and Japan after Fukushima caused Germany and Japan to switch off nuclear generation capacity. Supply issues in Australia and loss of supply from met "crossover" coal caused the annual Asian contract price to surge to $130/t in 2011 from $55/t in 2007.

Supply growth overtook peaking demand in 2012-13 and prices began to slide

Indonesia and Australia responded strongly to the rise in coal prices. Indonesian exports ramped to 424mt in 2014 from 195mt in 2007, while Australian exports ramped to 201mt in 2014 from 112mt in 2007. At the same time, higher domestic Chinese production allowed the country to begin to reverse out of the seaborne market beginning in 2014. Also, weak natural gas prices in the US in 2012, decreased US thermal coal demand, which was ultimately redirected into the export market.

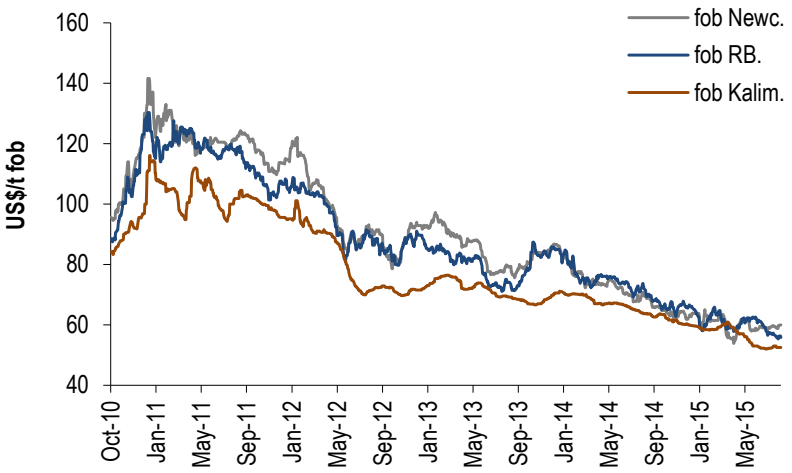
We think it could take years for the seaborne market to move back into balance

In our view, Chinese coal consumption has either already peaked or is on the verge. China is focused on decreasing coal generation in an effort to stem pollution, and new power generation growth will likely be met by coastal nuclear plants and renewables. As a result, Chinese imports could continue to slide, making it unlikely that we will see a balanced market in the next few years.

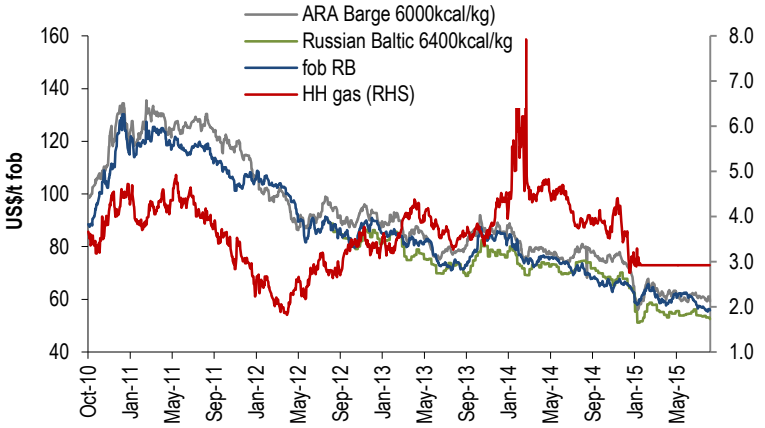
Source: Morgan Stanley Research

Global Thermal Coal Market: Pricing Trends

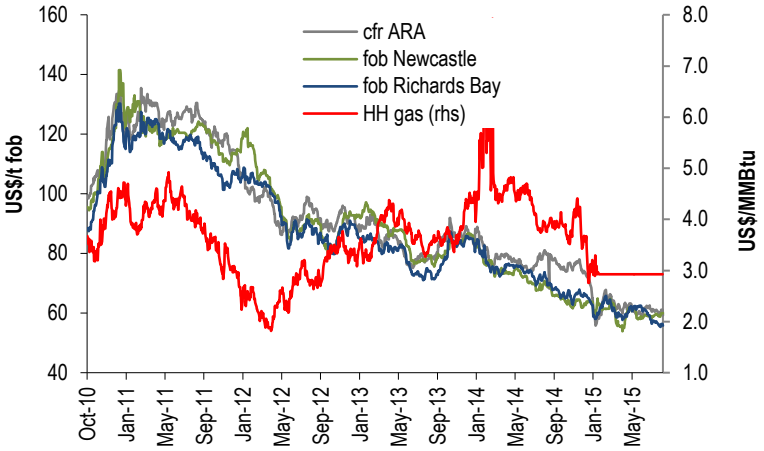
Thermal Coal Price Indices ($USD/t fob)



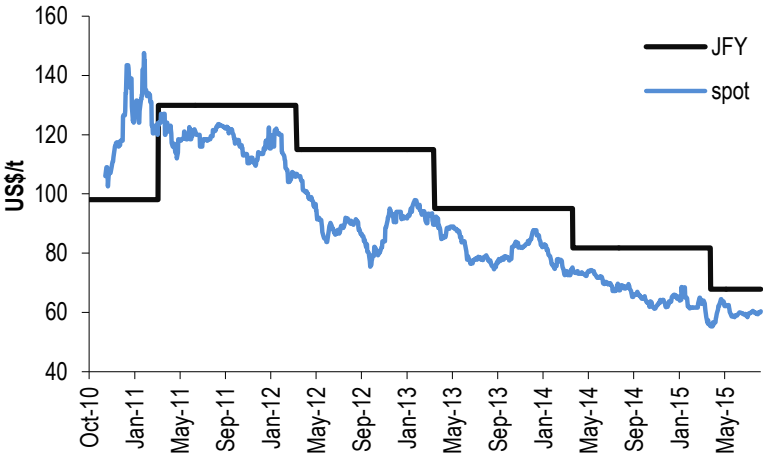
Thermal Coal Price Indices ($USD/t fob)



Thermal Coal Price Indices ($USD/t fob)

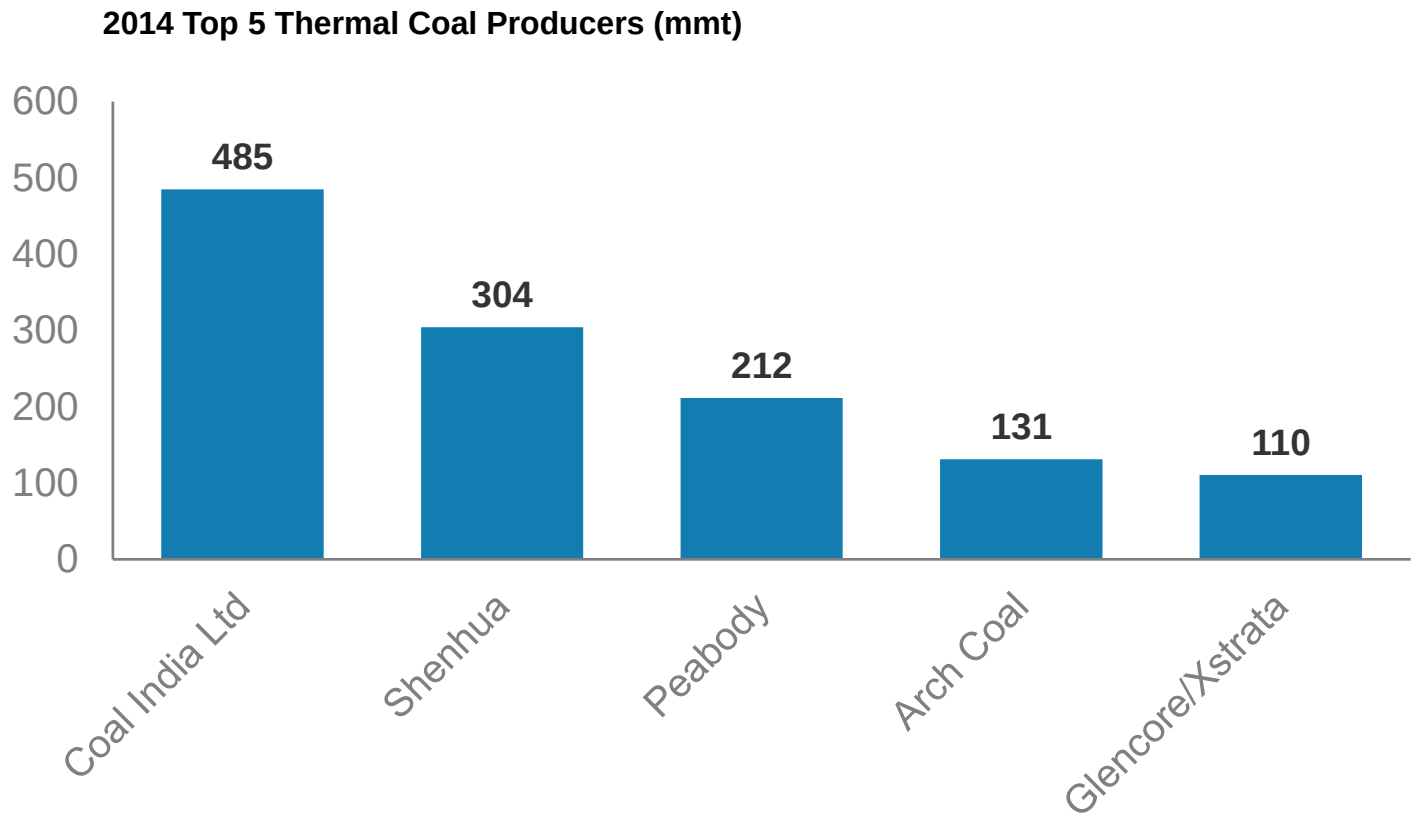


Thermal Coal's JFY vs. Spot (fob Newc. 6300cv; $USD/t)



Source: McClosekeys, Platts, Morgan Stanley Research

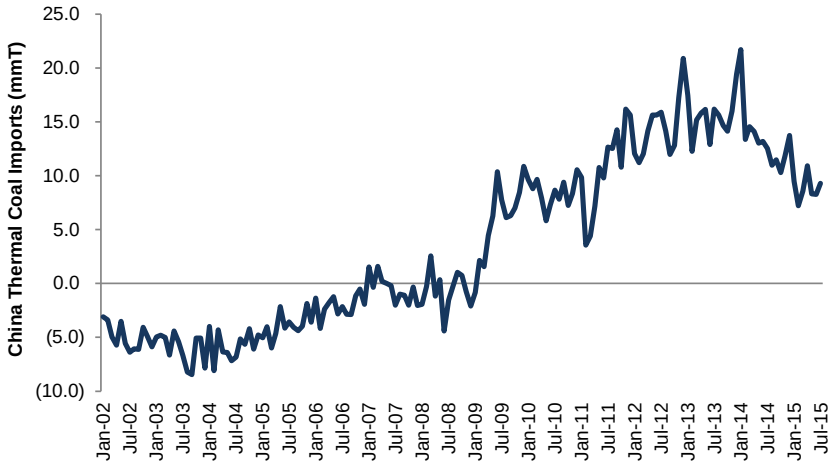
Seaborne Thermal Coal Market: Global Thermal Coal Producers



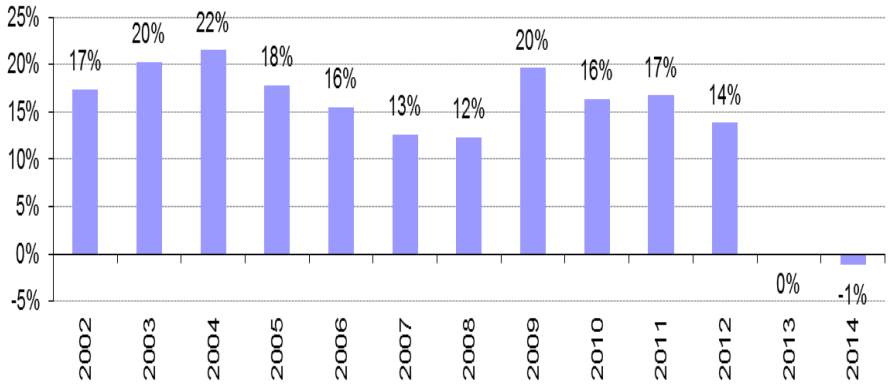
Source: Company Documents, Morgan Stanley Research

Global Thermal Coal Market: Importers & Exporters – China

China monthly thermal coal net imports



China coal apparent consumption growth



A largely self-sufficient user of thermal coal, China continues to set demand trends in the worldwide market

- Some debate as to whether Chinese domestic coal demand could peak in 2016 or 2017, or whether thermal coal burn has already peaked
- Power generation growth relative to GDP growth will likely fall, as the new five-year plan will phase out power-intensive heavy industrial growth
- In 2015 YTD, power demand growth weak at ~.8%

Thermal coal production and consumption beginning to level off, could begin to fall

- Government is beginning to closely monitor production, and any mining company found in violation of the production caps may have trouble applying for new permits. However, we are skeptical the government will take strong action to close coal mines and kill jobs.

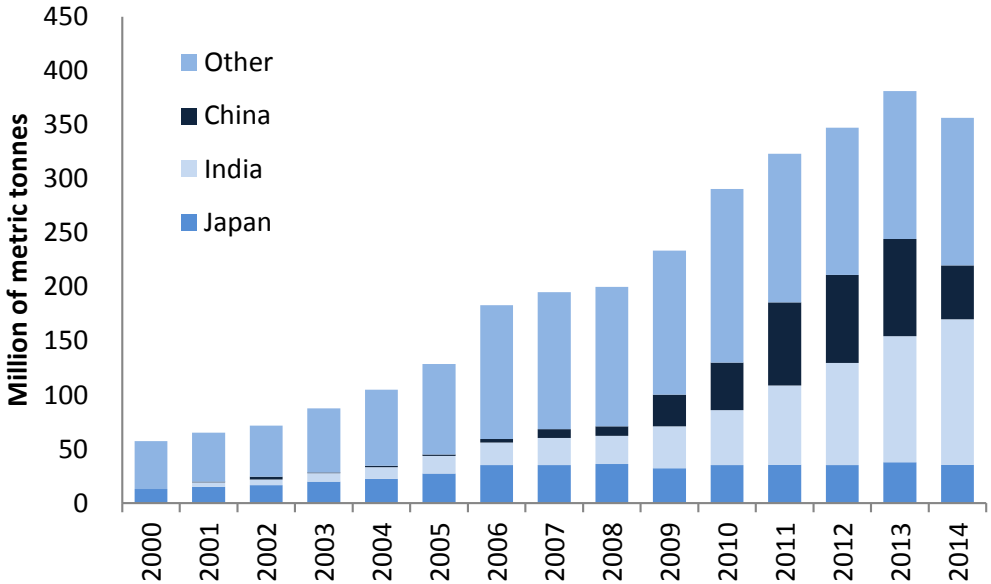
Future power generation capacity unlikely to come primarily from coal

- Despite an abundance of cheap coal, much of the new generation capacity in China is expected to come from coastal nuclear power plants and renewables
- Chinese government appears to be taking the carbon reduction efforts seriously
- Industrial overcapacity in the coastal provinces has lowered overall power demand in the region as well, further depressing demand growth for thermal coal

Source: McCloskeys, EIA, Morgan Stanley Research

Global Thermal Coal Market: Importers & Exporters – Indonesia

Indonesian thermal exports



Indonesia is a large low-cost supplier to the seaborne market

- Indonesia is the largest seaborne thermal coal exporter in the world, and has ramped up exports significantly to serve the growing Indian and Chinese markets.
- However, Indonesian coal is a sub-bituminous coal with a lower heat content and is less desirable than Australian coals.
- Recently, China began to impose import duties on lower-rank coals, which could impact the demand for Indonesian coal going forward.

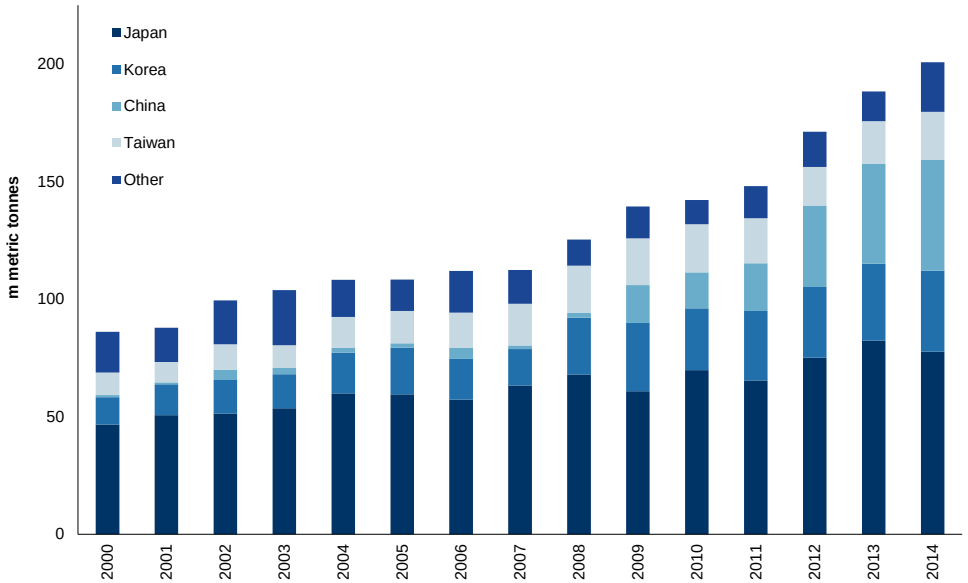
Exports may have peaked in 2013

- Exports took a step lower in 2013 and are on track to fall again in 2014 as Chinese import demand wanes.
- Also part of the issue is that Indonesian mines have become less competitive versus Australian mines as the AUD weakens.
- Another factor is a recently added 1.5% export tax imposed on Indonesian coal. While miners can supposedly recoup the tax as a corporate tax deduction, many miners currently do not pay corporate tax due to the affect weak market conditions on profits.

Source: McCloskeys, Morgan Stanley Research

Global Thermal Coal Market: Importers & Exporters – Australia

Australia annual thermal coal exports



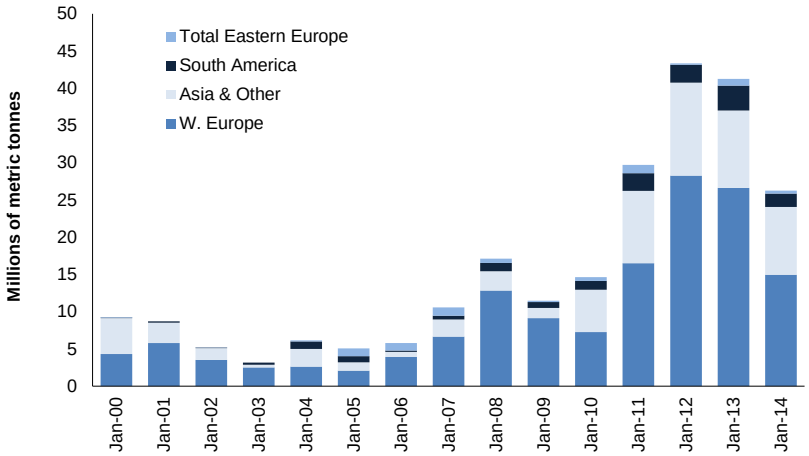
Australia has steadily increased its thermal coal imports on an absolute basis

- Despite a weak pricing environment, Australia has continued to churn out record amounts of thermal coal. The higher quality of Australian coal relative to Indonesian coal is helping to keep volumes strong.
- Constrained by port and rail capacity, Australia has historically been somewhat limited in getting supply of thermal coal out of the country. However, recent expansions have helped.
- Continues to fill most of China's import demands, while also exporting a great deal of thermal coal to Japan

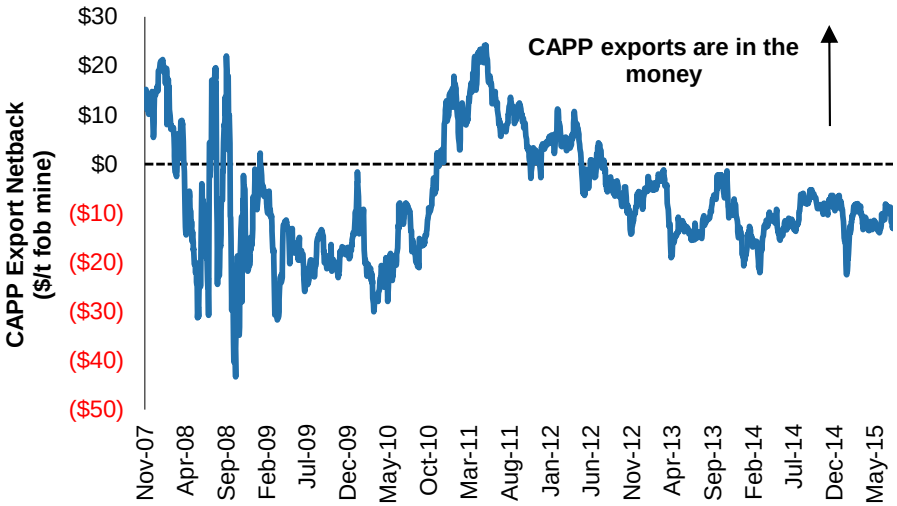
Source: McCloskeys, Morgan Stanley Research

Global Thermal Coal Market: Importers & Exporters – United States

US thermal coal exports have declined as arbs have closed



CAPP export netbacks are out of the money



US exports surged in 2011 and 2012 on Fukushima, China demand, and low-cost gas

- As a reaction to the March 2011 Fukushima nuclear disaster, both Japan and Germany shut down their nuclear generation capacity. As a result, US coal exports to both Europe and Japan moved sharply higher.
- Chinese demand growth outstripped local supply growth and China turned to the seaborne market to fill the void, also supporting US exports.
- Finally, US natural gas plummeted to sub-$2 levels, which prompted US power generators to switch from coal to gas burn. Many power companies had locked into take-or-pay agreements, and the only way out of them was to re-sell the coal into the international market, which also supported export growth.

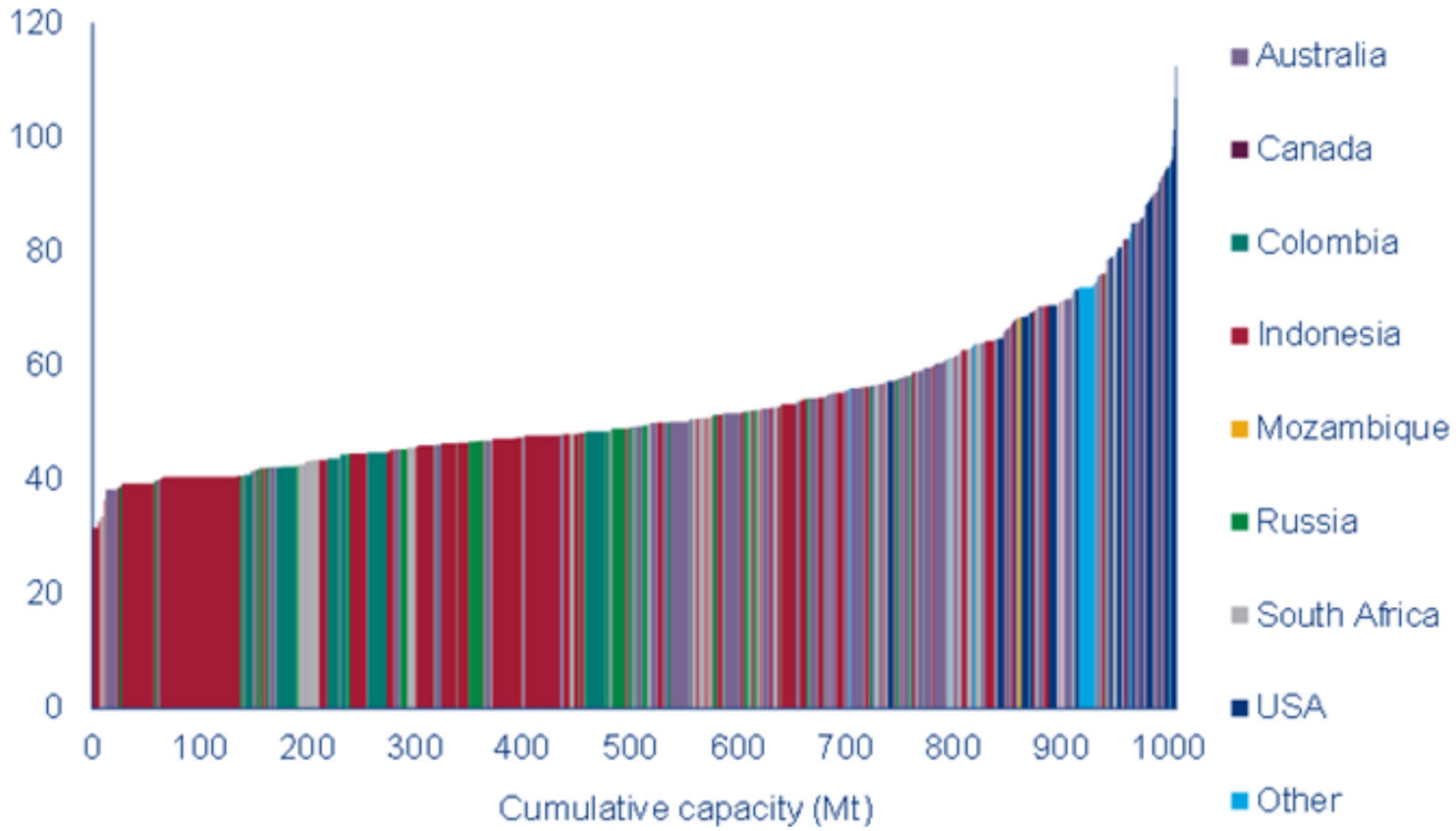
Exports began to decline as the arb closed in late 2012

- On a netback basis, many North American producers lose money by exporting their product given depressed thermal coal prices.
- As LT contracts and rail/port take-or-pay agreements roll off, we think that US exports will continue to decline.

Source: McCloskeys, Morgan Stanley Research

Global Thermal Coal Market: Seaborne Cost Curve

Indonesia and Russia continue to be the low-cost producers best positioned to take advantage of export demand



Source: Morgan Stanley Research, Wood Mackenzie

Seaborne Thermal Coal Market: Global Supply/Demand Model

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Global IP growth (adjusted PPP weights)	%	7.63	1.45	-6.36	10.92	5.49	3.75	3.36	4.50	4.95	5.13	5.07	5.05	5.03	4.97
Supply															
Indonesia	Mt	195	200	234	298	353	384	424	408	372	379	387	391	395	399
Australia	Mt	112	126	128	141	148	171	188	201	193	193	195	197	201	205
Colombia	Mt	65	69	63	69	76	79	74	75	79	80	81	81	81	82
South Africa	Mt	64	65	66	68	66	74	73	76	75	76	77	78	78	79
United States	Mt	11	18	12	16	31	48	44	29	29	29	30	30	30	30
Canada	Mt	4	4	6	4	6	4	3	3	1	1	1	1	1	1
China	Mt	45	36	18	14	7	5	4	2	1	1	1	1	1	1
Poland	Mt	12	8	6	6	6	6	6	6	6	6	6	6	6	6
Russia	Mt	76	79	93	91	88	93	85	115	105	95	96	96	97	97
RoW	Mt	58	50	56	47	53	51	46	40	40	41	41	41	41	41
Total Supply	**Mt**	**642**	**654**	**683**	**754**	**833**	**916**	**947**	**956**	**902**	**901**	**913**	**921**	**931**	**941**
YoY % chg	%	4.7%	1.8%	4.5%	10.5%	10.4%	10.0%	3.4%	1.0%	-5.7%	0.0%	1.3%	0.9%	1.1%	1.1%
Demand															
Japan	Mt	124	128	111	125	121	132	139	145	149	151	153	156	158	160
South Korea	Mt	66	74	78	88	98	97	97	98	101	102	103	105	106	107
Taiwan	Mt	54	53	49	53	55	43	46	45	43	44	45	46	47	48
China	Mt	46	37	105	141	177	235	252	229	163	147	132	121	112	103
India	Mt	29	36	60	75	92	101	112	137	136	143	150	158	166	174
Europe	Mt	189	193	163	150	168	192	185	180	180	183	187	190	194	198
North America	Mt	54	52	40	34	30	25	24	25	26	26	26	27	27	27
ROW	Mt	82	81	78	87	91	92	93	96	95	98	100	103	107	110
Total Imports	**Mt**	**644**	**654**	**683**	**753**	**833**	**915**	**947**	**956**	**893**	**894**	**897**	**905**	**915**	**926**
YoY % chg	%	5.2%	1.6%	4.4%	10.2%	10.7%	9.8%	3.4%	1.0%	-6.6%	0.1%	0.4%	0.9%	1.1%	1.2%
Atlantic Market	Mt	270	275	231	215	231	250	244	241	244	250	255	261	268	274
YoY % chg	%	-2.8%	1.6%	-15.7%	-7.2%	7.4%	8.3%	-2.4%	-1.3%	1.3%	2.3%	2.3%	2.4%	2.4%	2.4%
Pacific Market	Mt	374	380	452	538	602	665	703	715	649	645	642	644	647	652
YoY % chg	%	11.9%	1.5%	18.9%	19.2%	12.0%	10.4%	5.6%	1.8%	-9.2%	-0.7%	-0.4%	0.3%	0.5%	0.7%
Trade Balance	**Mt**	**-2.3**	**-0.8**	**-0.2**	**1.3**	**-0.5**	**0.5**	**0.0**	**-0.1**	**8.5**	**7.4**	**15.7**	**15.5**	**15.8**	**14.7**
Annual Asian Reference Price (US$/t, JFY)		**$55**	**$125**	**$70**	**$98**	**$130**	**$115**	**$95**	**$82**	**$69**	**$72**	**$75**	**$76**	**$78**	**$80**
Price (Newcastle spot, 6,322 kcal/kg, US$/t fob)		**$76**	**$130**	**$75**	**$100**	**$117**	**$85**	**$79**	**$66**	**$63**	**$66**	**$70**	**$72**	**$73**	**$75**
China's Thermal Coal Supply-Demand															
Domestic production (for power generation)	Mt	3,041	3,222	3,712	4,201	4,432	4,663	4,894	5,124	5,355	5,587	5,819	6,051	6,283	6,514
Imports	Mt	46	37	105	141	177	235	252	229	163	147	132	121	112	103
Total supply	Mt	2,994	3,185	3,607	4,061	4,255	4,428	4,642	4,895	5,192	5,440	5,687	5,929	6,171	6,412

Source: Morgan Stanley Research

US Thermal Coal Market

US Coal Market: Structural Industry Shifts

Regulation of the coal industry continues to be a concern, with multiple pieces of legislation challenging the industry

With the implementation of preexisting legislation and new clean air rules coming into play, regulation will continue to challenge the coal industry. A republican administration could try to reverse some of the recent EPA moves on clean power, but we would not count on this since public opinion has shifted against coal.

The continuing improvement in shale gas drilling costs will likely keep gas prices depressed and pressure coal demand

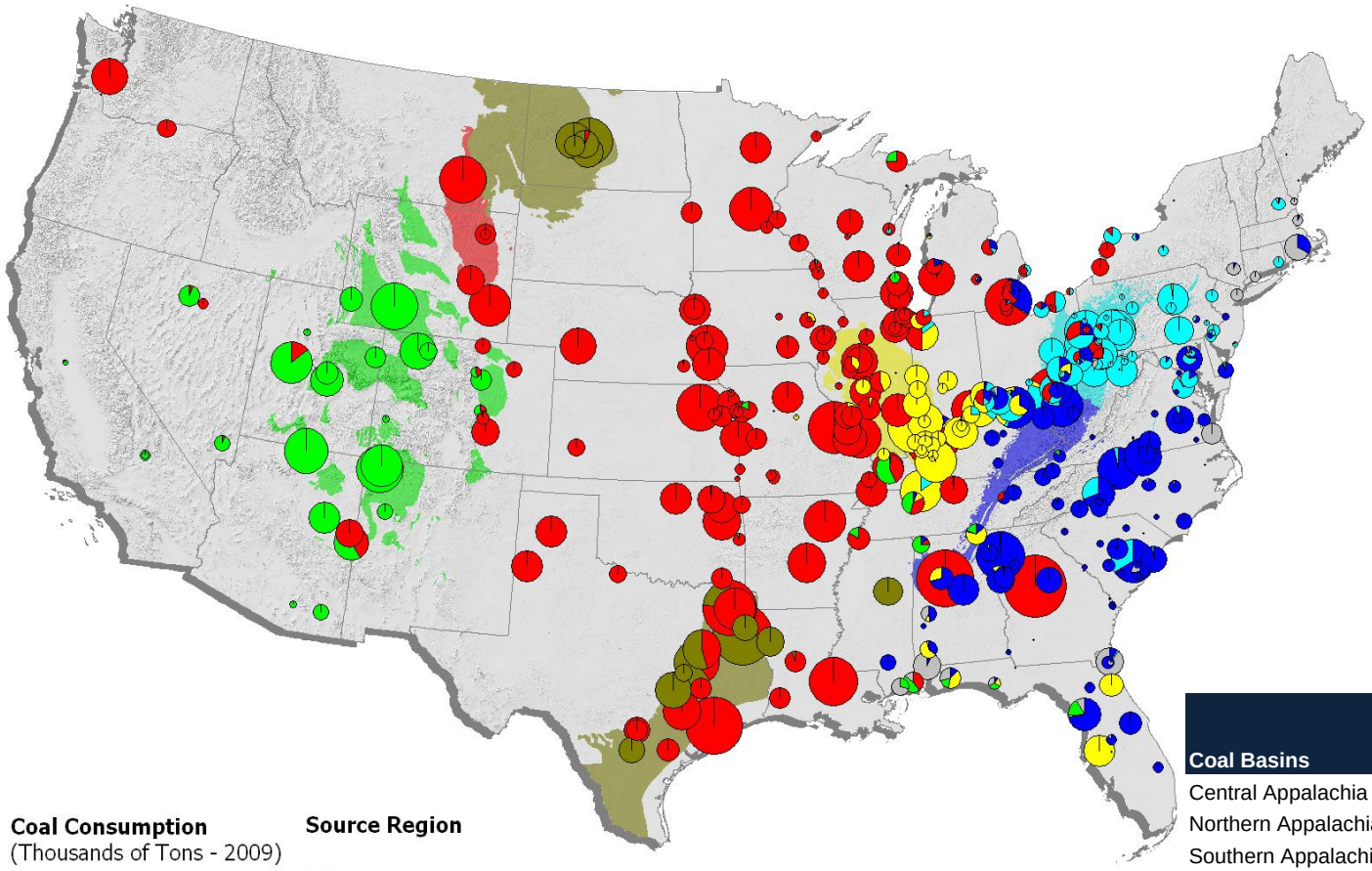
Gas has displaced coal as the base-load power generation fuel in many parts of the country as new drilling technologies have structurally lowered the price of gas. As a result, a portion of the coal industry, particularly in the Central Appalachian region, is no longer competitive with gas.

Renewables will continue to be subsidized by the government, while potential advancements in renewables technology pose a real threat to coal producers

Growth in renewables continues to play out in the US, with further investment in technology aimed at making renewables more practical. Depending on how the efficiency of renewables plays out, coal could face a real threat from alternative sources of energy generation.

Source: Morgan Stanley Research

US Coal Market: Producing "Basins" and Consuming Regions

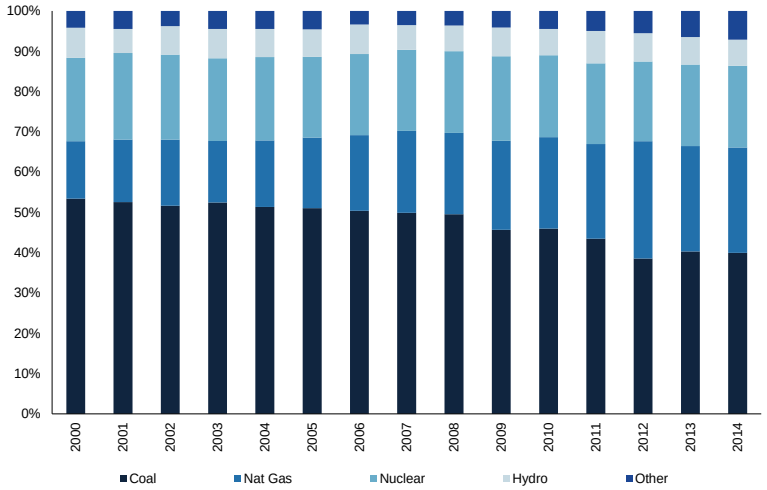


Coal Basins	Heat Content (Btu/lb)	2014 Prod. (mt)
Central Appalachia (CAPP)	12,500	118
Northern Appalachia (NAPP)	13,000	135
Southern Appalachia (SAPP)	12,000	18
Illinois Basin (ILB)	11,200	136
Powder River Basin (PRB)	8,700	435
Western Bituminous (WBIT)	11,500	43
Lignite	6,500	79
Other	12,000	33
Total	**10,188**	**997**

Source: Ventyx, Morgan Stanley Research

US Thermal Coal Market: Threats from Low Natural Gas Prices

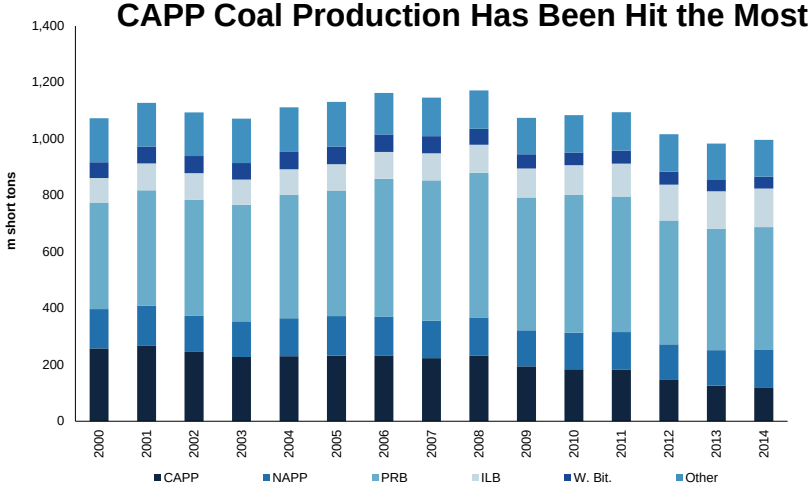
Coal Fired Electricity Generation Steadily Losing to Gas



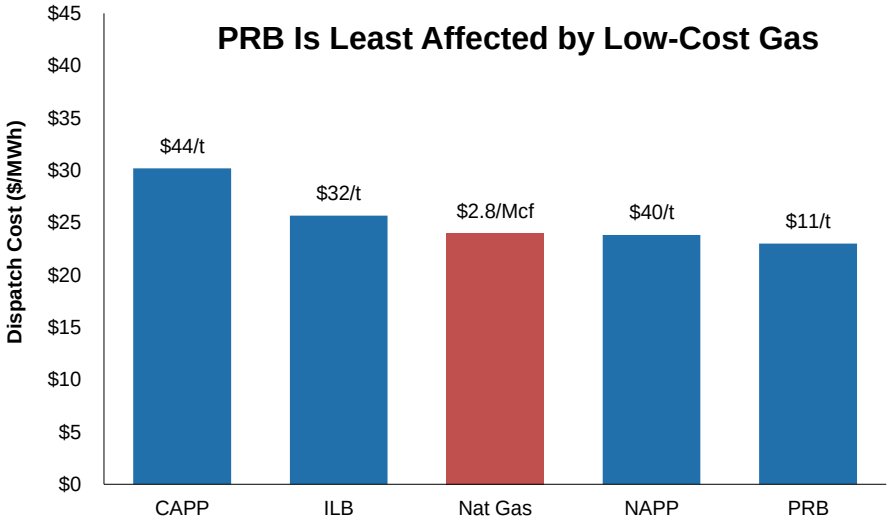
Low-cost shale gas has been steadily displacing coal demand

- In the United States, the continuous improvement in gas drilling economics has lead to a significant amount of coal burn displacement.
- The CAPP region, with it's high production costs has felt the burn of the competition from gas
- PRB coal is significantly less exposed to gas competition, although we believe some the lower heat content PRB coal may be at risk.

CAPP Coal Production Has Been Hit the Most



PRB Is Least Affected by Low-Cost Gas



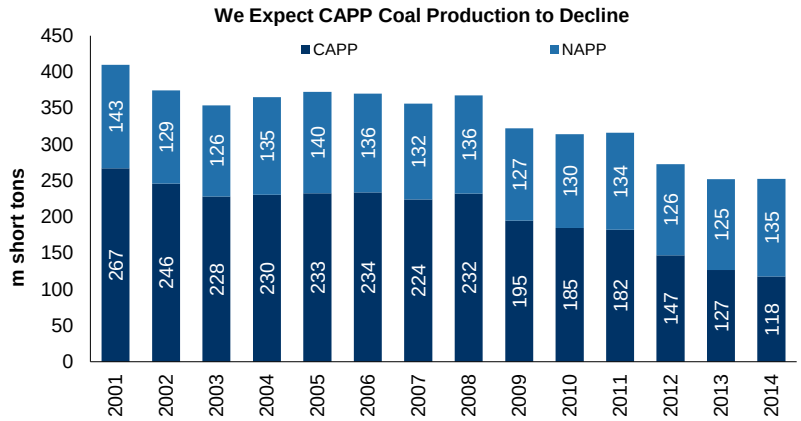
Source: EIA, Morgan Stanley Research

US Thermal Coal Market: Threats from Low Natural Gas Prices—Dispatch Economics

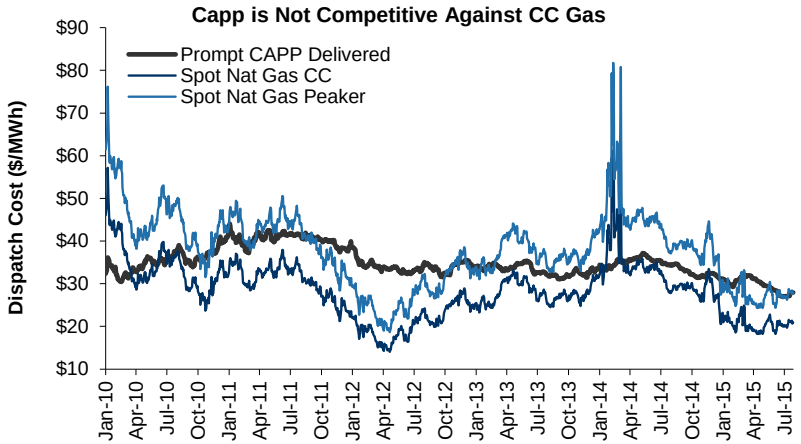
Utility Dispatch Cost Model - Current Coal Prices						Nat Gas		Coal Parity @ $2.80 Nat Gas (CC)			
Region	CAPP Rail	PRB Rail	NAPP	Illinois B	West Bit	Efficient Comb. Cycle	Inefficient Peaker	CAPP	PRB	NAPP	Illinois B
Heat Rate (Btu/kWh)	**10,000**	10,000	10,000	10,000	10,000	**7,500**	**10,000**	10,000	10,000	10,000	10,000
Fuel Cost											
Heat Content (Btu/lb)	12500	8800	13000	11200	11700			12500	8800	13000	11200
Carbon Content (% weight)	70%	48%	74%	60%	65%			70%	48%	74%	60%
FOB Mine Coal Price ($/ton)	**$44**	**$11**	**$40**	**$32**	**$30**			**$28**	**$13**	**$40**	**$28**
2nd Q Mining Cost ($/ton)	**$59**	**$10**	**$44**	**$33**	**$30**			**$58**	**$10**	**$44**	**$33**
Fuel Cost ($/mmbtu)	**$1.75**	**$0.61**	**$1.54**	**$1.41**	**$1.28**	**$2.80**	**$2.80**	**$1.13**	**$0.71**	**$1.55**	**$1.24**
Fuel Cost ($/MWh)	**$17.52**	**$6.11**	**$15.38**	**$14.06**	**$12.82**	**$21.00**	**$28.00**	**$11.31**	**$7.11**	**$15.54**	**$12.38**
Transportation Cost											
Transport Cost ($/ton)	$25.00	$25.00	$15.00	$20.00	$7.00	**8.0%**	**8.0%**	$25.00	$25.00	$15.00	$20.00
Largest Marginal End-Market	Southeast	Southeast	MidAtlantic	Southeast	Rockies			Southeast	Southeast	MidAtlantic	Southeast
Transport ($/mmbtu)	**$1.00**	**$1.42**	**$0.58**	**$0.89**	**$0.30**	**$0.22**	**$0.22**	**$1.00**	**$1.42**	**$0.58**	**$0.89**
Transport ($/MWh)	**$10.00**	**$14.20**	**$5.77**	**$8.93**	**$2.99**	**$1.68**	**$2.24**	**$10.00**	**$14.20**	**$5.77**	**$8.93**
Delivered Cost ($/mmbtu)	**$2.75**	**$2.03**	**$2.12**	**$2.30**	**$1.58**	**$3.02**	**$3.02**	**$2.13**	**$2.13**	**$2.13**	**$2.13**
Delivered Cost ($/MWh)	**$27.52**	**$20.31**	**$21.15**	**$22.99**	**$15.81**	**$22.68**	**$30.24**	**$21.31**	**$21.31**	**$21.31**	**$21.31**
Emission Cost											
Sulfur Content of Coal (S,%)	1.0%	0.35%	2.9%	2.8%	1.0%			1.0%	0.4%	2.9%	2.8%
SO_2 Generated (lbs per mmbtu)	1.60	0.80	4.46	5.00	1.71			1.60	0.80	4.46	5.00
SO_2 Allowance Price ($/ton)	$0	$0	$0	$0	$0			$0	$0	$0	$0
SO_2 Emission Cost ($/mmbtu)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
SO_2 Emission Cost ($/MWh)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
NO_x Generated (lbs per mmbtu)	0.45	0.45	0.45	0.45	0.45			0.45	0.45	0.45	0.45
NO_x Allowance Price ($/ton)	$0	$0	$0	$0	$0			$0	$0	$0	$0
NO_x Emission Cost ($/mmbtu)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
NO_x Emission Cost ($/MWh)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
Total Emission Cost ($/mmbtu)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
Total Emission Cost ($/MWh)	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**			**$0.00**	**$0.00**	**$0.00**	**$0.00**
Sub-Total ($/mmbtu)	**$2.75**	**$2.03**	**$2.12**	**$2.30**	**$1.58**	**$3.02**	**$3.02**	**$2.13**	**$2.13**	**$2.13**	**$2.13**
Sub-Total ($/MWh)	**$27.52**	**$20.31**	**$21.15**	**$22.99**	**$15.81**	**$22.68**	**$30.24**	**$21.31**	**$21.31**	**$21.31**	**$21.31**
Incremental O&M ($/mmbtu)	$0.27	$0.27	$0.27	$0.27	$0.27	$0.18	$0.18	$0.27	$0.27	$0.27	$0.27
Total ($/mmbtu)	**$3.02**	**$2.30**	**$2.38**	**$2.57**	**$1.85**	**$3.20**	**$3.20**	**$2.40**	**$2.40**	**$2.40**	**$2.40**
$/MWh	**$30**	**$23**	**$24**	**$26**	**$18**	**$24**	**$32**	**$24**	**$24**	**$24**	**$24**
Carbon Credit ($/ton)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Plus Carbon ($/MWh)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total ($/MWh)	**$30**	**$23**	**$24**	**$26**	**$18**	**$24**	**$32**	**$24**	**$24**	**$24**	**$24**

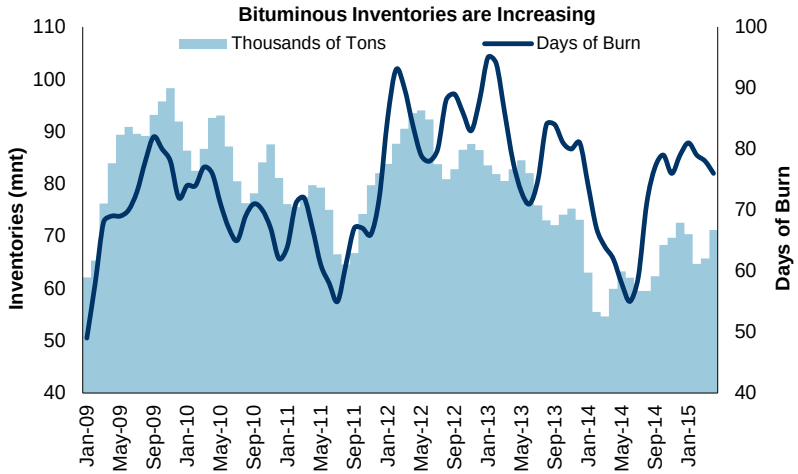
Source: Morgan Stanley Research

Appalachian Market Conditions



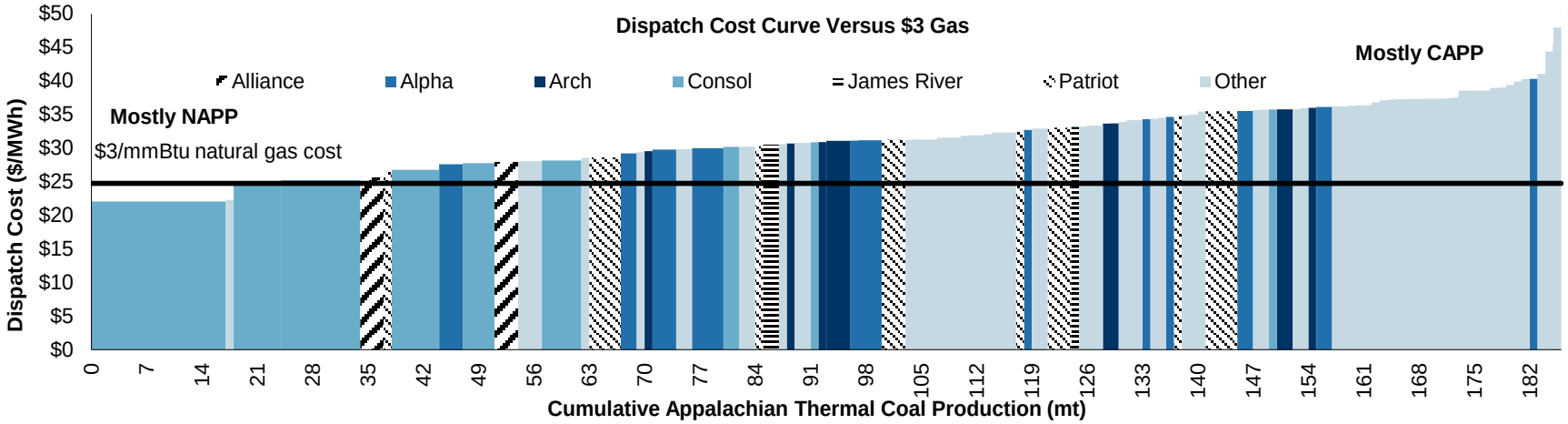
- We believe most Central App coal mines cannot competitively dispatch against combined cycle gas plants in a sub-$5.00/mmBtu nat gas price environment
- Given our outlook for nat gas prices to stay below ~$5.00/mmBtu mid-term, we believe Central App coal production will continue to decline
- Northern App and Illinois Basin coal can compete with $3.00-$4.00/mmBtu gas, and could gain ground vs. Central App as scrubber upgrades allow more plants to burn higher sulfur coals

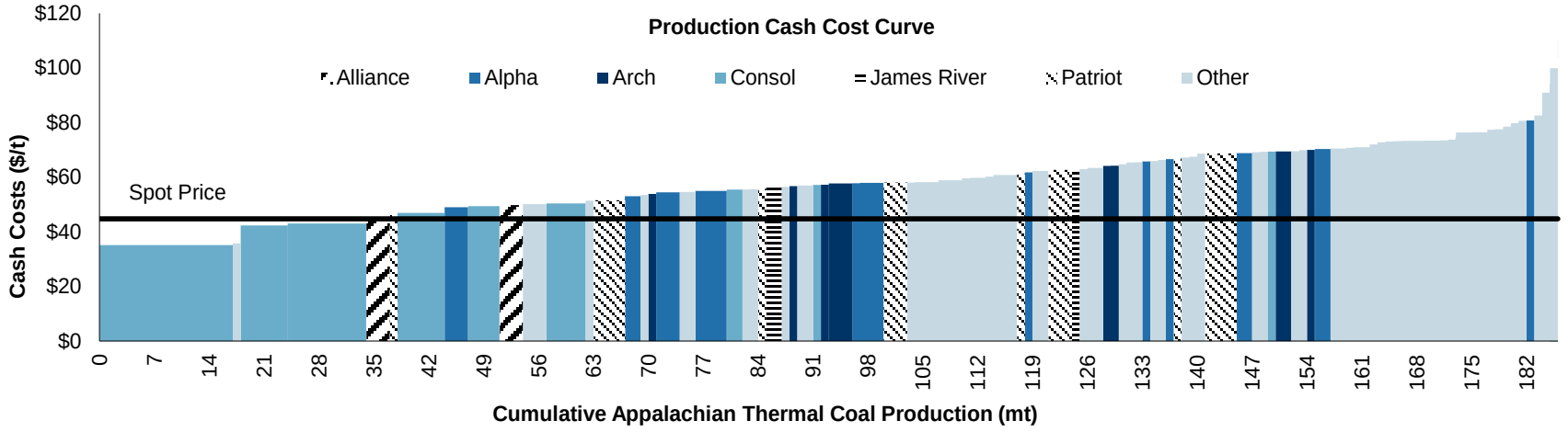




Source: EIA, Bloomberg, Morgan Stanley Research

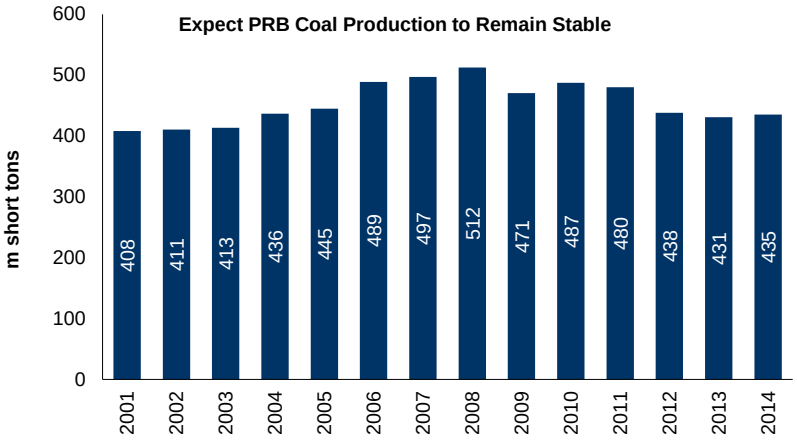
Appalachian Cost Curve



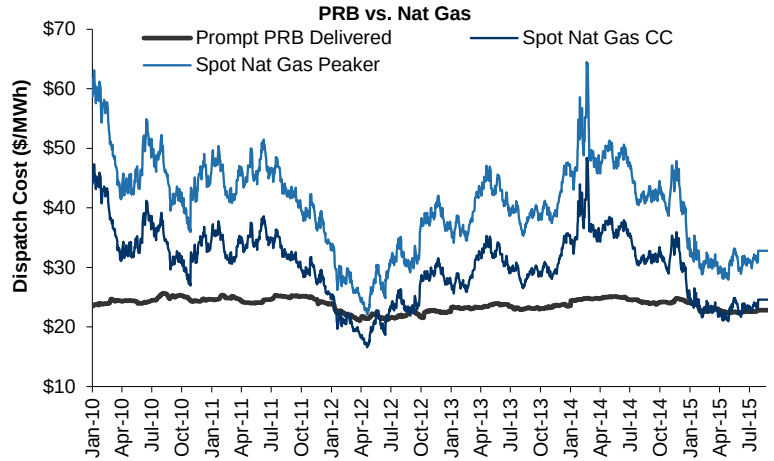


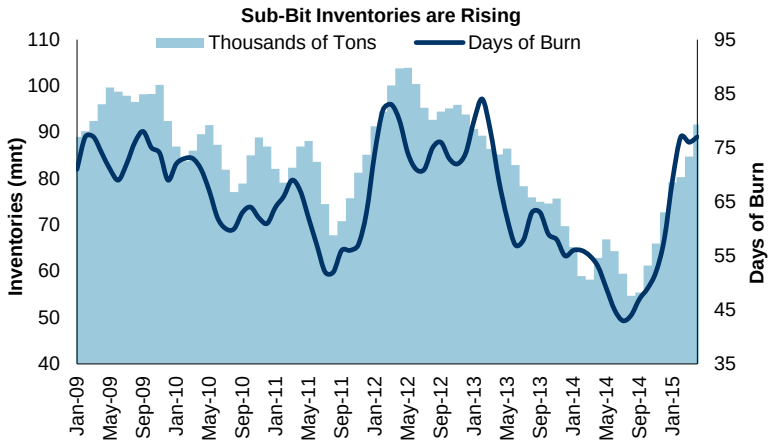
Source: WoodMackenzie, Morgan Stanley Research

Powder River Basin Market Conditions



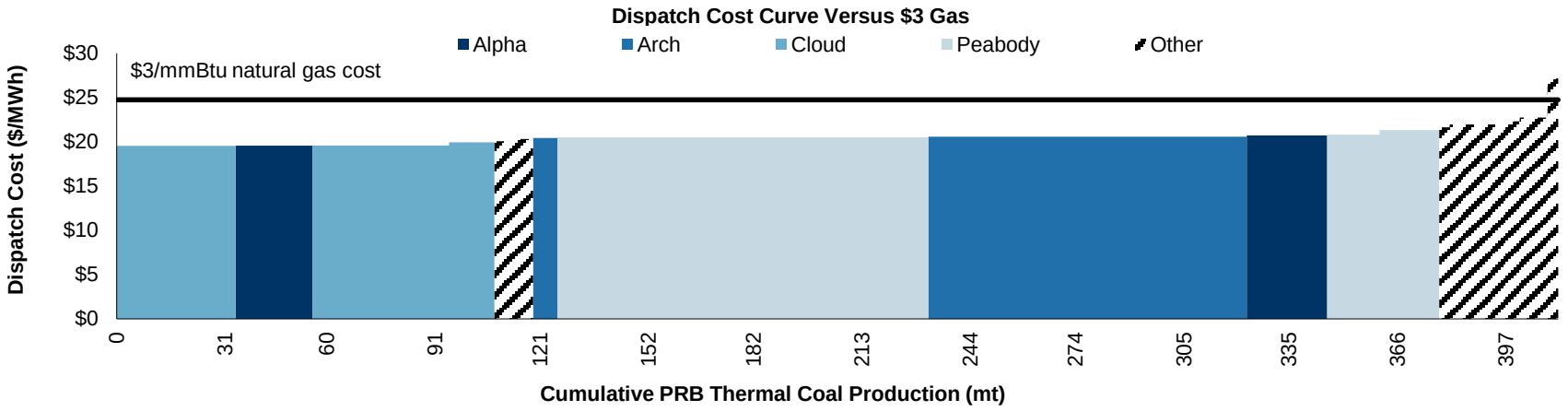
- We believe that PRB coal dispatches competitively against combined cycle gas plants down to ~$2.75-$3.00/mmBtu natural gas prices
- The PRB has a meaningful amount of unused production capacity, which could limit pricing upside in the mid-term if demand recovers
- Electricity generators in the Midwest, Texas, and the Southeast are major consumers of PRB coal

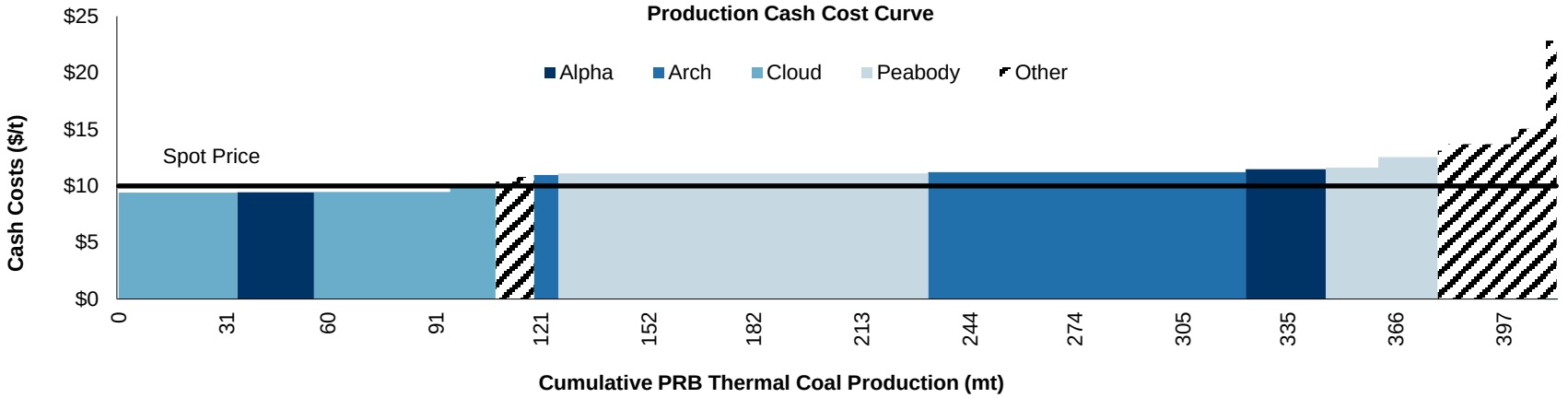




Source: EIA. Bloomberg, Morgan Stanley Research

Powder River Basin Cost Curve





Source: WoodMackenzie, Morgan Stanley Research

US Coal Market: PRB Long-Term Prices

A minimum LT price of $18/t is required for a new PRB mine, nearly 80% higher than today's price. Even if no new equipment is needed, close to $15/t would be needed to incentivize a mine extension

		Development			Production													
30 year mine life	**Year**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**32**	**33**
LBA Reserve Additions (mmt)	**1200**	**800**	0	0	0	0	0	0	0	0	400	0	0	0	0	0	0	0
Reserves at Period End		800	800	800	760	720	680	640	600	440	800	760	720	680	640	600	40	0
Years of Reserves Remaining at YE					19	18	17	16	15	11	20	19	18	17	16	15	1	0
Tons Produced	**40.0**	0	0	0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Price ($/short ton)	**$18.00/ton**	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18	$18
Revenues ($ mm)		**0**	**0**	**0**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**
Mining Cost ($ mm)	**$6.00/ton**	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6	$6
Royalty ($ mm)	**30%**	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5
Cost of Sales ($ mm)		**0**	**0**	**0**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**	**456**
EBITDA ($ mm)		**0**	**0**	**0**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**	**264**
EBITDA ($/t)					$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
- Depreciation		18	18	18	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Operating Profit ($ mm)		**(18)**	**(18)**	**(18)**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**	**172**
- Cash Taxes ($ mm)	**35%**				60	60	60	60	60	60	60	60	60	60	60	60	60	60
+ DD&A		18	18	18	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Gross Cash Flow ($ mm)		**0**	**0**	**0**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**	**204**
- Equipment Capex ($ mm)	**$584 total**	195	195	195	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Federal Bonus Bid ($ mm)	**$1.10/ton**	176	176	176	176	176					88	88	88	88	88			
- Development Capex ($ mm)	**$100 total**	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Sustaining Capex	**$0.75/ton**	0	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Free Cash Flow		**(404)**	**(404)**	**(404)**	**(2)**	**(2)**	**174**	**174**	**174**	**174**	**86**	**86**	**86**	**86**	**86**	**174**	**174**	**174**
IRR	**9.0%**																	

Source: Morgan Stanley Research

US Coal Market: S. PRB Reserves Must Be Leased from the Federal Government

Much of the southern PRB is located on federal land, and reserves must be leased from the Bureau of Land Management through the Lease-By-Application (LBA) process. Recent wining bids came in near the $1.10/t mark.

AWARDED SOUTHERN PRB LBAS

8800 BTU/lb					RCT	Draft	Final			Process	Tons	Strip Ratio		Winning Bid	
Tract	Mine	Heat	SO2	Applied	Review	EIS	EIS	ROD	Sale	Years	(mm)	(BCY/t)	Winner	$ mm	$/ton
Thundercloud	Jacob's Ranch	8810	0.34%	Apr-95	Apr-96	Aug-97	Feb-98	Jul-98	Oct-98	3.5	412.0	2.57	Arch	$158	$0.383
Powder River	North Antelope/Rochelle	8742	0.18%	Mar-95	Apr-96	Aug-97	Nov-97	Apr-98	Jun-98	3.3	532.0	3.01	Powder River	$110	$0.206
Horse Creek	Antelope	8890	0.22%	Feb-97	Apr-97	Nov-99	May-00	Jun-00	Sep-00	3.6	275.6	2.60	Kennecott	$91	$0.331
N. Jacobs Ranch	Jacob's Ranch	8792	0.45%	Oct-98	Oct-99	Jul-00	*Jan-01*	Nov-01	Jan-02	3.3	537.5	3.50	Kennecott	$380	$0.706
NARO South	North Antelope/Rochelle	8929	0.20%	Mar-00	Oct-00	Feb-03	Dec-03	May-04	Jun-04	4.3	297.5	2.80	Peabody	$274	$0.921
Little Thunder	Black Thunder	8884	0.24%	Mar-00	Oct-00	Feb-03	Dec-03	Aug-04	Sep-04	4.5	719.0	3.40	Arch	$611	$0.850
West Antelope	Antelope	8858	0.23%	Sep-00	Oct-00	Feb-03	Dec-03	Oct-04	Dec-04	4.3	195.0	3.00	Kennecott	$146	$0.750
NARO North	North Antelope/Rochelle	9090	0.25%	Mar-00	Oct-00	Feb-03	Dec-03	Jul-04	Dec-04	4.8	324.6	3.90	Peabody	$299	$0.921
West Roundup	North Rochelle	8790	0.20%	Jul-00	Oct-00	Feb-03	Dec-03	Sep-04	Feb-05	4.6	327.2	4.30	Peabody	$318	$0.971
West Antelope II N	North Rochelle	8967	0.23%	Apr-05	Apr-05	Feb-08	Dec-08	Apr-10	May-11	6.1	350.3	4.60	Cloud	$298	$0.850
West Antelope II S	Antelope	8807	0.28%	Apr-05	Apr-05	Feb-08	Dec-08	Apr-10	Jun-11	6.2	56.4	5.00	Cloud	$49	$0.875
Hilight Field South	Black Thunder	9000	0.27%	Oct-05	Apr-06	Jun-09	Jul-10	Mar-11	Dec-11	6.2	222.0	4.20	Arch	$300	$1.351
South Porcupine	North Antelope Rochelle	8910	0.20%	Sep-06	Jan-07	Jun-09	Jul-10	Aug-11	May-12	5.6	401.8	4.30	Peabody	$446	$1.110
North Porcupine	North Antelope Rochelle	8892	0.20%	Sep-06	Jan-07	Jun-09	Jul-10	Oct-11	Jun-12	5.8	721.0	4.00	Peabody	$793	$1.100

8400-8500 BTU/lb					RCT	Draft	Final			Process	Tons	Strip Ratio		Winning Bid	
Tract	Mine	Heat	SO2	Applied	Review	EIS	EIS	ROD	Sale	Years	(mm)	(BCY/t)	Winner	$ mm	$/ton
Hay Creek	Buckskin	8346	0.28%	Aug-00	Oct-00	Mar-03	Jun-04	Oct-04	Nov-04	4.2	142.7	2.00	Kiewit	$43	$0.300
Eagle Butte West	Eagle Butte	8434	0.40%	Oct-03	Apr-05	Oct-06	Aug-07	Oct-07	Feb-08	4.4	255.0	2.90	Foundation	$181	$0.708
South Maysdorf	Cordero-Rojo	8404	0.29%	Nov-04	Apr-05	May-06	Apr-07	Aug-07	Apr-08	3.5	288.1	3.70	Rio Tinto	$251	$0.871
North Maysdorf	Cordero-Rojo	8586	0.27%	Nov-04	Apr-05	May-06	Apr-07	Aug-07	Jan-09	4.2	54.7	3.70	Rio Tinto	$48	$0.880
Belle Ayr North	Caballo	8542	0.34%	Jul-04	Apr-05	Oct-08	Aug-09	Jul-10	Jul-11	7.0	221.7	4.20	Peabody	$211	$0.950
West Caballo LBA	Belle Ayr	8501	0.33%	Mar-06	Apr-06	Oct-08	Aug-09	Jul-10	Aug-11	5.4	130.2	4.20	Alpha	$143	$1.102

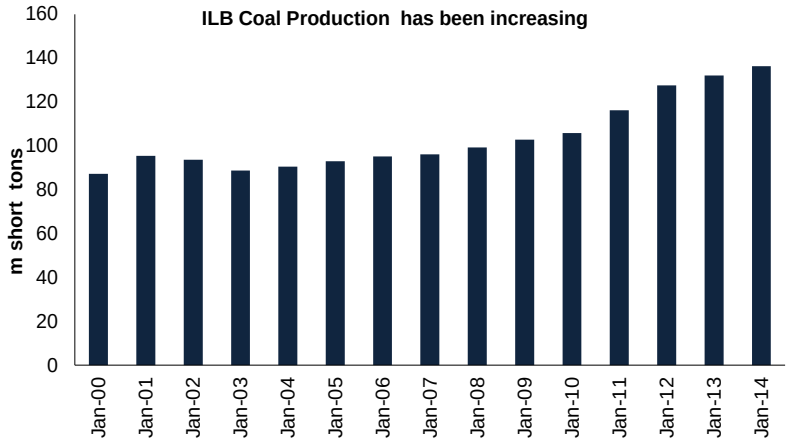
PENDING SOUTHERN PRB LBAS

8800 BTU/lb					RCT	Draft	Final		Potential	Process	Tons	Strip Ratio		Winning Bid	
Tract	Mine	Heat	SO2	Applied	Review	EIS	EIS	ROD	Sale	Years	(mm)	(BCY/t)	Winner	$ mm	$/ton
Hilight Field North	Black Thunder			Oct-05	Apr-06	Jun-09	Jul-10	Feb-12			325.0		(Arch)	$0	
West Hilight Field	Black Thunder			Jan-06	Apr-06	Jun-09	Jul-10				440.4		(Arch)	$0	
Antelope Ridge	North Antelope Rochelle			Sep-11	Oct-11										

8400-8500 BTU/lb					RCT	Draft	Final			Process	Tons	Strip Ratio		Winning Bid	
Tract	Mine	Heat	SO2	Applied	Review	EIS	EIS	ROD	Sale	Years	(mm)	(BCY/t)	Winner	$ mm	$/ton
Hay Creek II	Buckskin			Mar-06	Apr-06	Mar-10	Jul-11	Jul-11			51.9		(Kiewit)	$0	
Maysdorf II	Cordero-Rojo			Aug-06	Jan-07	Oct-08	Aug-09				434.0		(Cloud)	$0	
Belle Ayr West	Belle Ayr			Aug-11	Oct-11										

Source: BLM, Morgan Stanley Research

Illinois Basin Market Condition

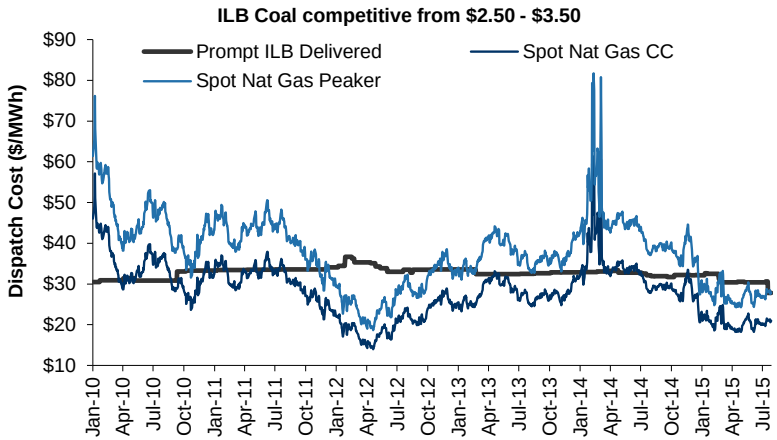


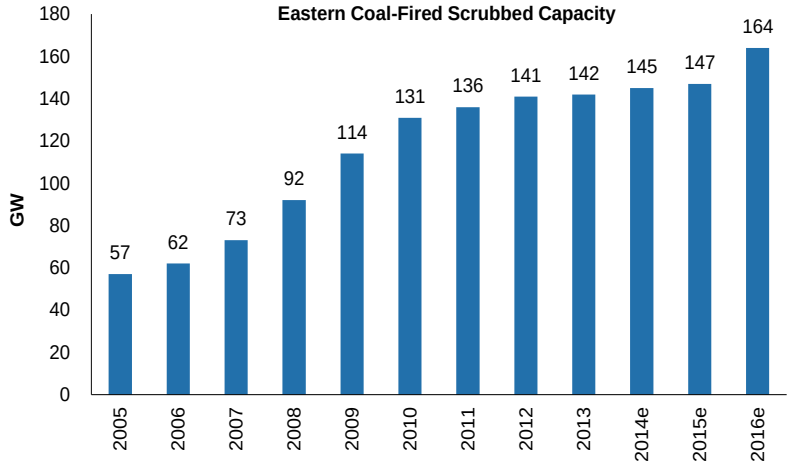
- We believe that the ILB will continue to take market share from CAPP. We see Illinois Basin burn growing by an average of ~3.8% per year vs an average ~3.2% annual decline over the same period for Central Appalachia production

- Aided by increased blending techniques and wider scrubber adoption at power plants, the higher sulfur content coal found in the ILB has become more competitive with its lower sulfur peers.

- Located near core coal burning states in the Midwest, Ohio Valley, and Southeast.

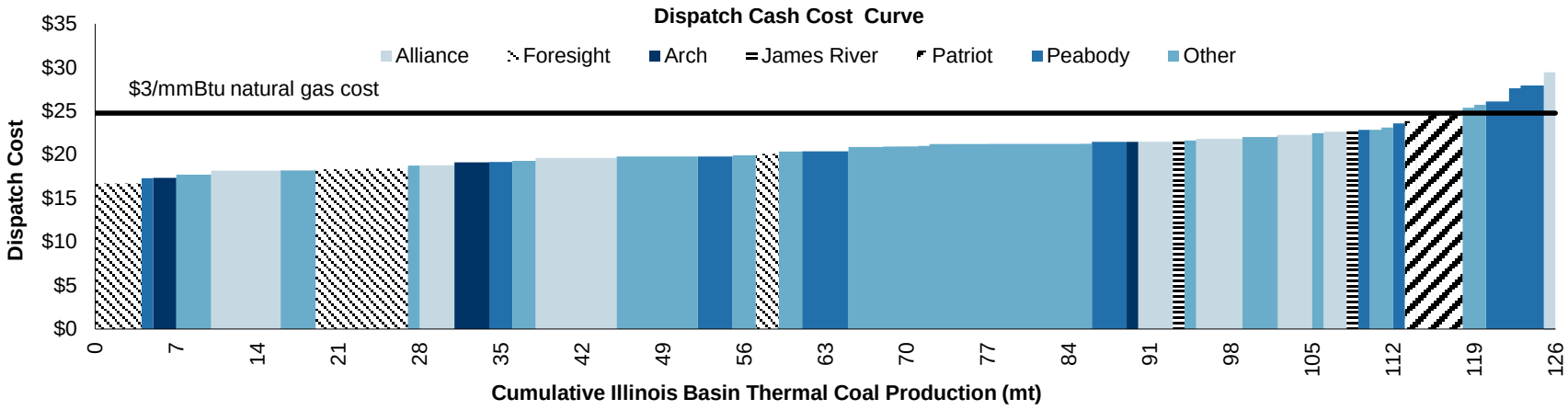
- Due to the wide range of costs in the ILB, some coal is competitive with gave below $2.50 while others require gas above $3.50.

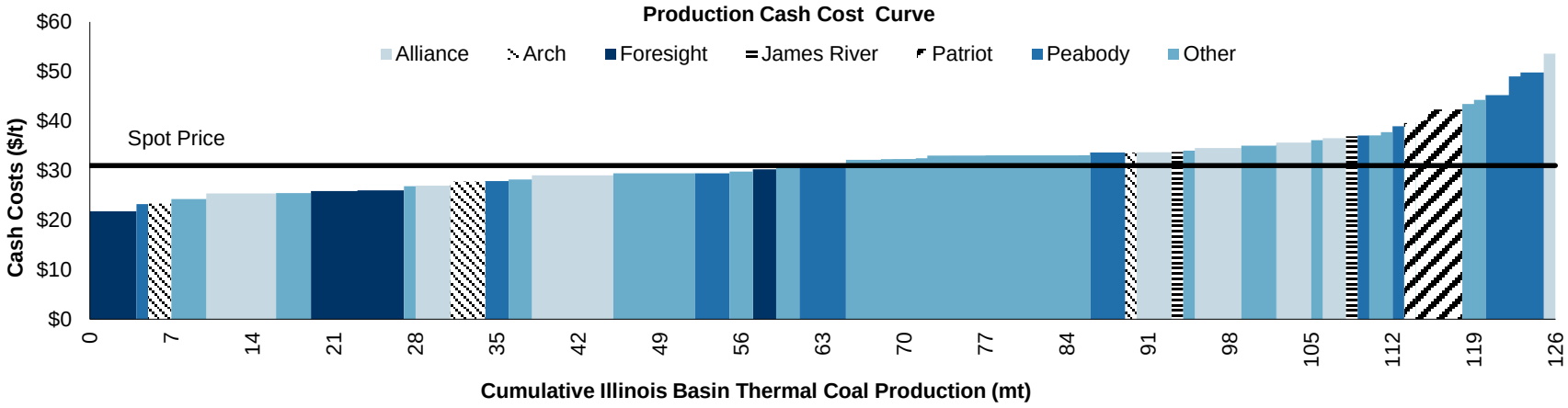




Source: EIA. Bloomberg, Morgan Stanley Research

Illinois Basin Cost Curve

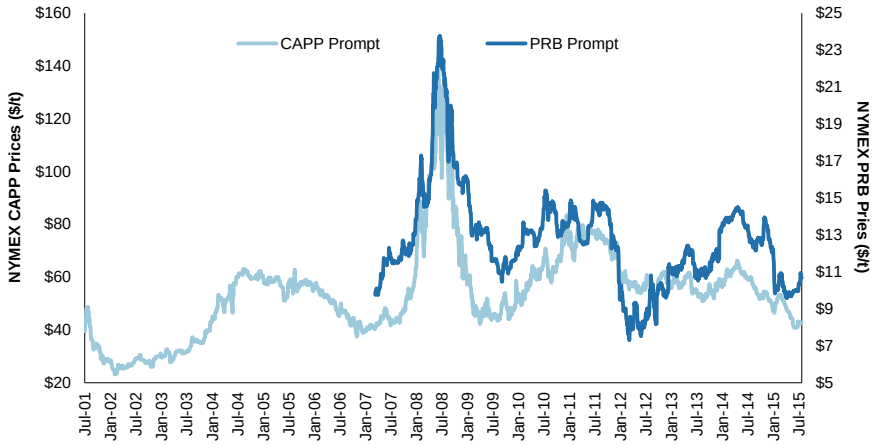




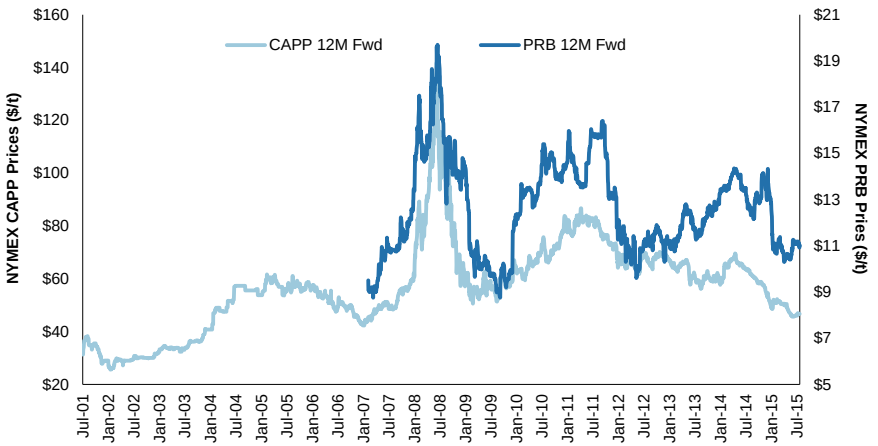
Source: WoodMackenzie, Morgan Stanley Research

US Thermal Coal Market: Basin Historical Prices

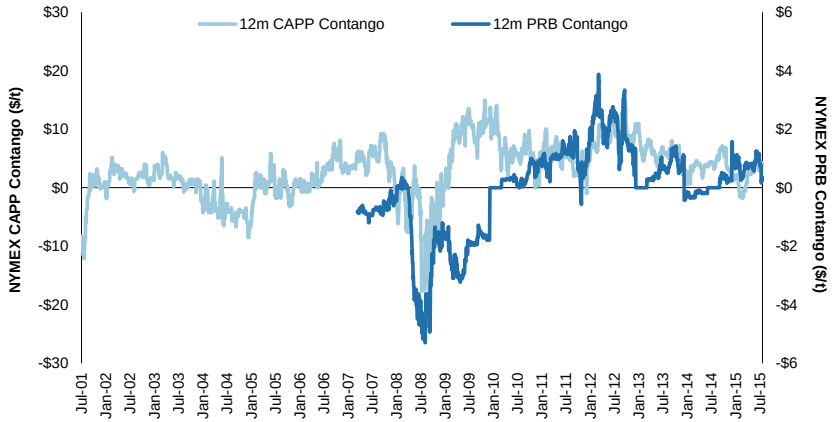
CAPP vs. PRB Prompt Prices



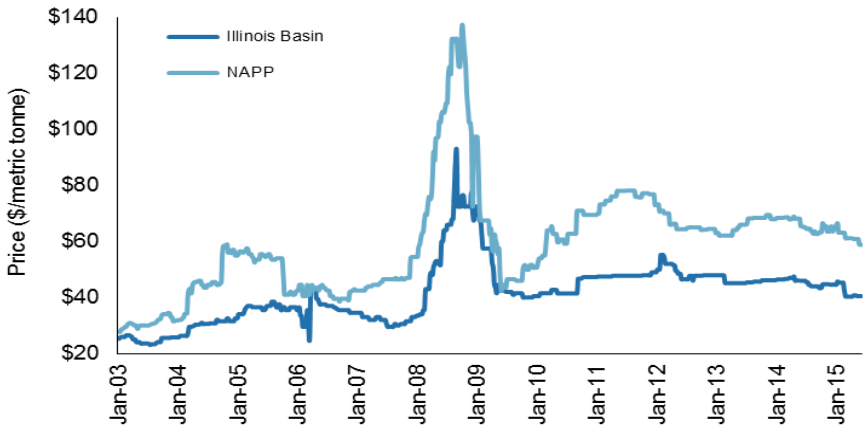
CAPP vs. PRB 12-Month Forward Prices



CAPP vs. PRB Contango



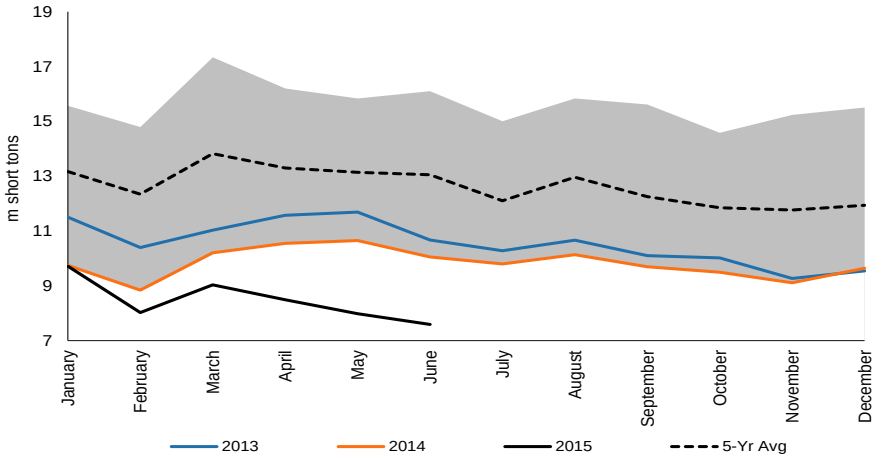
Illinois Basin vs. NAPP Prices



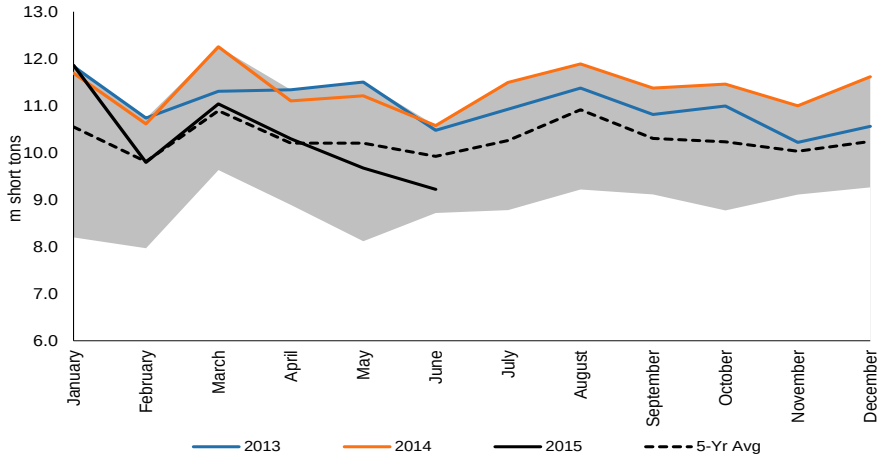
Source: Bloomberg, Morgan Stanley Research

US Thermal Coal Market: Basin Productivity

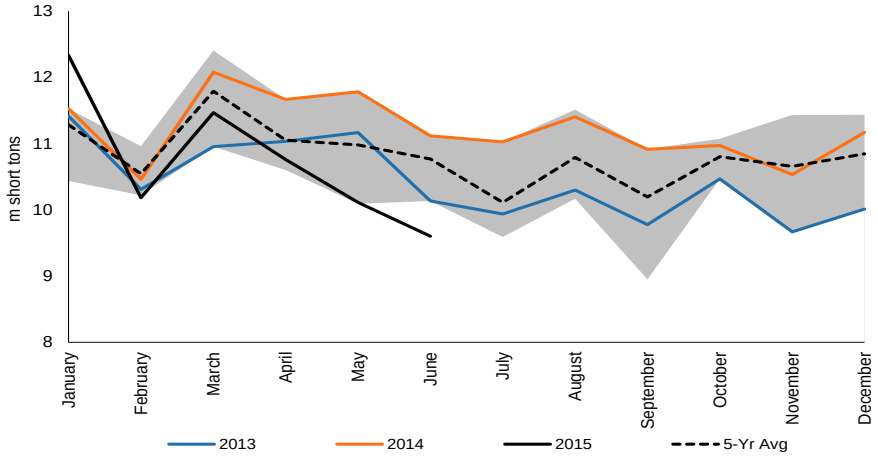
CAPP Production



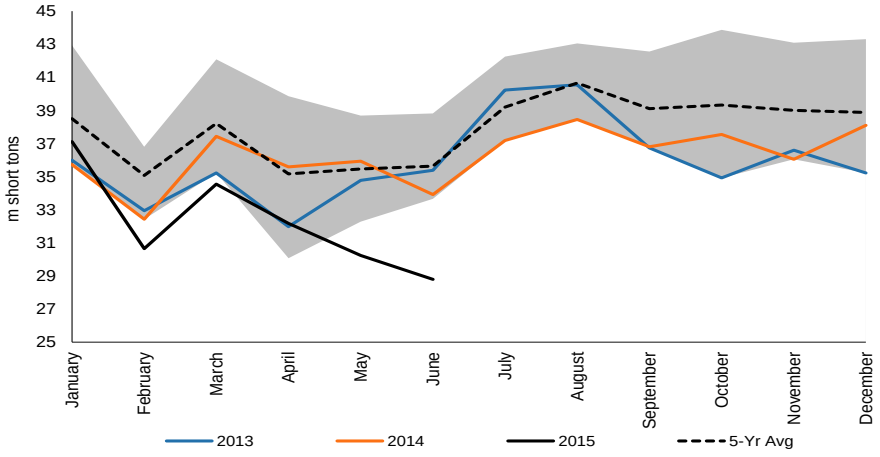
Illinois Bit Production



NAPP Production



PRB Production



Source: EIA, Morgan Stanley Research

US Thermal Coal Market: Notable Thermal Coal Mine Projects

There has been significant growth in ILB and NAPP capacity in recent years as low-cost high-sulfur reserves were ramped up to take advantage of new scrubbed power plants. However, future growth timelines are uncertain given current market conditions.

US Thermal Coal Mine Projects

Company	Region	Mine	Total Capacity	Net Capacity Added	Start Date	2012	2013	2014	2015	2016	2017	2018	2019	2020	Norm. Prod.
Foresight Energy	ILB	Sugar Camp #2 LW	7.0	7.0	*2014*			1.0	4.8	0.5					*6.3*
Foresight Energy	ILB	Sugar Camp #3 LW	7.0	7.0	*2017*						0.5	5.3	0.5		*6.3*
Foresight Energy	ILB	Sugar Camp #4 LW	7.0	7.0	*2018*							0.5	5.3	0.5	*6.3*
Foresight Energy	ILB	Hillsboro #1 LW	9.0	9.0	2012	1.5	6.0	0.6							*8.1*
Foresight Energy	ILB	Hillsboro #2 LW	9.0	9.0	*2018*							1.5	6.0	0.6	*8.1*
Foresight Energy	ILB	Hillsboro #3 LW	9.0	9.0	*2019*								1.5	6.0	*8.1*
Peabody	ILB	Bear Run Expansion	4.0	4.0	TBD										*3.6*
Peabody	ILB	Gateway North Replacement	4.5	1.5	2014			1.4							*1.4*
Alliance	ILB	Gibson South	3.3	3.3	2014			0.7	2.0	0.3					*3.0*
Alliance	ILB	Sebree Reserves	TBD	TBD	TBD										
Alliance/WOR	ILB	White Oak	6.3	6.3	2013		1.0	3.0	1.6						*5.6*
Armstrong	ILB	Lewis Creek Underground	0.9	0.9	2013		0.4	0.4							*0.8*
Armstrong	ILB	Lewis Creek West	0.8	0.8	2014					0.3	0.4				*0.7*
Rhino	ILB	Pennyrile I	0.8	0.8	2014			0.2	0.5						*0.7*
Rhino	ILB	Pennyrile II	1.2	1.2	2017						0.1	0.7	0.3		*1.1*
Vectren	ILB	Oaktown No. 2	2.5	2.5	2013		0.5	1.5	0.3						*2.3*
Alpha	ILB	Wabash	1.7	1.7	TBD										*1.5*
Arch	ILB	TBD	TBD	TBD	TBD										
Total ILB				**70.9**		**1.5**	**7.9**	**8.8**	**9.2**	**1.1**	**1.0**	**8.0**	**13.6**	**7.1**	**63.8**
Alliance	NAPP	Tunnel Ridge	5.8	5.8	2012	1.0	4.0	0.2							*5.2*
Alliance	NAPP	Penn Ridge	5.0	5.0	*2018*							0.5	3.5	0.5	*4.5*
Consol	NAPP	BMX Expansion	5.0	5.0	2014			2.5	2.0						*4.5*
Total NAPP				**15.8**		**1.0**	**4.0**	**2.7**	**2.0**	**0.0**	**0.0**	**0.5**	**3.5**	**0.5**	**14.2**
Total				**86.7**		**2.5**	**11.9**	**11.5**	**11.2**	**1.1**	**1.0**	**8.5**	**17.1**	**7.6**	**78.0**

Source: Company Documents, Morgan Stanley Research

US Thermal Coal Market: Export Arbitrage

Nearly all coal export routes yield lower netback than domestic prices, so export will likely continue to fall as contracts roll off.

Coal Source	***Pitt 8***	***CAPP Rail***	***Illinois B.***	***PRB***
Port of Export	*Baltimore*	*Hampton Roads*	*Gulf*	*Gulf*
Spec in Btu/lb GAR	***13000***	***12500***	***11200***	***8800***
Btu Premium to ARA Spec	***15%***	***11%***	***(1%)***	***(22%)***
Destination	***ARA***	***ARA***	***ARA***	***ARA***
API 2, Delivered Europe	$55	$55	$55	$55
less: Ocean Freight	$5	$5	$7	$7
add: Btu differential	$8	$6	($0)	($12)
FOB Port ($/tonne)	**$58**	**$56**	**$48**	**$36**
FOB Port ($/short ton)	**$53**	**$51**	**$43**	**$33**
less: Rail/Barge, Load	$15	$20	$17	$35
less: Sulfur Discount	$5	$0	$10	($2)
FOB Mine Netback	**$33**	**$31**	**$16**	**($0.2)**
Current OTC Price	$40	$44	$32	$10.8
Typical Cash Costs	**$44**	**$64**	**$33**	**$10.2**

Source: Bloomberg, McCloskeys, Morgan Stanley Research

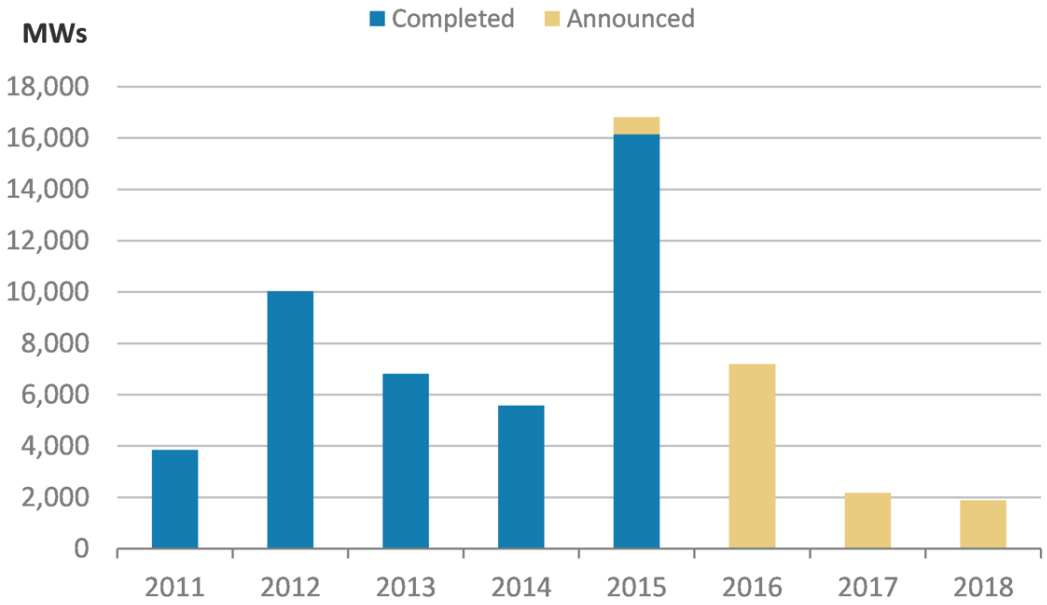
US Coal Market: Key Regulations to Watch

Environmental Regulations		
Rule	**Description**	**Timing**
Mercury & Air Toxics Standards (MATS)	Regulates hazardous air pollutant emissions, including mercury. Power plants must implement Maximum Achievable Control Technology (MACT).	Effective April 2015, with potential unit-level waivers for up to one additional year. EPA recently lost appeal, but remedy is still unclear.
Cross-State Air Pollution Rule (CSAPR)	CAIR replacement. Regulates SO2 and NOX emissions in 28 eastern states. State level standards.	Originally scheduled for 2012 compliance. Upheld by Supreme Court in April 2014.
Existing Source Performance Standards (Clean Air Plan)	Regulates carbon emissions by existing power plants. Prelim. plan recently proposed by EPA.	As it stands, the plan is to reduce carbon emmissions by 32% from 2005 levels by 2030. This would reduce coal burn by ~100mn tons, but the rule is unlikely to remain in its current form.
MSHA Coal Dust Rule	Lowers existing concentration limit for respirable coal mine dust. Requires use of a Continuous Personal Dust Monitor.	Final rule as of December 2013. Effective August 2014. 2-year phase-in.
EPA Clean Water Rule	Subjects more bodies of water, and potential bodies to the federal Clean Water Act	Scehduled to go into effect August 28, 2015, but states and miners are suing.

Source: EPA, SNL, Morgan Stanley Research

US Coal Market: Regulation Deep Dive — Mercury & Air Toxics Standards (MATS)

Most coal-fired generators set to close as a result of MATS have already closed, and will not come back regardless of the outcome of ongoing litigation.



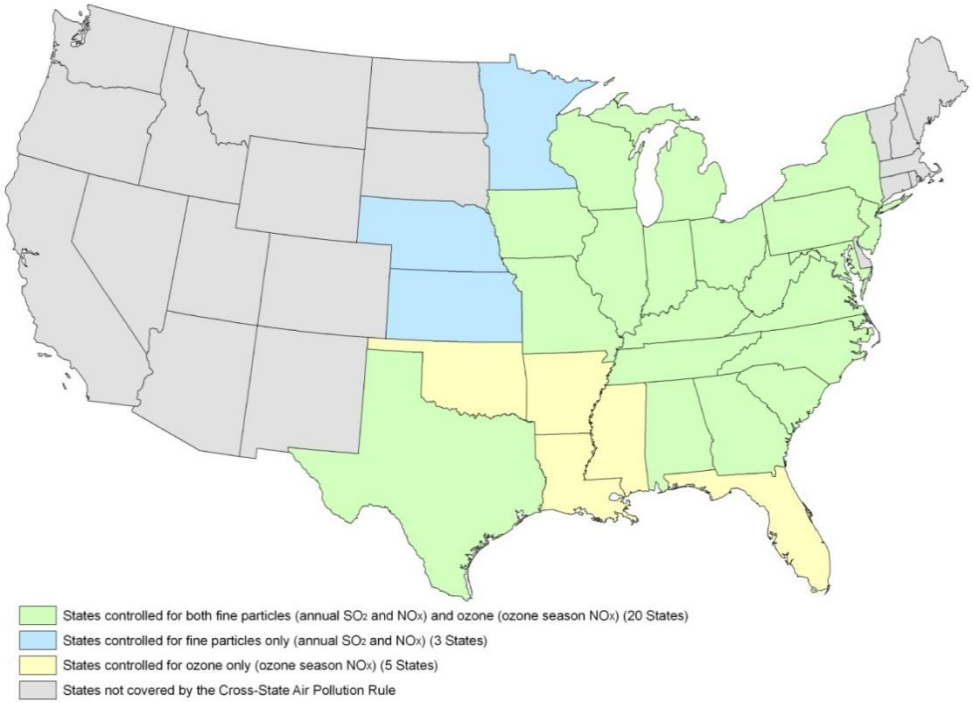
Supreme Court ruled against EPA in Jun-15, subsequent alterations to the standards expected

- Targeting coal and oil-fired power plants, MATS aims to set emissions standards corresponding to air pollution limits surrounding power plant
- The rules would use the best-performing power plants in terms of air pollution as a benchmark, and set emissions limitations based on the top performers, commonly referred to as Maximum Achievable Control Technology (MACT)
- Supreme Court determined the EPA must take into account the estimated annual compliance cost ($9.6 billion) when determining if regulation is “appropriate and necessary”
- The court also cited pre-existing concerns that if MATS were upheld, it would set off a wave of coal plant retirements that could wreck havoc on power grid reliability
- However, MATS is still effectively in place, and coal-fired power plants are still required to abide by pollution control standards
- A majority of closures as a result of MATS have already been carried out, and plants that were set to close over the next four years will most likely still close

Source: EPA, SNL, Morgan Stanley Research

US Coal Market: Regulation Deep Dive — Cross-State Air Pollution Rule (CSAPR)

States that are included in the Cross-State Air Pollution Rule



CSAPR affects 28 eastern states in the US and aims to significantly lower sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions

- Put into effect Jan-15, CSAPR aims to reduce power plant SO_2 and NO_x emissions by 73% and 53%, respectively
- The rule also requires Iowa, Michigan, Missouri, Oklahoma, and Wisconsin to cut nitrogen oxide emissions during the summertime season
- General argument behind CSAPR involves “upwind” states polluting “downwind” states and preventing them from achieving their government-mandated air quality standards
- Since the pollution crosses state lines, it falls under the jurisdiction of the EPA, allowing federal regulation of power plant pollution
- Reinforces the EPA’s goal to maintain National Ambient Air Quality Standards (NAAQS) for pollutants that could be detrimental to public health

Source: EPA, Morgan Stanley Research

US Coal Market: Regulation Deep Dive — MSHA Coal Dust Rule

Aug-14

- Operators are required to collect respirable dust samples for the entirety of a miner's work period
- E.g. if a miner works 12 hours, a 12-hour sample must be recorded to observe how much respirable dust they were exposed to
- Implemented expansion of medical surveillance requirements, and transfer rights for all miners with evidence of black lung

Feb-16

- Requires all underground miners to use a (CPDM)
- Increases the sampling frequency within underground mines, and requires 15 valid samples per quarter versus the previous 5
- Miners will begin to receive more information regarding the respirable dust levels within their mine

Aug-16

- Overall respirable dust exposure standard falls to .5-1.5 mg/m^3 depending on a worker's position within the mine (underground, surface, etc.)
- Air used to ventilate areas where workers are present falls to .5-1 mg/m^3

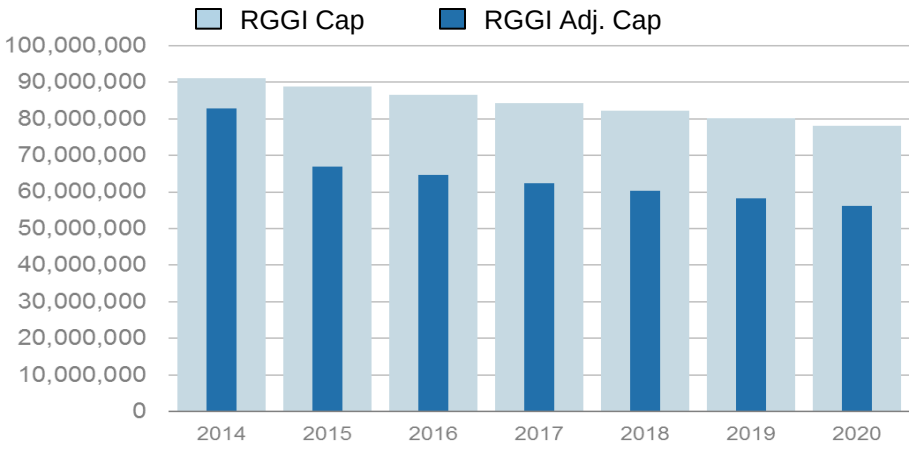
Rule dictates standards for how long a miner can work according to respirable coal dust exposure

- Effectively lowers the overall concentration limit for acceptable respirable coal dust exposure from 2 mg/m^3 to .5-1.5 mg/m^3
- Requires the use of a continuous personal coal dust monitor (CPDM)
- Places additional limits on overall work time and redefines a normal work shift in order to reduce worker time within the mine
- Designed to be phased in over a two-year period, with many of the stricter requirements pushed back to Feb-16 and Aug-16
- MHSA estimates annualized cost per mine of ~$3.1 million for a majority of the mines in the US, with abnormally small or large mines bearing much lower costs

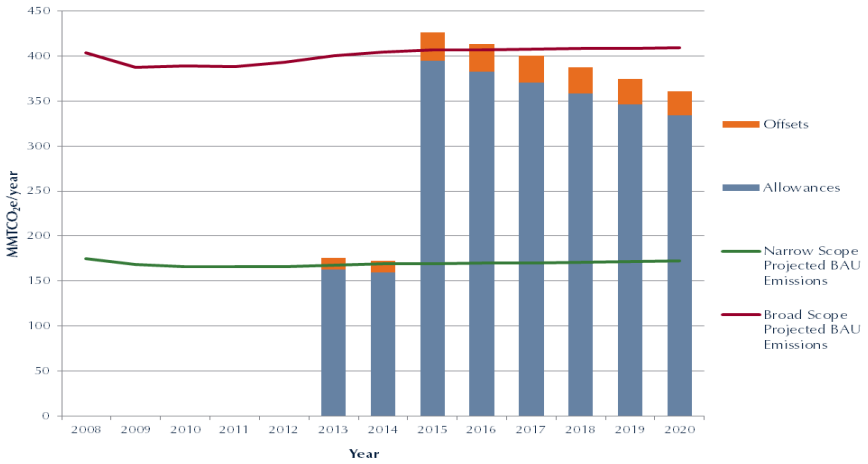
Source: MSHA, Morgan Stanley Research

US Coal Market: Regulation Deep Dive — Regional Greenhouse Gas Initiative

RGGI CO2 Total Emissions Cap (short tons)



California's Emissions Cap/Business-as-Usual (BAU) Projections



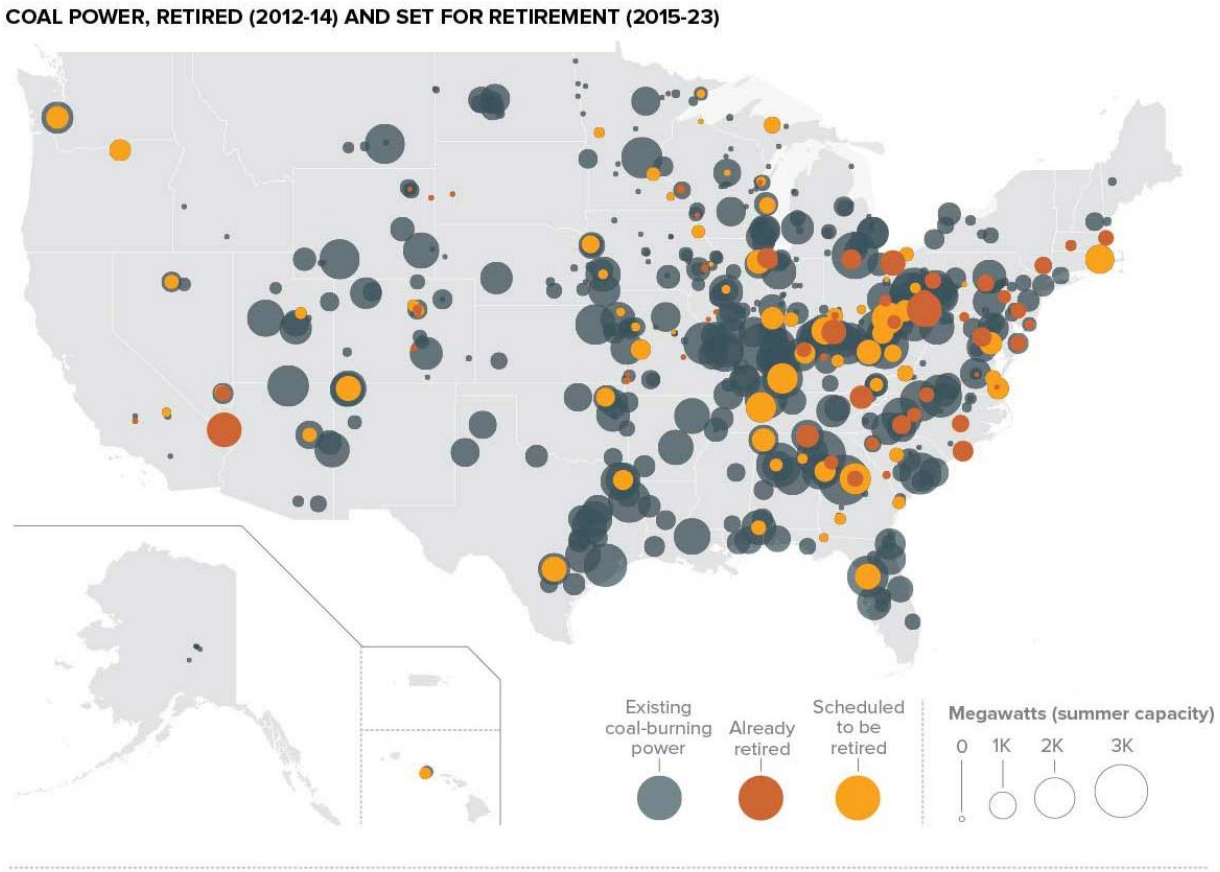
The Regional Greenhouse Gas Initiative (RGGI) is a mandatory, market-based CO_2 emissions reduction program, operating in nine Northeast states

- Better known as a "cap-and-trade" system, the RGGI was the first state-implemented reduction program in the US
- Program sets "regional budgets" for CO_2 emissions from the power sector, which effectively sets a hard cap for emissions coming from any one regulated plant
- Regulated sources of emissions can "trade" allowances on the open market, allowing one source to emit more CO_2 while keeping the overall emission level constant
- Similar program implemented by California in 2013 for power plants, industrial plants and fuel in distributors (in 2015)
- California targeting a 16% reduction in emissions from 2013-2020
- Holds a yearly auction for allowances that can be traded on the open market similar to the Northeast program

Source: RGGI, C2ES, Morgan Stanley Research

US Thermal Coal Market: US Thermal Coal Power Closures

As a result of regulation, particularly MATS and CPP, and an outlook for low LT gas prices, many coal-fired power plants are slated to close. No new coal-fired power plants are being contemplated at this time.



Source: Morgan Stanley Research, Politico

US Thermal Coal Market: Supply/Demand Model

US Coal Supply-Demand (m short tons)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Real GDP Growth (YOY%)	4.1%	0.9%	1.8%	2.8%	3.8%	3.4%	2.7%	1.8%	(0.3)%	(2.8)%	2.5%	1.8%	2.8%	1.9%	2.4%	3.3%	2.4%	2.0%	2.0%	2.0%	2.0%
IP Growth (YOY%)	4.0%	(3.4)%	0.2%	1.2%	2.3%	3.2%	2.2%	2.5%	(3.4)%	(11.3)%	5.7%	3.4%	3.6%	2.6%	4.0%	3.6%	2.4%	2.4%	2.4%	2.0%	2.0%
Power Sector Gen (TWh)	3,638	3,580	3,698	3,721	3,808	3,902	3,908	4,005	3,974	3,810	3,972	3,948	3,890	3,904	3,936	3,970	4,048	4,112	4,176	4,242	4,326
Nuclear	754	769	780	764	789	782	787	806	806	799	807	790	769	789	797	777	784	745	760	775	775
Hydro	271	214	260	272	265	267	286	246	253	272	258	318	274	266	256	271	262	260	260	260	260
Petroleum	105	119	90	114	115	116	60	61	43	36	35	28	20	24	28	26	26	26	17	16	16
Renewables & Other	46	41	50	52	56	61	71	79	101	122	143	168	194	224	251	295	335	350	372	397	422
Gas	518	555	608	567	627	684	734	815	802	841	901	926	1,133	1,029	1,029	1,186	1,193	1,228	1,287	1,326	1,366
Coal-fired Gen. (TWh)	**1,943**	**1,883**	**1,911**	**1,953**	**1,957**	**1,992**	**1,970**	**1,998**	**1,969**	**1,741**	**1,828**	**1,718**	**1,501**	**1,572**	**1,574**	**1,415**	**1,448**	**1,503**	**1,480**	**1,467**	**1,488**
Coal Gen Capacity (GW)	337	338	337	335	336	336	336	337	337	338	341	343	344	343	339	322	320	313	312	312	310
Utilization Rate (%)	68%	66%	67%	68%	68%	70%	69%	70%	68%	60%	63%	59%	51%	54%	55%	52%	53%	56%	56%	55%	56%
Electric Power	983	962	975	1,003	1,012	1,034	1,023	1,041	1,037	930	971	929	821	856	849	777	795	825	813	806	817
Industrial Consumption	65	65	61	61	62	60	59	57	54	45	49	46	43	43	43	40	40	39	38	37	37
Coke Plants	29	26	24	24	24	23	23	23	22	15	21	21	21	21	20	23	23	23	23	23	23
Other	4	4	4	4	5	5	3	4	4	3	3	3	2	2	2	2	2	2	2	2	2
Total Coal Burn	**1,081**	**1,057**	**1,064**	**1,093**	**1,103**	**1,122**	**1,108**	**1,124**	**1,117**	**994**	**1,045**	**999**	**886**	**922**	**915**	**843**	**860**	**889**	**875**	**868**	**878**
Thermal Exports (Land)	15	14	12	18	14	16	16	15	20	9	9	5	6	7	5	6	5	5	5	4	4
Thermal Export (Sea)	10	10	6	3	7	6	6	12	19	13	16	33	50	45	29	28	30	32	33	35	35
Total Thermal Exports	26	23	18	21	21	21	22	27	39	22	26	38	56	52	34	34	35	37	38	39	39
Met Exports (Land)	4	4	5	5	5	5	5	4	4	3	4	5	6	7	6	6	6	6	6	6	6
Met Exports (Sea)	29	21	16	17	22	24	23	28	38	34	52	64	64	59	57	51	48	42	38	36	36
Total Met Exports	33	25	21	22	27	29	28	32	43	37	56	70	70	66	63	57	54	48	44	42	42
Total Exports	**58**	**49**	**40**	**43**	**48**	**50**	**50**	**59**	**82**	**59**	**82**	**107**	**126**	**118**	**97**	**91**	**89**	**85**	**82**	**82**	**81**
Net Exports	46	29	23	18	21	19	13	23	47	36	62	94	117	109	86	79	78	74	71	70	70
TOTAL COAL DEMAND	**1,139**	**1,106**	**1,104**	**1,136**	**1,151**	**1,172**	**1,158**	**1,183**	**1,198**	**1,053**	**1,126**	**1,107**	**1,012**	**1,040**	**1,012**	**933**	**949**	**974**	**957**	**950**	**960**
Central Appalachia	258	267	246	228	230	233	234	224	232	195	185	182	147	127	118	95	81	73	66	66	66
Northern Appalachia	139	143	129	126	135	140	136	132	136	127	130	134	126	125	135	130	130	130	130	134	134
Southern Appalachia	22	23	22	23	25	25	22	22	23	21	22	21	21	20	18	18	18	18	18	18	18
Wyoming/Montana (PRB)	377	408	411	413	436	445	489	497	512	471	487	480	438	431	435	430	410	420	420	420	420
Illinois Basin	87	95	94	89	91	93	95	96	99	103	106	116	128	132	136	142	146	147	153	165	172
Colorado/Utah	56	60	60	59	62	63	62	61	56	50	45	47	46	40	43	40	40	40	40	40	40
Lignite	85	80	82	86	83	84	84	78	75	72	78	81	79	77	79	77	77	77	77	77	77
Other	49	51	51	48	50	50	41	36	37	36	32	34	33	33	33	33	33	33	33	33	33
Total Coal Production	**1,074**	**1,128**	**1,094**	**1,072**	**1,112**	**1,131**	**1,163**	**1,147**	**1,172**	**1,075**	**1,084**	**1,094**	**1,017**	**984**	**997**	**965**	**935**	**937**	**937**	**953**	**960**
Southern Appalachia Met (Est)	5	5	6	6	6	7	7	8	9	9	9	8	10	12	12	12	12	12	15	15	15
Northern Appalachia Met (Est)	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*4*	*2*	*5*	*10*	*15*	*17*	*18*	*18*	*18*	*18*	*18*	*18*	*18*
Central Appalachia Met (Est)	56	46	39	40	45	46	44	44	52	42	63	74	65	58	53	50	47	41	34	32	32
Met Coal Production	**61**	**51**	**45**	**46**	**51**	**53**	**51**	**54**	**65**	**52**	**77**	**92**	**91**	**87**	**83**	**80**	**77**	**71**	**67**	**65**	**65**
Thermal Coal Production	**1,012**	**1,076**	**1,049**	**1,026**	**1,061**	**1,078**	**1,112**	**1,093**	**1,107**	**1,023**	**1,007**	**1,003**	**926**	**897**	**914**	**885**	**858**	**866**	**869**	**887**	**895**
Total Imports	13	20	17	25	27	30	36	36	34	23	19	13	9	9	11	11	11	11	11	11	11
Waste Coal Supplied	9	10	9	10	11	13	14	14	14	14	14	13	11	10	11	10	9	9	9	9	9
TOTAL COAL SUPPLY	**1,095**	**1,158**	**1,120**	**1,107**	**1,151**	**1,175**	**1,213**	**1,197**	**1,220**	**1,111**	**1,117**	**1,121**	**1,037**	**1,003**	**1,019**	**986**	**955**	**958**	**957**	**973**	**980**
YE Producer Stocks	32	36	43	38	41	35	37	34	35	48	50	52	46	46	45	38	37	36	36	37	38
YE Cokery Stocks	1	2	1	1	1	3	3	2	2	2	2	3	3	2	2	2	2	2	2	2	2
YE Other Stocks	5	6	6	5	5	6	7	6	6	5	5	4	4	4	5	5	4	4	4	4	4
YE Utility Stocks	102	138	142	122	107	101	141	151	162	189	175	172	185	148	151	199	195	167	154	164	172
Depreciated Stocks & Other	4	10	6	(2)	11	13	13	8	9	19	4	14	18	2	5	12	12	12	12	12	12
YE Total Stockpiles	140	182	192	165	154	144	187	193	205	245	232	232	239	200	203	244	238	210	197	208	216
Net Surplus (Deficit)	**(48)**	**42**	**10**	**(27)**	**(11)**	**(10)**	**43**	**6**	**12**	**40**	**(13)**	**0**	**7**	**(39)**	**2**	**41**	**(6)**	**(29)**	**(13)**	**11**	**8**
YE Utility Stocks Days	37	53	51	42	36	34	49	52	56	67	62	73	79	60	65	94	90	74	69	74	77
YE Total Stocks Days	44	63	62	52	47	44	59	59	65	78	72	82	84	68	67	97	93	79	76	81	83
Avg Utility Stocks Days	38	53	53	45	39	36	50	53	57	74	66	68	83	63	65	94	90	74	69	74	77
Avg Total Stocks Days	57	55	65	60	52	48	56	60	61	85	78	74	91	78	67	97	93	79	76	81	83

Source: Morgan Stanley Research

Coal Companies and Valuation

Coal: Most Common Methods of Valuation

EV-EBITDA (FY1)

- EV/EBITDA is generally relied upon more than P/E since many of the company have vastly different capital structures and liabilities. Also, GAAP tax rates can fluctuate widely as a result of arcane mining accounting rules, which make P/E comparisons difficult.

EV-EBITDA (FY2)

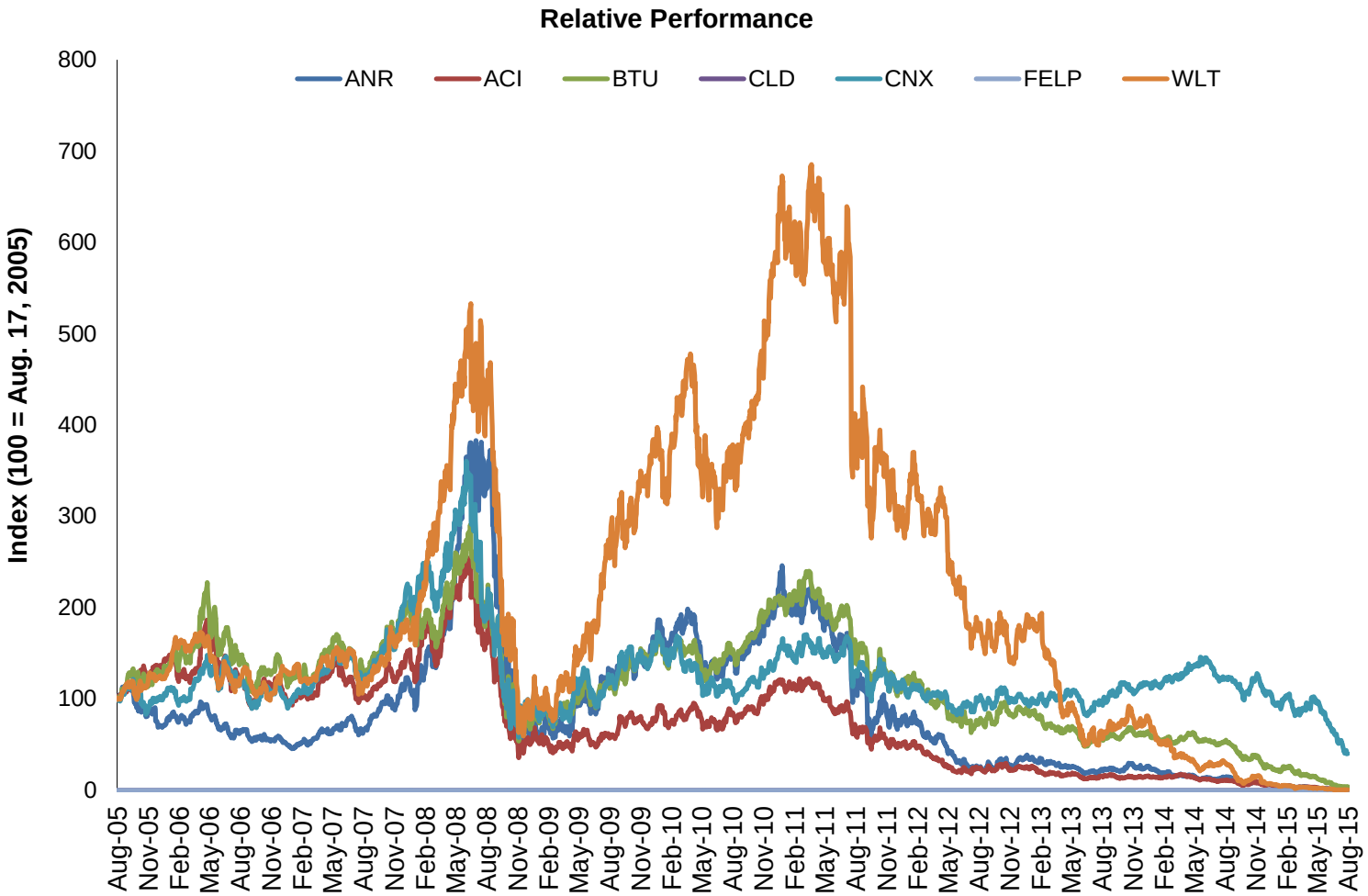
- Investors also like to look at forward EBITDA 2 years out. Most coal companies have near-term tons contracted, so commodity volatility does not impact current-year EBITDA. Valuing companies on a year with a large degree of open tonnage can be helpful.

DCF

- Mines are generally easy to model since production rates and mine lives are known. Also, in the current environment many companies are nearing breakeven levels of EBITDA, which makes multiple analysis difficult. DCFs are highly dependent on the LT commodity price assumed in the terminal year. LT prices should generally be set near the price needed to incentive an additional ton of production in a growing industry or the marginal cash cost of production in a shrinking industry.

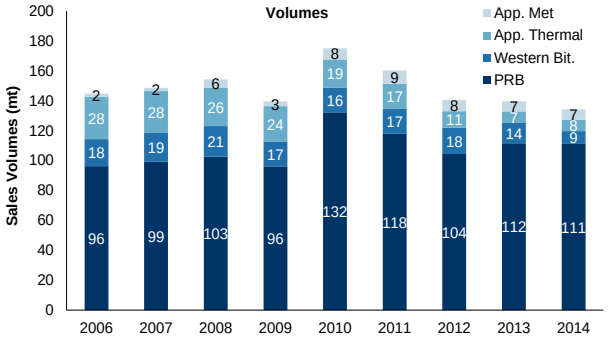
Source: Morgan Stanley Research

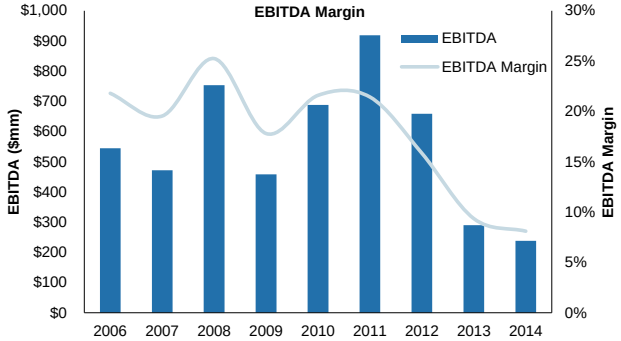
Relative Performance – Coal

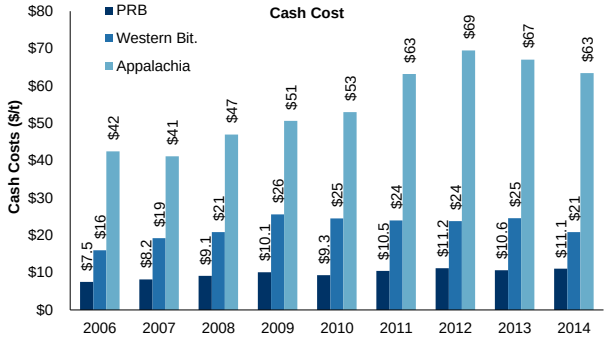


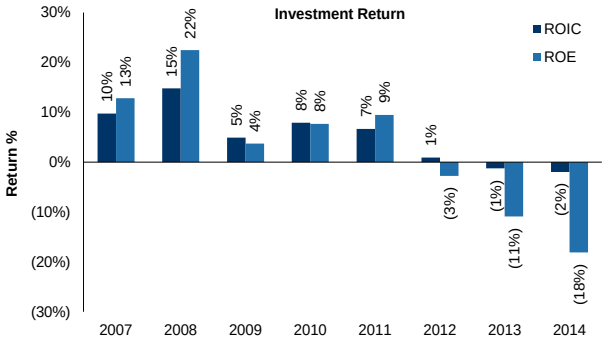
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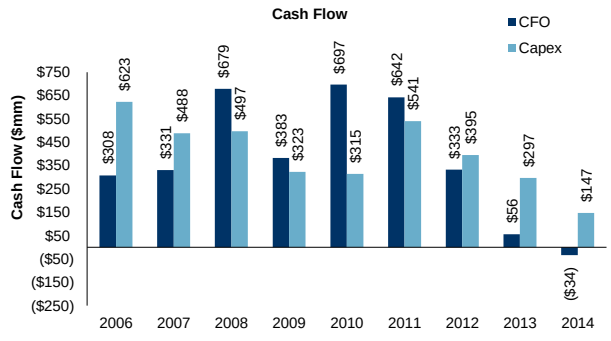
Company Profiles – Arch Coal

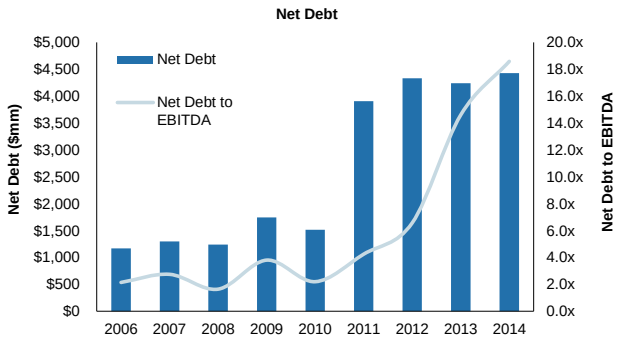






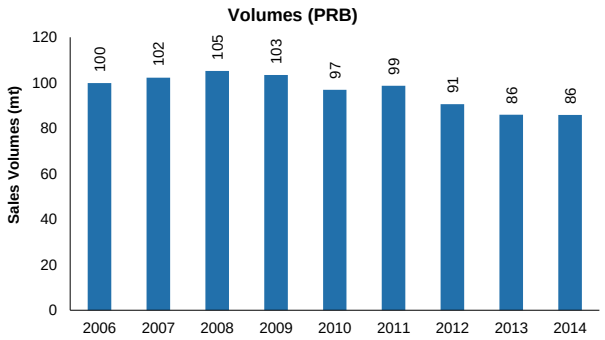


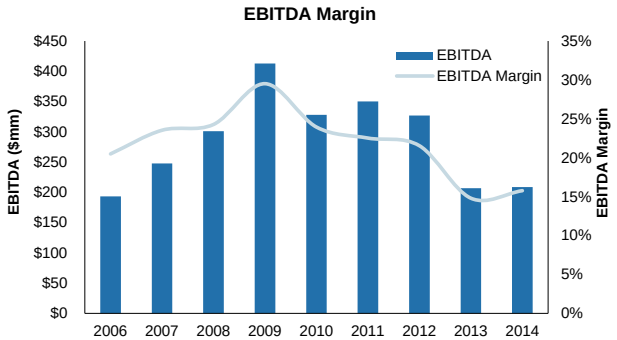


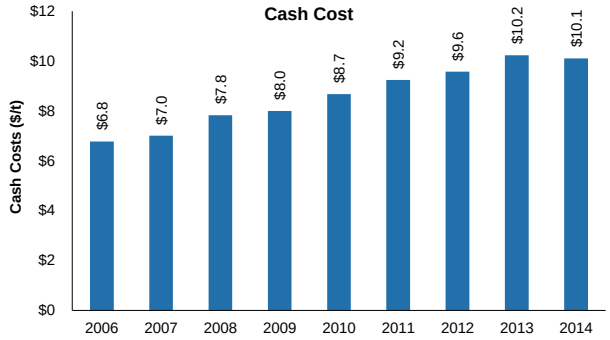


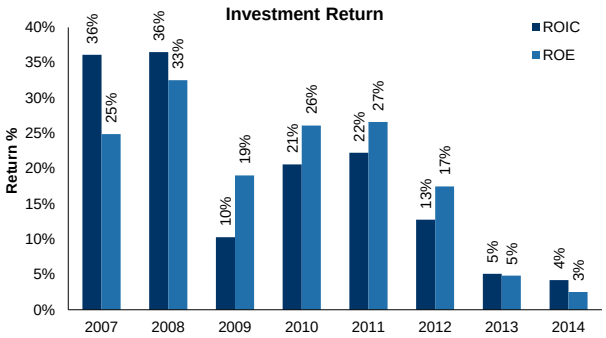
Source: Company Data, Morgan Stanley Research

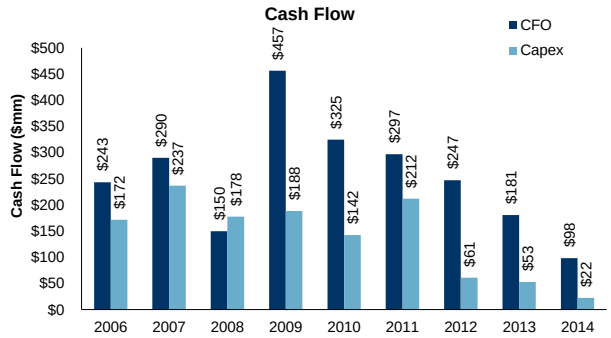
Company Profiles – Cloud Peak Energy

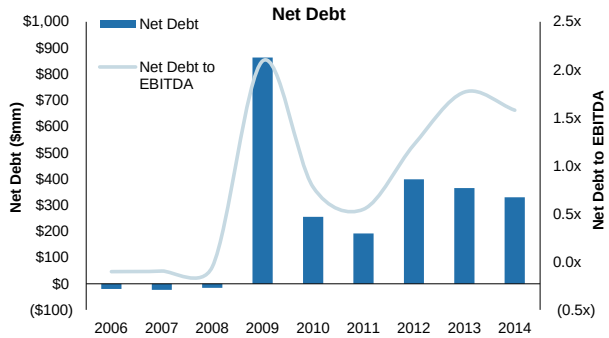






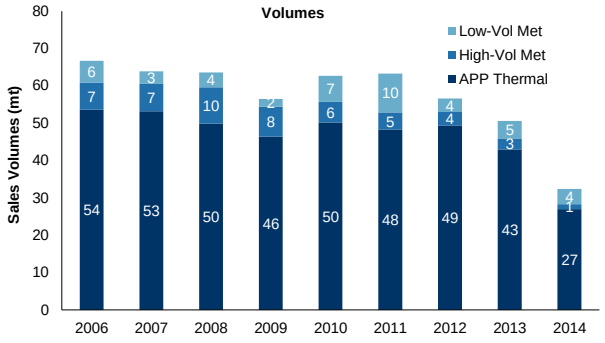


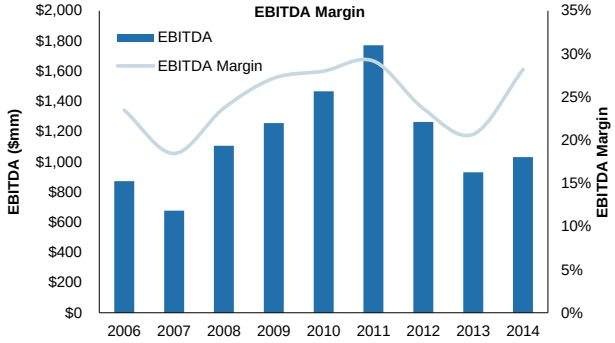


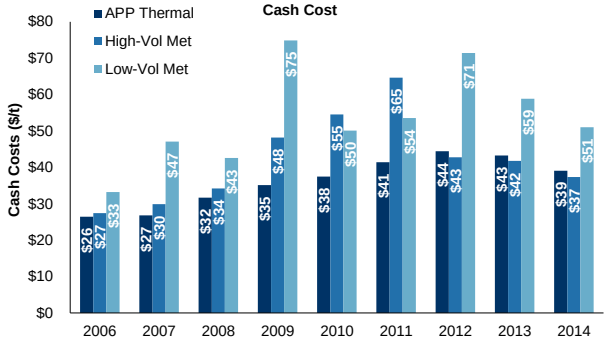


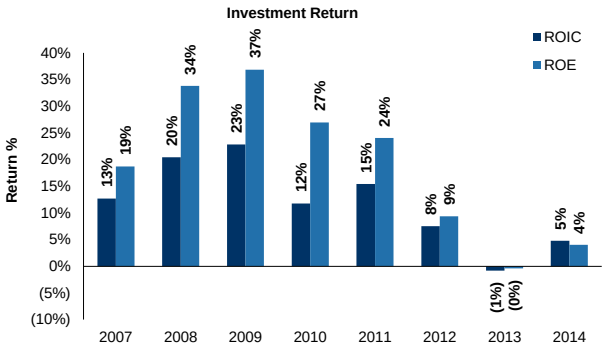
Source: Company Data, Morgan Stanley Research

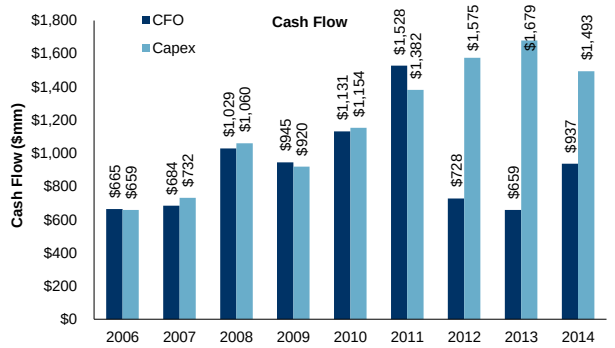
Company Profiles – Consol Energy

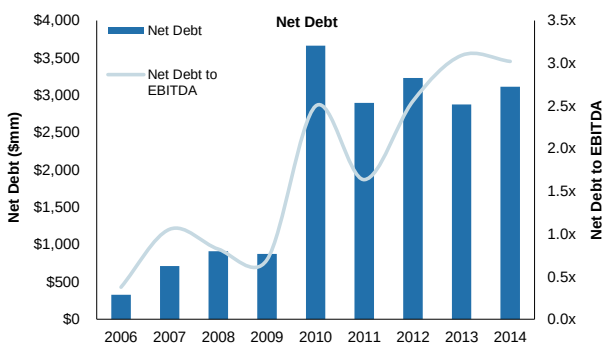






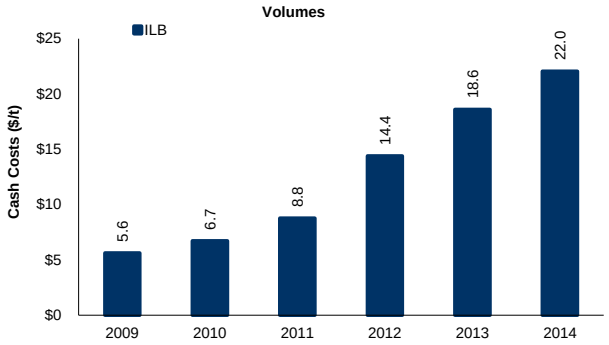


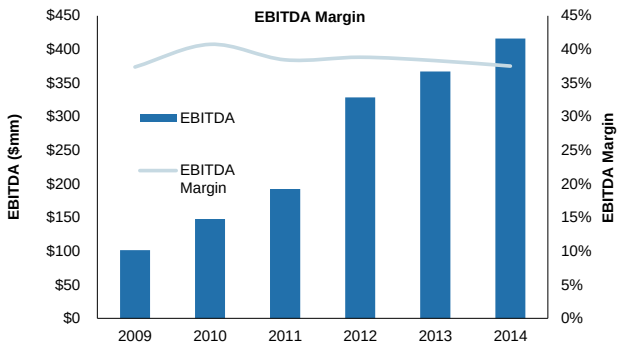


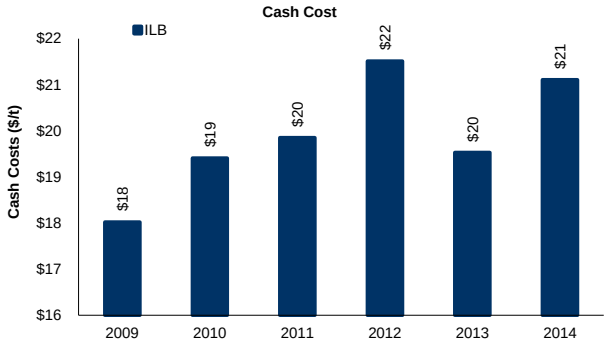


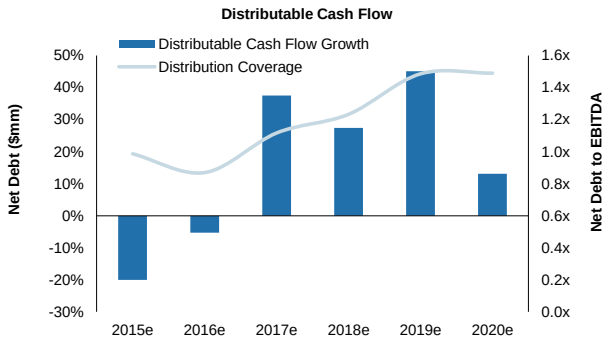
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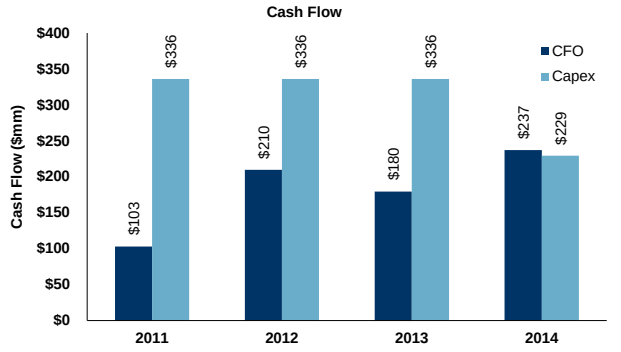
Company Profiles – Foresight Energy

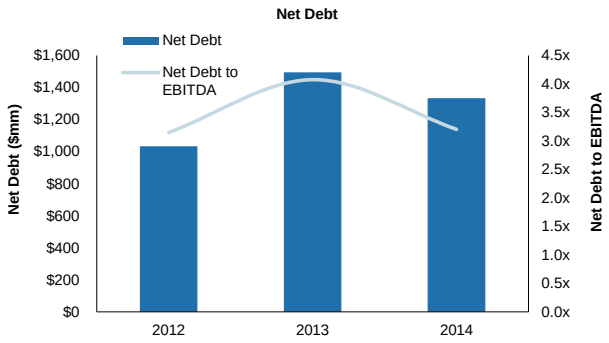






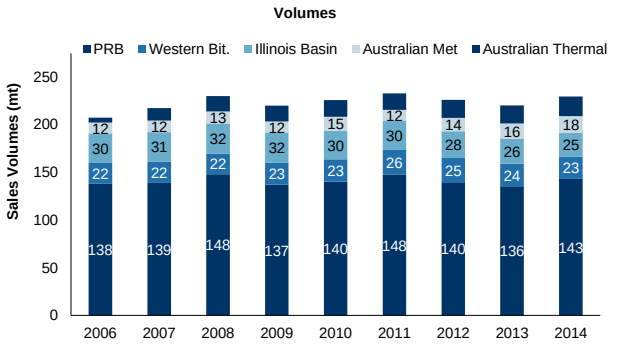


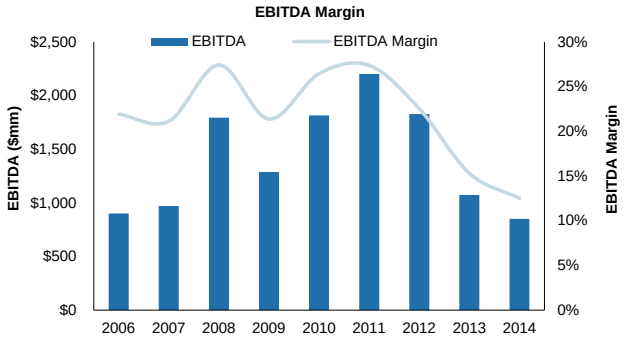


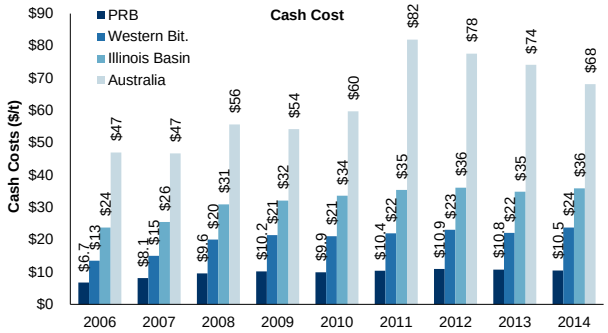


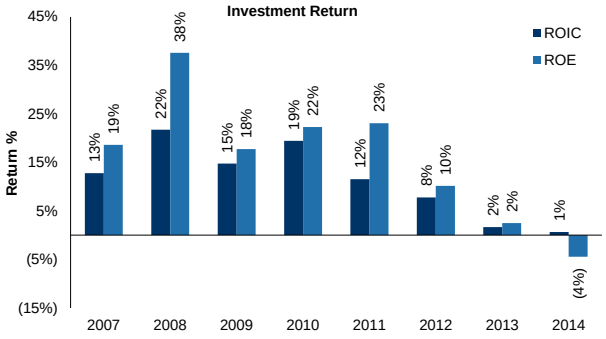
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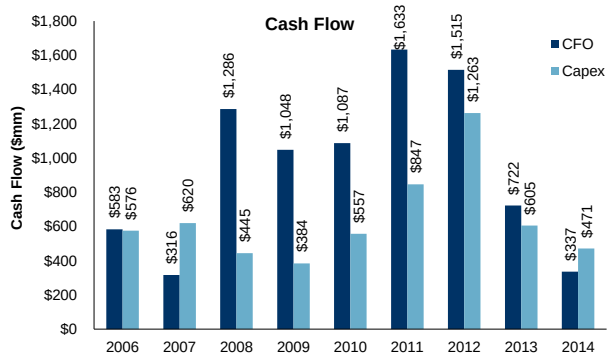
Company Profiles – Peabody Energy

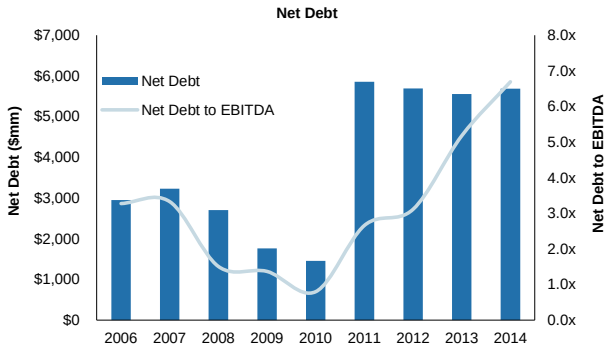












Source: Company Data, Morgan Stanley Research

Glossary of Steelmaking Terms

Glossary

Agglomerating Processes	Fine particles of limestone (flux) and iron ore are difficult to handle and transport because of dusting and decomposition. The powdery material is therefore usually processed into larger pieces. The raw material's properties determine the technique that is used by mills.
Alloy steel	Alloy steels are steels in which additional elements have been added to the usual iron, carbon, manganese and silicon that is present in ordinary carbon steels in order to improve their properties and performance. This typically involves better strength and/or hardness and/or ductility and/or corrosion resistance. Several additional elements may be present, and sometimes the desired properties are achieved through a combination of alloying and heat treatment.
Aluminized sheet	This is sheet steel to which a thin, hot-dip, aluminum-silicon alloy coating has been applied. It is primarily used in applications that must withstand or reflect heat and resist corrosion at temperatures that are higher than galvanized coatings can cope with.
Annealing	Annealing is the heating of metal to restore desirable properties after rolling, forging etc. Its function is to soften the metal, relieve internal stresses or improve internal structure. In steel the process is mostly used on cold rolled products – predominantly sheet, but also wire.
Apparent Consumption	This is a statistically-derived figure for national or regional steel consumption during a given period. It is based on the sum of reported mill shipments of finished steel plus steel imports into the country/region, minus steel exports.
Argon-Oxygen Decarburization (AOD)	A process for further refinement of stainless steel through reduction of carbon content.
Automatic gauge control (AGC)	Apart from correct metallurgy, the key parameters that determine the physical acceptability of flat rolled steel to the customer are its uniformity of thickness, its flatness, and its surface finish.
Bake hardening	The steel sheet used for automotive bodywork needs to be very formable during the press shop stage of panel manufacture, but must have high strength for optimum in-service performance. These are conflicting requirements which bake hardening resolves by altering the properties of the sheet on the car production line.
Bars	Long steel products of various different cross-sectional shapes including round, square, L-shaped (angle bars) and tees.
Basic Oxygen Furnace (BOF)	A pear-shaped furnace, lined with refractory bricks, that refines molten iron from the blast furnace and scrap into steel. Up to 30% of the charge into the BOF can be scrap, with hot metal accounting for the rest.
Beams	Structural steel products of various shapes used to construct the supporting elements of buildings, bridges, etc. (see also: wide flange
Bessemer Process	The main principle of the process is using oxidation to remove impurities from the molten iron by blowing air through the iron. The oxidation of the iron raises the temperature to keep it molten during the operation. A large container called the Bessemer Converter is used. This is made from steel with a special lining of silica and clay or dolomite.
Billet	These are long, continuously cast semis of less than 150mm square/round section. Like blooms they are cut-to-length after casting, and are reheated for rolling.
Blackplate	This is thin, low carbon, cold reduced steel coil which is used as a substrate for producing tinplate or tin-free steel/ECCS (electrolytic chromium coated steel – see separate entries). It should not be confused with black coil (untreated hot rolled coil).
Blast furnace	The blast furnace (BF) is a key installation in steelworks using iron ore as their principal raw material. These tall, shaft-like structures extract iron from ore in a continuous thermal process that produces molten iron (pig iron) for conversion into steel in a basic oxygen furnace.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Blooms	These are large, long, continuously cast pieces of steel with a minimum square section of 150mm x 150mm, but usually much larger. They are cut-to-length immediately after casting.
Busheling	This is a ferrous scrap term which originated in the USA and applies to thin uncoated clippings and stamping offcuts from manufacturing operations. Consequently it only applies to new production scrap, rather than scrap generated from obsolete used items.
Carbon steel	Plain ordinary grades of steel with no significant alloy content.
Case hardening	A method of heat treatment to increase the hardness, and therefore the wear and abrasion resistance, of the surface of low carbon steels, while leaving a softer interior which is tougher and more fracture resistant.
Cogging mill	This term is mostly associated with a heavy duty rolling mill for shaping reheated steel ingots into blooms or slabs. It has largely been superseded by the continuous casting of steel directly into these shapes. The mill is a reversing mill, allowing the ingot to pass and re-pass through the rolling stand until the desired profile is achieved.
Coke	Coke, iron ore and limestone are the principal inputs for blast furnace (BF) ironmaking. Coke provides thermal energy, combines with the oxygen in the ore to release iron, and ensures a permeable physical structure within the furnace to allow hot gases to move upwards, heating the incoming materials, and molten iron and slag to move downwards for tapping.
Coking coal	Unlike thermal or steaming coal used in power stations or for industrial or domestic heating, coking (or metallurgical) coal has unique properties that suit it to iron making.
Cold drawing	This is a process for changing the cross-sectional size or profile of steel in bar or coil by pulling (drawing) the unheated metal through a die of smaller diameter and/or different cross-section. The advantages include improved surface condition, good tolerances and better mechanical properties – such as higher tensile strength.
Cold rolled coil (CRC)	Flat rolled steel that has been rolled on a cold strip mill to reduce thickness and improve flatness. This form of gauge reduction also referred to as cold reduction.
Continuous casting	This is a process for converting liquid steel directly into a semi-finished shape suitable for further processing.
Corex	This is an ironmaking technology which, unlike the blast furnace, uses steaming (non-coking) coals, so avoiding the higher cost of coke.
Crude steel	The normal measure of steel output. Crude steel is either liquid steel or cast steel before being further worked.
Deburring	The process used to smooth the sharp, jagged edges of a cut piece of steel.
Deep drawing steel	Deep drawing is a mechanical process in which steel sheet is severely deformed to make a pronounced shape with a uniform thickness – such as a can body, canister, box or specific component. Consequently, deep drawing steels have properties that allow a rapid and radical change in shape in a die without tearing or rupture.
Descaling	The process of removing scale from the surface of steel. Scale forms most readily when the steel is hot by union oxygen with iron.
Desulfurization	Operation that injects a chemical mixture into a ladle full of hot metal to remove sulfur prior to its charging into the Basic Oxygen Furnace.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Direct reduced iron (DRI)	Direct reduced iron (DRI) is a metallic iron product used in electric arc furnace (EAF) steelmaking. It is produced from iron ore in a thermal, natural gas based process, & because of its purity and consistency tends to carry a price premium to scrap. It is sold as pellet, lump or in briquetted form (HBI – hot briquetted iron).
Drill Pipe	Pipe used in the drilling of an oil or gas well. Drill pipe is the conduit between the wellhead motor and the drill bit. Drilling mud is pumped down the center of the pipe during drilling, to lubricate the drill bit and transmit the drilled core to the surface. Because of the high stress, torque and temperature associated with well drilling, drill pipe is a seamless product.
Dry metric tonne unit	A dry metric tonne unit (dmtu) is 1% of iron (Fe) contained in a tonne of ore, excluding moisture. The price per tonne of a consignment of iron ore is calculated by multiplying the cents/dmtu price by the percent Fe content of the ore in that shipment.
Ductility	Ability of steel to undergo permanent changes in shape without fracture at room temperature.
Edge Rolling (Edge Conditioning)	Rolling a strip of steel to smooth the edges. By removing the burr off the coil, it is safer for customers to manipulate.
Electric arc furnace (EAF)	Electric arc furnaces produce steel directly from scrap. This can be supplemented by other inputs like direct reduced iron and pig iron. They account for about one third of global steel output. Basic oxygen furnace (converter) steelmaking accounts for the rest.
Electric Resistance Welded (ERW) Pipe	Pipe made from strips of hot-rolled steel which are passed through forming rolls and welded. While seamless pipe is traditionally stronger and more expensive than comparable ERW pipe, ERW technology is improving and the technique now accounts for approximately 48% of OCTG shipments by tonnage.
Electrical Steels	Electrical steels have a low carbon content but can contain up to around 3% Si – hence the alternative name silicon steel – and come in two forms: grain-oriented (GO) and non-grain-oriented (NGO).
Energy optimizing furnace (EOF)	The energy optimizing furnace (EOF) burns coal, enhanced by oxygen injection, to generate the thermal energy needed to preheat and then melt a mixture of scrap and pig iron, or other steelmaking raw materials, in an enclosed hearth.
ERW pipe	Both electric resistance welded (ERW) and submerged arc welded (SAW) tube or pipe is mostly produced by first forming steel sheet or plate into a cylinder and then welding the longitudinal gap to form a seam.
Extrusion	Extrusion is method of producing lengths of steel to a particular profile by forcing the metal though a die cut to the cross-sectional shape required. The result is a profile with good dimensional tolerances (near net shape), though not as dimensionally accurate as a machined
Fabricator	A producer of intermediate products that does not also produce primary metal. For example, a rebar (see Reinforcing Bar) fabricator purchases rebar and processes the material to the specifications of a particular construction project.
Fastmet	A process to directly reduce iron ore to metallic iron pellets that can be fed into an electric arc furnace with an equal amount of scrap. This process is designed to bypass the coke oven-blast furnace route to produce hot metal from iron ore.
Ferro-Alloys	These are the condiments of steelmaking. They are alloys of iron with other key elements, which, when added to the steel, melt determine whether the metal will have the properties which make it suitable for use as paper clips, a car body, an aircraft undercarriage, a beam in a
Fines	Material that passes through a standard screen on which coarser fragments are retained. In iron ore terms, fines is used to classify material that is usually between 1-10mm in size.
Finished steel	A steelworks' end products - such as bar, plate, beams, coil.
Flat products	Plate, strip and sheet, including strip/sheet coated with zinc, tin or other materials.
Flotation	A liquid concentration process in which the desirable mineral particles attach themselves to bubbles and float away from the waste particles.

Source: AISI, SBB, Morgan Stanley Research

Glossary

FOB, FOT	A sales contract negotiated on a free on board (FOB) basis means the seller pays for the goods and the cost of transporting them to the port of shipment and loading them. The buyer pays for shipping, unloading, and transportation to the final destination, as well as insurance. Risk passes to the buyer as goods cross the ship's rail. Free on truck (FOT) places similar conditions on the supplier, but at his premises, when goods are to be transported to the customer by road.
Forging	This is a way of producing individual metal parts by mechanical impact. It is suitable for working a wide range of steels, and can done with the metal cold, warm or hot. Forging differs from casting in that the metal changes shape while in a solid rather than molten state.
Galvanizing	This is the application of a thin layer of zinc or zinc-aluminum alloy to steel to provide corrosion resistance. The two principal coating methods are continuous galvanizing and batch (or general) galvanizing.
Galvannealed sheet	A hot-dip galvanized sheet which after the zinc coating stage on a continuous galvanizing line passes through a further furnace. This re-heating enables iron in the carbon steel strip to migrate into the zinc layer to form a zinc-iron alloy.
Heavy Structural Shapes	A general term given to rolled flanged sections that have at least one dimension of their cross sections three inches or greater. The category includes beams, channels, tees and zees if the depth dimension is three inches or greater, and angles if the length of the leg is three inches
HMS 1 & HMS 2	HMS stands for heavy melting scrap, and 1 & 2 are the two grades within that definition. They are widely traded, particularly in the western hemisphere.
Hot Briquetted Iron (HBI)	Direct reduced iron that has been processed into briquettes. Instead of using a blast furnace, the oxygen is removed from the ore using natural gas and results in a substance that is 90%–92% iron. Because DRI may spontaneously combust during transportation, HBI is preferred when the metallic material must be stored or moved.
Hot idling	Unless a steelmaker plans major maintenance work on a blast furnace it is not usually allowed to cool down. If it does the refractory brick lining can be irreparably damaged, unless very specific shut down procedures are followed, and a total reline be required. This is a very time consuming and expensive exercise which steelmakers go to great lengths to avoid.
Hot rolled coil (HRC)	The most common form of flat steel product. Rolled on a hot strip mill, it is typically 2-25mm thick and up to 2,250mm wide
Hydroforming	This is a way of producing fully formed steel parts by using internal hydraulic pressure within a tubular blank to achieve the desired final
Induction Furnace	Unlike the electric arc furnace (EAF) which provides heat energy via electrodes submerged within the furnace charge, induction furnaces heat the charge indirectly.
Ingot casting	Liquid steel cast in a mold into an unwrought mass. Now largely superseded by continuous casting.
Integrated Mills	These facilities make steel by processing iron ore and other raw materials in blast furnaces. Technically, only the hot end differentiates integrated mills from mini-mills. However, the differing technological approaches to molten steel imply different scale efficiencies and, therefore, separate management styles, labor relations, and product markets. Nearly all domestic integrated mills specialize in flat-rolled
Killed steel	This is steel that has been treated with a deoxidizing agent such as aluminum or silicon while molten and prior to casting. The aim is to significantly lower or totally remove the steel's oxygen content so that there is no gas formed during subsequent solidification.
London Metal Exchange	The London Metal Exchange (LME) offers futures and options contracts for non-ferrous metals, steel and plastics. It was established in London over 130 years ago, and until recently only traded in non-ferrous metals.
Long products	Steel products other than flat products. Includes bar, rod, beams and rail.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Manganese	This is the most widely used alloying addition in steelmaking, and is present in virtually every grade of steel. Manganese (Mn) has three key benefits. It combines with sulfur in the melt to improve the hot working properties of the resulting steel, it acts as a deoxidant, and it makes an important contribution to the final toughness and hardness of the steel.
Merchant Bar	Merchant bar is a range of commodity carbon steel long products widely used in the manufacture and fabrication of a broad range of items. It includes round, square and hexagonal bars, angles, channels and flats.
Merchant pig iron	Most pig iron is produced in blast furnaces for subsequent steelmaking at integrated steelworks, and is transferred as molten iron from BF to nearby oxygen converters. But a much smaller tonnage is produced for sale as a steelmaking or foundry raw material. This merchant pig iron is mostly made in coke or charcoal fuelled BFs and sold as ingot. Electric arc furnace (EAF) steelmaking, rather than foundry castings, is the main application. Some integrated steel mills also sell surplus pig iron.
Mesh	Steel rods or bars welded into an open lattice for reinforcing flat concrete structures.
Metric Ton (mt)	A unit of mass and weight equal to 1,000 kilograms, or 2,204.6 pounds.
Mill scale	Mill scale forms on the surface of steel when oxygen reacts with very hot metal to form iron oxides. This occurs immediately after casting, and during reheating and hot rolling.
Mini Mills	Although this term is becoming less widely used, it refers to scrap-based steelworks, usually producing mainstream/commodity products, which are mainly sold into local/regional markets.
OCTG	This is shorthand for Oil Country Tubular Goods, a category of steel tube used in oil and gas drilling and extraction. Much of it is seamless, but welded tube is also very prominent.
Open hearth steelmaking	Open hearth steelmaking has largely been superseded by basic oxygen, and in some instances by electric arc furnaces (BOFs and EAFs), and today accounts for less than 3% of world crude steel output. Where plants still exist – notably in Russia and Ukraine, but also India – they are mostly being phased out.
PCI (pulverised coal injection)	This is principally a cost reducing technique in ironmaking. It involves substituting part of the normal coke charge to a blast furnace with coal that is cheaper than the hard coking variety needed for coke making. PCI also reduces environmental impact because less cokemaking
PCI Coal	The coals used by steelmakers for pulverised coal injection (PCI) into blast furnaces are broadly speaking steam coals (which are mostly used by coal-fired power stations) rather than the coking coals used to produce coke.
Pellet	A small, round, marble-sized ball of iron ore manufactured as feed for blast furnaces (see pelletizing).
Pelletizing	The process by which iron ore is crushed, ground into a powder, rolled into balls and fired in a furnace to produce strong, marble-sized pellets that contain 60% to 65% iron. Raw iron ore pellets are generally manufactured within certain size categories and with mechanical properties high enough to maintain usefulness during the stresses of transference, transport, and use. Both mechanical force and thermal processes are used to produce the correct pellet properties.
Pickled & Oiled	Pickling is a continuous operation that requires the decoiling and subsequent recoiling of the HRC so that it can pass through the acid-based liquid pickling process. This cleans the steel, removing surface scale, rust and dirt or grease, before rinsing and drying.
Plate	Plate is thick, flat-rolled steel produced from slab or ingot, and is mostly sold as discrete pieces but also coiled. It is available in carbon, alloy and stainless grades.
Punching	The cutting of holes into carbon steel beams or plates by pressing or welding per customer specifications.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Quarto Plate	Quarto plate is hot rolled from slab. Desired thickness is achieved by passing the slab back and forth through the mill (a 4-high, hence "quarto", reversing mill). This distinguishes it from plate rolled on a multiple stand (tandem) mill without reversing direction (continuously
Quench Hardening	A process of hardening a ferrous alloy of suitable composition by heating within or above the transformation range and cooling at a rate sufficient to increase the hardness substantially. The process usually involves the formation of martensite.
Rebar (reinforcing bar)	A steel bar, normally having surface deformations, for use in reinforcing concrete.
Refractories	These are used to line and insulate the vessels involved in iron and steel making (blast furnaces, torpedo cars, basic oxygen converters, ladle furnaces, tundishes) as well as the various heating furnaces used to ensure cast steel is at the correct temperature for hot rolling.
Reheat furnace	Reheat furnaces are used to ensure that partly worked steel, which has been allowed to cool, arrives at its next processing stage at the optimum temperature. They are mostly used for semi-finished items like slabs, blooms, billets and beam blanks, but also tubes.
Rod	Round, thin semi-finished steel length that is rolled from a billet and coiled for further processing. Rod is commonly drawn into wire products or used to make bolts and nails.
Rolling mill	A machine which converts semi-finished steel (semis) into finished steel products by passing them through sets of rotating cylinders which squeeze the steel into the desired shape. Rolled steel products include bar, rod, plate, beams, coil etc.
SAW pipe	Both electric resistance welded (ERW) and submerged arc welded (SAW) tube or pipe is mostly produced by first forming steel sheet or plate into a cylinder and then welding the longitudinal gap to form a seam.
SBQ	SBQ, or special bar quality, is a predominantly North American term to describe steel long products for more demanding processing or end-use applications than can be met by commodity grades. Elsewhere the term "engineering steels" is widely used.
Scrap	All steel is 100% recyclable without loss of quality. Obsolete scrap is derived from steel-containing goods at the end of their useful lives (a drinks can, a 15-year-old car, a 50-year-old building). Revert scrap (home scrap) is steel waste produced and recycled within a steelworks. New production scrap (prompt scrap) is generated when steel is cut and formed during the manufacturing of finished products or components. The scrap is returned to steelworks and foundries.
Seamless tube/pipe	Seamless tubes have greater strength than welded tubes because of their homogenous microstructure, but are much more expensive to produce. They are made by rolling a preheated billet between offset rolls (the axes form an "x") At high rolling speeds and pressures this configuration sets up stresses in the center of the billet that facilitate its piercing with a pointed bar, or plug, to create a tube shell.
Secondary metallurgy	Steel's precise composition can vary from customer to customer, and steelmakers use a secondary metallurgy vessel (often referred to as a ladle furnace) between the steelmaking and casting operations to allow molten steel to be brought to the required specification.
Semis	Semis is short for semi-finished steel, which is the name given to large, uniform cast pieces that require further processing in order to be transformed into finished long, flat and tubular steel products.
Sendzimir mill (Z-mill)	The Sendzimir mill is specifically designed for processing stainless steel and other metals which rapidly work harden during cold rolling, making gauge reduction difficult. A typical Sendzimir rolling stand is immediately recognizable by its large number of small diameter back-up rolls (typically about 20) clustered around two small-diameter work rolls. This is in contrast to the large diameter work rolls and two or four large back-up rolls on most
Service Center	A catchall name for an operation that buys steel, often processes it in some way and then sells it in a slightly different form. A service center is distinguished from an end-user by the fact that, unlike an end-user, a service center sells steel, not a fabricated product. Service centers are manufacturers to the extent that they add labor to steel by providing a service.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Sinter	This lumpy material is produced by integrated steelworks for use as a raw material in ironmaking, and is the main way of introducing iron ore into blast furnaces. Sinter is made by mixing iron ore fines, coke and a flux, such as limestone, placing this mixture on a steel conveyor belt, and igniting it. The resulting high temperature causes the constituents to fuse into a porous clinker but not to melt.
Skelp	Steel that is the entry material to a pipe mill. It resembles hot-rolled strip, but its properties allow for the severe forming and welding operations required for pipe production.
Slab	A semi-finished product (semi) of flat cross-section, but usually more than 200mm thick, used for rolling into a plate or coil.
Slag	The impurities in a molten pool of iron. Flux such as limestone may be added to foster the congregation of undesired elements into a slag. Because slag is lighter than iron, it will float on top of the pool, where it can be skimmed.
Stainless Steel	Good corrosion resistance due to a high chromium content is the key characteristic. Opinions vary on the level of chromium (Cr) at which a steel becomes stainless, but it is at least 10.5%. Nickel (Ni) and molybdenum (Mo) are often present, and manganese, copper, titanium, silicon + other alloying elements may be added.
Steckel mill	This is a piece of equipment usually associated with the production of flat rolled steel, and is essentially a reversing hot rolling mill where steel slab is reduced to strip by passing back and forth though either single or twin mill stands until the desired gauge is reached.
Strip	Thin flat steel normally produced in a continuous strip and wound into a coil weighing up to 40 tonnes for further processing.
Structural steel	Structural steel is produced specifically for building construction with a specific shape or cross section, chemical composition and strength. These parameters and more, such as storage, are regulated to particular standards in most industrialized countries.
Tailor Welded Blanks	These are shaped sheets made up by welding different grades and/or thicknesses of steel together to form a blank which is ready for final stamping by car makers – say for an inner door panel or engine compartment.
Tandem Mill	A type of cold-rolling mill, the tandem mill imparts greater strength, a uniform and smoother surface, and reduced thickness to the steel sheet. Unlike the original single-stand mills, a tandem mill rolls steel through a series of rolls (generally three to five in a row) to achieve a desired thickness and surface quality.
Tempering	This is a heat treatment process applied to steels which have been hardened for a particular application (by heating and rapidly cooling), but as a result have become too brittle for the end-use for which they are intended.
Terne	Sheet steel coated with a mixture of lead and tin. Terne principally is used in the manufacture of gasoline tanks, although it also can be found in chemical containers, oil filters, and television chassis.
Thin slab casting	In steelworks producing flat rolled products, molten steel is continuously cast into slabs in excess of 200mm thick. These are either allowed to cool before reheating for hot rolling, or kept hot in a nearby furnace before being sent on to the hot mill.
Tinplate	Tinplate is cold reduced steel sheet coated with a thin layer of tin. It has good corrosion resistance and food compatibility – although many products require a thin coating of lacquer to maximize the shelf life of the contents.
Torpedo ladle	Torpedo ladles – or torpedo cars – are large, well insulated vessels used to transport liquid iron from blast furnace to steel converter.

Source: AISI, SBB, Morgan Stanley Research

Glossary

Vacuum degassing	Vacuum degassing (VD) is used following steel making to reduce the carbon, nitrogen, hydrogen and sulfur content of molten steel. Phosphorus can also be reduced. The process takes place under vacuum in a ladle furnace, and is frequently employed by both volume and
Welded tube/pipe	This is made from hot rolled or cold reduced strip, sheet or plate. Small and medium diameters are produced in continuous, multiple-roll mills that progressively bend incoming, unheated strip into a circular cross-section prior to welding along the longitudinal seam. Tube may subsequently be cold-drawn through dies to achieve precise dimensions and finish.
Wire Drawing	This is the process by which steel wire is produced from a larger diameter feedstock, usually wire rod.
Wire Rod	Hot rolled from low, medium and high carbon or alloy steel billet, wire rod is delivered as coil, most commonly at 5.5mm dia, but in sizes up to 60mm dia. Close control of final cooling is a critical part of production.
Wrought iron	This is a type of iron, which unlike hard, brittle pig iron – such as is tapped from a blast furnace – is tough and malleable, allowing it to be forged and welded. It has a high tensile strength and is more corrosion resistant than steel.
Zorba	Heterogeneous mixture of aluminum and copper after a car has been shredded. Primarily sold to Asian buyers for further sorting.

Source: AISI, SBB, Morgan Stanley Research

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Total	**3,347**		**802**		

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INDUSTRY COVERAGE: Steel

COMPANY (TICKER)	RATING (AS OF)	PRICE* (09/11/2015)
Evan L Kurtz, CFA		
AK Steel Holding Corp. (AKS.N)	E (01/30/2012)	$2.77
Cliffs Natural Resources Inc (CLF.N)	U (03/27/2013)	$3.66
Commercial Metals Company (CMC.N)	E (11/18/2008)	$14.87
Nucor Corporation (NUE.N)	E (11/13/2013)	$42.12
Schnitzer Steel Industries (SCHN.O)	U (07/17/2009)	$16.17
Steel Dynamics (STLD.O)	O (07/20/2012)	$18.80
US Steel Corporation (X.N)	O (11/13/2013)	$14.10

Stock Ratings are subject to change. Please see latest research for each company.
* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Coal

COMPANY (TICKER)	RATING (AS OF)	PRICE* (09/11/2015)
Evan L Kurtz, CFA		
Arch Coal Inc. (ACI.N)	U (10/16/2013)	$3.93
Cloud Peak Energy Inc. (CLD.N)	O (01/20/2015)	$3.00
Consol Energy Inc (CNX.N)	O (05/02/2013)	$12.53
Foresight Energy LP (FELP.N)	O (07/14/2014)	$6.96
Peabody Energy Corp. (BTU.N)	O (05/12/2014)	$1.65

Stock Ratings are subject to change. Please see latest research for each company.
* Historical prices are not split adjusted.

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