Carbon Tracker Initiative

Energy Transition Advisors
ETA

The US Coal Crash

Evidence for Structural Change

March 2015

About Carbon Tracker

The Carbon Tracker Initiative is a team of financial specialists making climate risk real in today's financial markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system with the energy transition to a low carbon future.

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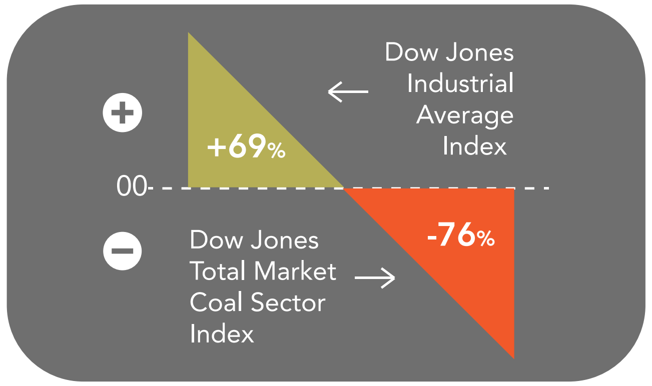
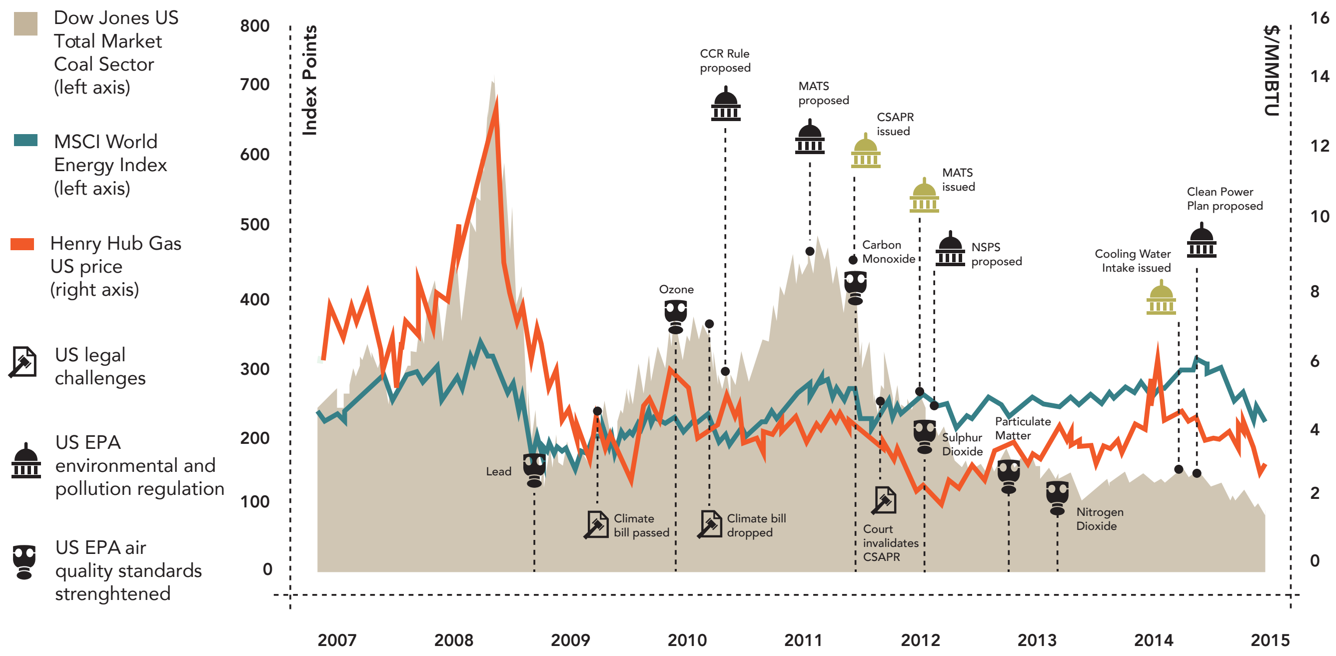
Waiting for an upturn in the coal markets that never came

Index comparison over the period 2009-2014

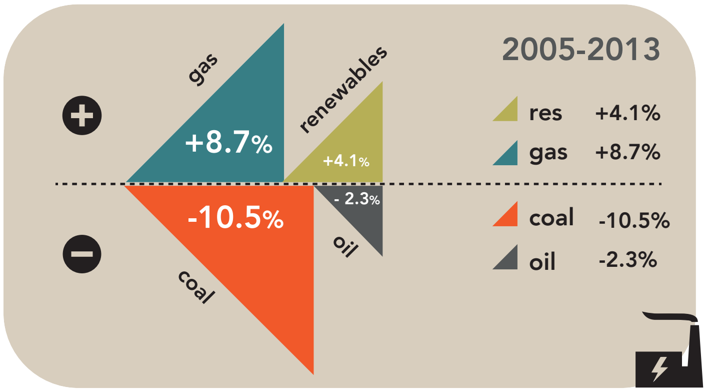


Many factors dampening demand in play

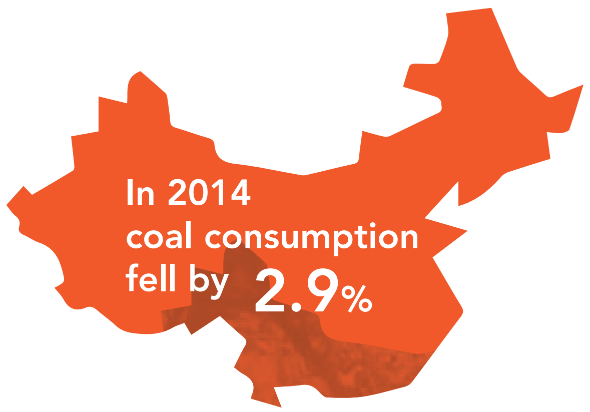


It is a structural shift

The level of US power generation remained the same between 2005 and 2013, but the share of energy sources used for generation have changed:



What about China?



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Executive Summary

Waiting for an upturn in the coal markets that never came

Historical trends indicate that the weakening of coal prices over the last few years came instead of another upturn in the market. Company disclosures reveal that some actors in the coal sector have been holding out for an upswing that has not materialised. Management teams that are still betting on a bright future in the US coal market are increasingly at odds with market sentiment.

Placing some big bets

The Dow Jones Total Market Coal Sector Index is down 76% over the last five years, compared to the Dow Jones Industrial Average that is up 69% over the same period. A number of the worst performers are those that made major acquisitions during the period, taking on heavy debt burdens. CONSOL Energy is the exception, having decided early on to hedge its coal exposure with gas assets, which has diluted the impact of faltering thermal coal performance. Recent years have seen at least 26 US coal companies go into bankruptcy, including once major producers such as James River Coal and Patriot Coal Corporation.

Metallurgical coal has also suffered, and operators with geographical concentration in Appalachia have fared worst.

Many factors in play

The operating context for thermal coal power generation clearly changed over the last few years, with factors like the falling cost of renewables, increased energy efficiency, rising construction costs and legal challenges all going against the sector. However, in our view the main structural drivers were: (1) the emergence of cheap shale gas seeing the price fall 80% since 2008; and (2) additional and increasingly stringent Environmental Protection Agency (EPA) regulations, especially the Mercury and Air Toxics Standards (MATS). This tag team effort can be thought of as gas prices taking the legs out from under the thermal coal industry, with EPA regulations making it difficult for coal to get up again every time it tried. What is also striking is that these factors were not driven explicitly by carbon or climate considerations; without a global climate deal or a federal carbon price, US coal is already down for the count.

Gas and renewables displace oil and coal

According to the US EIA, the level of US power generation was almost identical in 2005 and 2013. Between 2005 and 2013, coal lost 10.5% of the US power market and oil lost 2.3%. Market share was picked up by gas generation (8.7%) and renewables (4.1%), with energy efficiency also playing a significant role in dampening demand. Whereas, historically, economic growth in the US has consistently driven increased use of coal, since 2007 GDP has continued its upward climb but the use of coal has fallen.

It's a structural shift

Policy risk and technology risk are not new to the energy sector. The combination that has evolved in the US has still caught companies off guard. These risk factors have driven volatility and price pressure on the way down from peak prices that were always unlikely to last. The structural nature of this shift (see graph overleaf), which has demonstrated that a major developed economy can decouple its economic activity from coal-based power, is a wake-up call.

Demand destruction challenges capital flows

The industry remains highly leveraged and is struggling to make the sums for capex, dividends and debt payments add up. The erosion of demand for thermal coal and the subsequent weakening of prices in the US have impacted revenues. The poor market outlook, at home and abroad, should also raise further questions of capital expenditure being allocated to new thermal coal mining projects.

Utilities are the 'canary in the coal mine'

There are clearly already stranded assets emerging in the world as demand for fossil fuels shifts; the comments from the US utilities that coal was being taken out of the picture should have been a warning sign. In hindsight, the mismatch between US utilities retiring coal plants and US coal miners still being bullish on demand is an obvious contradiction. Some operators were hoping that increased international exposure through exports or acquiring overseas production would improve their fortunes, but a similar pattern of structural decline is emerging in the seaborne coal market.

Producers are still in denial

The largest coal producer in the US, Peabody Energy, appears to treat the signals that have led to such huge financial pain as an aberration, rather than the new normal. In their quarterly report for 2014, Peabody reveals their expectation that in the US, 'utility coal usage is projected to increase 10 to 30 million tons over 2014 levels'. Furthermore, Peabody expects 'global coal demand to rise 500 million tonnes by 2017… [with] an estimated 8 to 10% increase in seaborne thermal coal demand'. There are few signs that suggest that either forecast will come close to fruition.

Is Chinese thermal coal peaking?

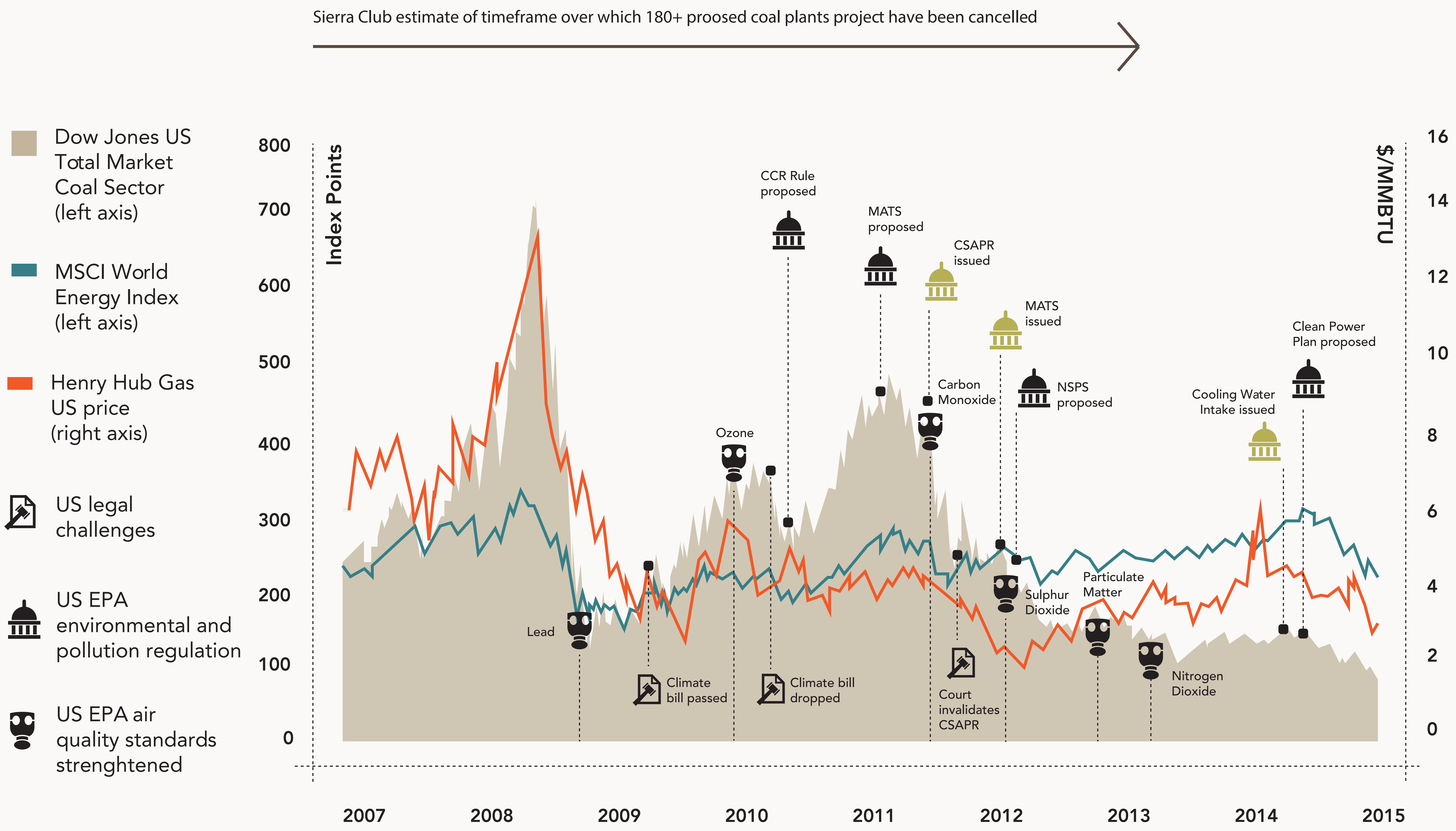
It is a common retort when discussing coal emissions – 'what about China?' OECD thermal coal demand is clearly declining; the question is whether growth in other markets (particularly China and India) can outstrip that decline. Seaborne trade in thermal coal has also seen prices weaken in the past few years. As a result, much of exported production is not even covering costs at present and the futures prices do not indicate much improvement. In 2014, China's coal consumption fell for the first time in 14 years, by 2.9%. The US coal industry's plan B – to simply export their production – has only served to add to the risks rather than bring some relief through geographic diversification.

Lessons for other markets on stranded assets risk

Other fossil fuel markets internationally should also acknowledge the extent of stranded assets incurred in the US coal sector. They should use this case study to build their understanding of, and resilience to, the potential value destruction that could result if stakeholders miss the evident trends of ever-falling costs of renewables and improved energy efficiencies driving the transition to a lower-carbon energy system.

Higher risk premium needed for fossil fuels

For companies involved in fossil fuel extraction, portfolios can be given increased downside protection by demanding higher hurdle IRRs before sanctioning projects. This will have the effect of ensuring that the projects they enter have lower breakeven prices and thus are more resilient to volatility. We believe that investors should expect greater capital discipline from companies and challenge capex on high-cost projects. The risk premium of fossil fuel project development needs to be raised.



Sierra Club estimate of timeframe over which 180+ proosed coal plants project have been cancelled
Dow Jones US Total Market Coal Sector (left axis)
MSCI World Energy Index (left axis)
Henry Hub Gas US price (right axis)
US legal challenges
US EPA environmental and pollution regulation
US EPA air quality standards strenghtened
Index Points
$/MMBTU
800
700
600
500
400
300
200
100
0
16
14
12
10
8
6
4
2
0
CCR Rule proposed
MATS proposed
CSAPR issued
MATS issued
Clean Power Plan proposed
Carbon Monoxide
NSPS proposed
Cooling Water Intake issued
Ozone
Lead
Climate bill passed
Climate bill dropped
Court invalidates CSAPR
Sulphur Dioxide
Particulate Matter
Nitrogen Dioxide
2007
2008
2009
2010
2011
2012
2013
2014
2015

Introduction

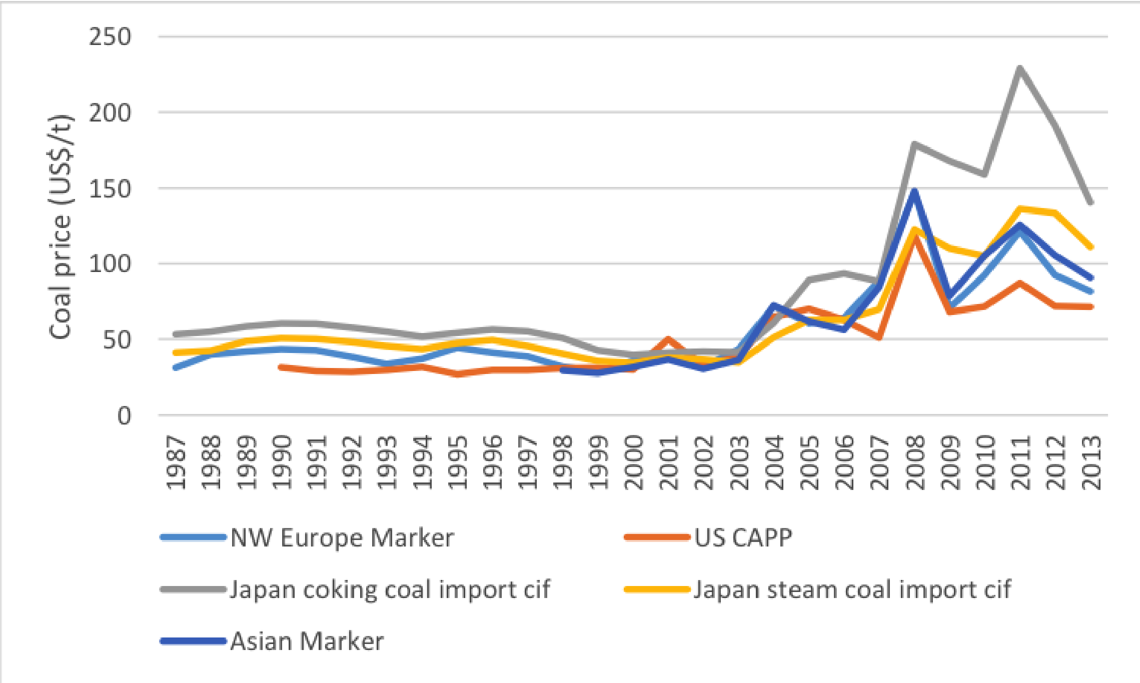
Background

As part of the series of reports on fossil fuel capital expenditure (capex) trends, in September 2014 the Carbon Tracker Initiative released "Carbon Supply Cost Curves: Evaluating Financial Risk to Coal Capital Expenditures"[i]. Along with a suite of three other documents on global demand, supply and financial trends, this formed a comprehensive analysis of the international coal sector. In this note, we take a deeper look at the US coal sector, examining the drivers for its crash since 2011 and consider its prospects moving forward.

Is the sun setting on a coal supercycle?

The coal industry has been on a bumpy ride in recent times. Like many commodities, after years in the doldrums in the 1980s and 1990s, Chinese economic growth and a strong international economy led to increased coal demand and hence pricing in the 2000s. Although coal was hit hard by the global financial crisis (GFC) – the 2007-08 period of severe stock market losses and economic slowdown precipitated by the bursting of the US housing bubble – prices and production managed to rebound after the initial shock. Such was their recovery that combined revenues for each producer category (thermal, metallurgical and balanced, based on the company universe in the aforementioned Carbon Supply Cost Curves report on coal) nearly doubled from 2008-2011.

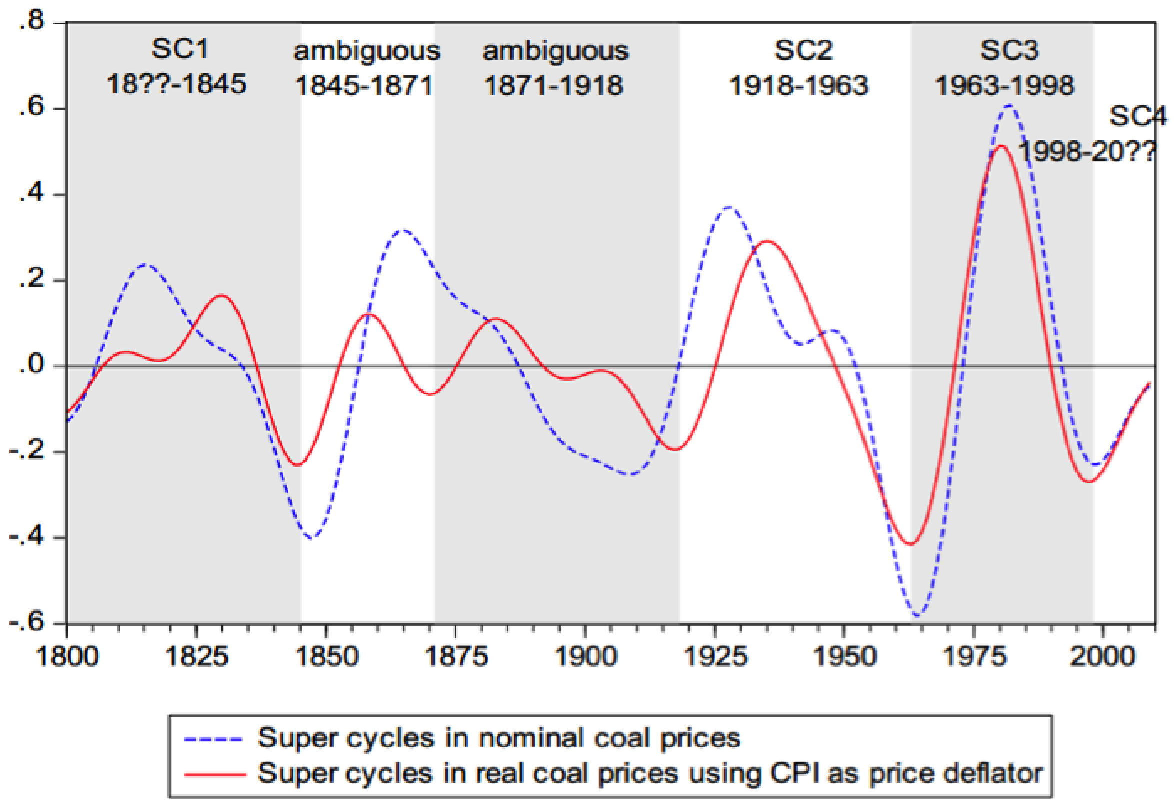
Figure 1: Performance of international coal pricing benchmarks, 1987-2013



Source: BP Statistical Review of World Energy

For many this rapid upturn in demand and pricing represented a resumption of a long trend rise in real commodity prices driven by high demand for coal and commodities more generally, known as a "supercycle". There is evidence that supercycles exist and that there was indeed one in action in the first decade of this century; Figure 2 suggests that, until peaking in 2008/2011, the strength in coal prices might have been part of the fourth such event in the last two hundred years.

Figure 2: Supercycles in the nominal and real coal prices[1]



Source: Zellou and Cuddington, 2012[ii]

Since 2011, however, structural headwinds have built against the coal sector across the globe, and coal prices, cash flows and company valuations have fallen sharply, as we will examine in this note. As Citi put it in mid-2013, this is the period "in which the death bells ring for the commodity supercycle"[iii]. That said, the collapse in prices since 2011 and comparison with historic cycles raises the question of whether the recent period should really be called a supercycle in coal, or whether it ran out of steam before it ever really got going.

US coal bullish in the face of despair

Throughout the crash, despite the (some might say in hindsight, others that signs were clearly emerging by 2010) evidently long-term implications of increasingly restrictive regulations and the boom in natural gas production, the majority of US coal producers remained positive about their prospects, expecting coal prices to rise and problems to be temporary. For example, in the below table we list quotes

1 Units on the vertical axis represent percentage deviations from the long-term trend.

from James River Coal's quarterly operating results announcements that illustrate the company's continuing optimism throughout the unrelentingly difficult period. James River Coal filed for Chapter 11 reorganisation in April 2014.

Table 1: James River Coal's quarterly operating results announcements

Operating results announcement	Quote
2011 Q1	"We substantially completed a very large acquisition, we completed three large capital markets transactions, and we continued to implement new and enhanced mining regulations. We expect all of them to have a significant positive impact later this year and into 2012. We are heading into stronger coal markets with a larger base of operations, a broader product portfolio, and a much stronger financial profile."
2011 Q2	"We are beginning to see much more sales and contracting activity in both Central Appalachia and the Midwest."
2011 Q3	"We were generally pleased with our progress this quarter. Obviously, we were disappointed to miss a couple of very valuable metallurgical coal shipments, but this was only an issue of timing not market conditions. "
2011 Q4	"While we are cautious and realistic about the current soft market conditions, we are also optimistic that James River will be well positioned for improving markets in the future."
2012 Q2	"Both the met and the thermal coal markets are in a state of transition…but continue to be very enthusiastic about the demand for these coals going forward."
2012 Q3	"The slowdown in growth, combined with warm weather last winter, has contributed to an unusually weak market for thermal and metallurgical coal. Hopefully, this condition will be corrected shortly."
2012 Q4	"The thermal market, although still weak, is starting to improve due primarily to reduced production by the coal industry and slightly better weather conditions. The met market is seeing clear signs of increased demand from Asia."
2013 Q2	"The coal markets have continued to be soft. The thermal markets are still weak, but we can see several factors that may lead to improvement later this year and into 2014.
2013 Q3	"Prices are still very low, but they are finally moving in a better direction."

Source: James River Coal

In this report we discuss the US coal market with a focus on producers and thermal coal[2], which has been most affected by shifts in specific local factors from 2011 to the present and the significant drop-off in demand for their product. There are a number of causal factors, some major and some more minor or transient. We have not attempted to apportion or quantify the impact of individual items given their concurrent or overlapping nature; indeed it seems that, rather than there being one single cataclysmic event, it has been the cumulative effect of steadily increasing natural gas production and the drip-drip-drip of additional regulatory hurdles that have most undermined confidence in the sector for investors.

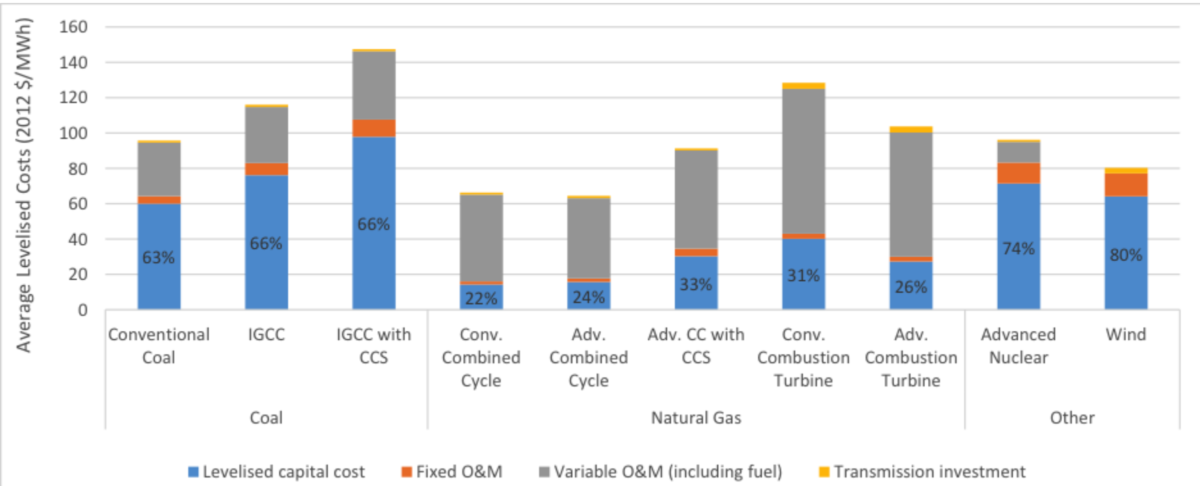
2 Thermal coal represents the vast majority of the US coal market – in 2013, 93% of domestic coal consumption was in the commercial electric power sector with 2% in coking plants. US miners produce metallurgical coal, used primarily in steel manufacture, for export markets. However, global metallurgical coal markets have also become depressed due to weak global demand for steel, particularly in Asian economies, and booming production.

The Pre-Crash Background: Cyclical Rising Construction Costs and Legal Challenges

As is usually the case, global economic growth was associated with rising costs for infrastructure projects in the 2000s. The US power sector was no exception by this trend, with international competition for design and construction resources along with rising commodity prices leading to inflation in capital costs.

Figure 3 shows the US EIA's estimates for average levelised costs for different types of power plant, and the % of their total cost accounted for by capital costs.

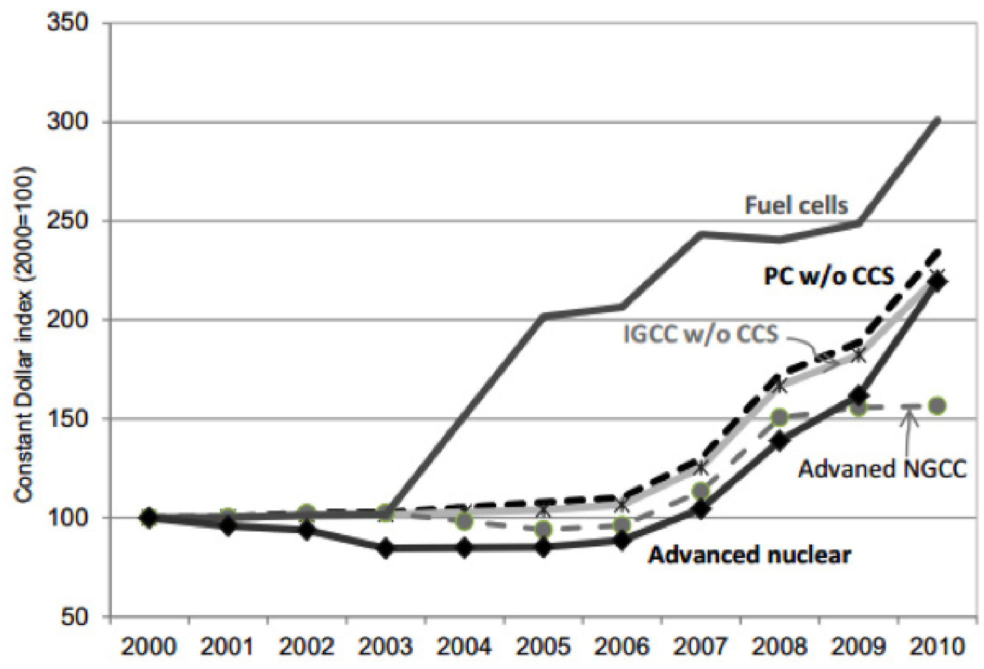
Figure 3: US average levelised costs (2012 $/MWh) for plants entering service in 2019 (excluding subsidies)[iv]



Source: EIA

In an environment where capital costs are rising, we might expect the projects with the highest capital intensity to be most affected, and so it proved. Figure 4, below, shows cost trends between 2001 and 2010. The cost of coal and nuclear projects can be seen to have risen steadily on a $/kW basis, whereas the lower capital intensity of natural gas plants meant that increases in capital cost were offset by lower fuel costs, with the effect that gas-fired power plant costs remained approximately flat from 2008 onwards.

Figure 4: EIA's base overnight capital costs estimates (2001-2010)[v]



Data sources: Assumptions to Annual Energy Outlook 2001 through 2011

Source: Fang Rong and David G Victor

Another obstacle for proposed coal plants during this period, particularly in the latter years, was the increasing level of public concern and hence frequent, time-consuming and costly legal actions being taken against them by opposition groups. Often, such challenges would be based on the grounds of violations of the Clean Air Act but, as additional EPA regulations were introduced, actions based on lack of compliance in various forms became increasingly common. Such challenges from organisations like the NRDC and Sierra Club with their 'Beyond Coal' campaign served to increase the risk profile for new coal power plants.

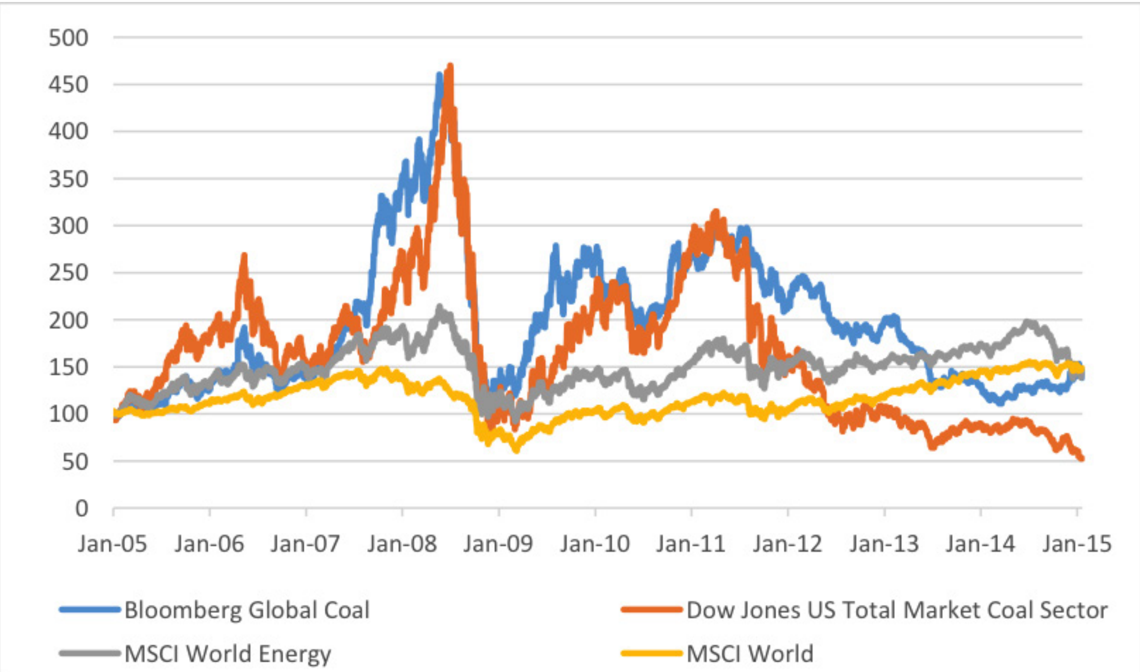
The result of these increases to capital costs and environmental challenges was that, whilst in 2005 the coal industry and federal government launched an initiative to build 150 new coal plants to replace the nation's aging fleet of power plants (in addition to other plants that were proposed outside this plan), many were not built. IEEFA point out that, in total, 182 proposed new plants, valued at $273bn, have been cancelled at various stages of development[vi]. Accordingly, a large amount of potential future demand for coal never materialised, a negative signal was sent to the markets and the structural drivers that will be covered in this report drove demand to lower levels.

The Time Line: Trend Analysis

Since 2000 and perhaps until very recently, thermal coal miners have been adding capacity to satisfy a world where global demand for thermal coal was growing at a CAGR of 4.5% and expected to continue at a robust rate. This left many miners exposed between 2011 and 2013 when growth in thermal coal slowed to 2.7% CAGR globally[vii]. In the US this impact was far more severe as thermal coal demand reversed to decline at a -4.1% CAGR from 2011-2013.

The Bloomberg Global Coal Index measures the performance of the coal sector by tracking the share prices of large pure-play coal producers. For a US-specific benchmark, the Dow Jones US Total Market Coal Index is composed of US-listed coal companies (whilst diversified companies also produce coal, they will be affected by additional and different market factors related to their other products). Figure 5, below, compares the performance (since the beginning of 2005) of these indices against the MSCI World Index (a proxy for overall market returns) and the MSCI World Energy Index (which is heavily weighted towards oil and gas companies given their larger market capitalisations relative to coal companies).

Figure 5: Performance of coal and wider sector benchmarks, January 2005 – January 2015



Source: Bloomberg LP, CTI/ETA analysis 2014

Table 2, below, shows that while, in the last 5 years, the overall market (as measured by the MSCI World index) increased in value by 44% (and the overall energy sector by 1%), the global coal sector declined in value by 43%. The US coal sector can be seen to have performed particularly badly, declining in value by 76%. This is despite an unprecedented US fiscal stimulus that has otherwise been a tide that lifts all boats; broader US benchmarks have risen to all-time highs even against the backdrop of an anaemic global economy. Over the 5 year period, the Dow Jones US Total Market Coal Sector Index has underperformed the Dow Jones Industrial Average by an absolute 144% and Standard and Poor's 500 by 157%.

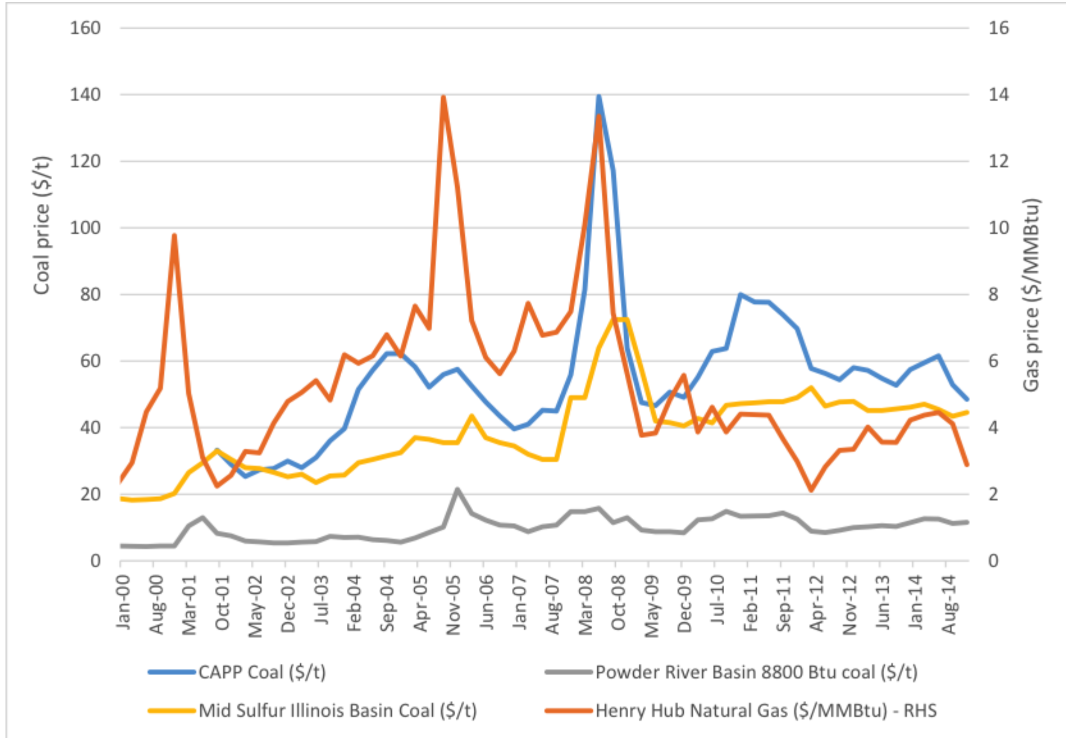
Table 2: Comparing prices changes of coal, energy sector and wider market Indices

	Dow Jones US Total Market Coal Sector	Bloomberg Global Coal	MSCI World Energy	MSCI World	S&P 500	Dow Jones Industrial Average
1 year	-39%	17%	-17%	2%	10%	7%
3 year	-65%	-41%	-8%	36%	54%	38%
5 year	-76%	-43%	1%	44%	81%	69%
10 year	-48%	42%	42%	49%	73%	69%
20 year	1%	-	296%	177%	335%	353%

Source: Bloomberg, CTI/ETA analysis 2014

The US coal sector's woes are strongly related to a weakening coal price. In the US, coal is mined from a number of different basins and accordingly a number of different price benchmarks are used. The spot price of coal from Central Appalachia (CAPP) – a benchmark price for coal supplied to thermal power plants in the eastern US – is c.$45/ton at the time of writing (as at 20 January 2015), down 68% from its July 2008 high of c.$143/t.

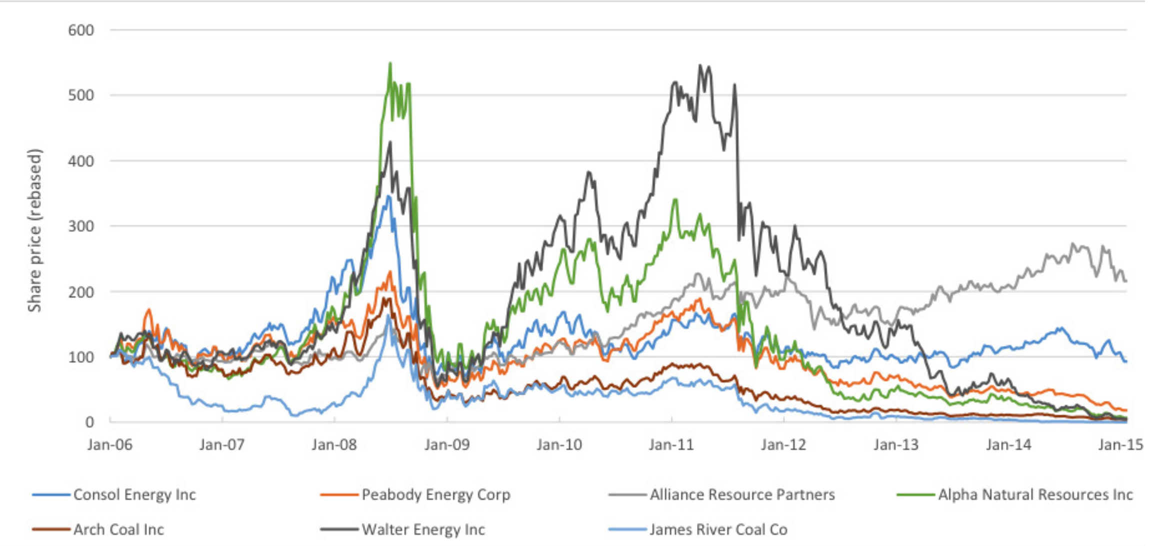
Figure 6: Prices for Central Appalachian (CAPP), Powder River Basin and Illinois Basin coal, 2000-2014



Source: Bloomberg, CTI/ETA analysis 2014

The more westerly Illinois and Powder River basin prices have also been heavily affected although to a lesser extent, down 35% and 51% from their 2008 highs respectively. The equity performance of US coal companies reflects this turmoil in the price of their primary products. Figure 7, below, shows the rebased share price performance of the largest US coal companies[3] from pre-crash to the present day. Of that sample, those producers that have remained solvent have suffered significant declines in market value, aside from CONSOL Energy, which has shifted their portfolio more towards natural gas (starting as early as 2000 with the purchase of MCN Energy's coal bed methane projects, but most significantly with the 2010 purchase of Dominion Resources' Appalachian gas assets for $3.5bn) and Alliance Resource Partners which has low cost production in the Illinois Basin and relatively high margins.

Figure 7: Share price performance of US coal companies, January 2006 – January 2015



Source: Bloomberg, CTI/ETA analysis 2014

Recent years have seen 26 US coal companies go into bankruptcy (chiefly in Kentucky and West Virginia), including once major producers such as James River Coal and Patriot Coal Corporation (each of which, at the time of their bankruptcy filings, claimed over $1 billion in assets)[viii].

A range of performance can be seen for the individual companies in the chart above, although they largely follow the same overall trends. While there are myriad smaller factors that have impacts of varying scale, we can see a few major trends that fit with the disparities in equity performance. Precipitated by an appreciation of the worsening fundamentals for thermal coal, a number of US companies expanded other revenue streams, primarily metallurgical coal. Unfortunately, the strategy was into the wrong commodity at the wrong time. Those that leveraged themselves heavily to buy into these assets, like Alpha and Arch, can be seen to have done particularly badly. Conversely, CONSOL's earlier diversification towards natural gas acreage in the Marcellus and Utica shales has protected shareholders from the steep falls that some of their peers have suffered. Management teams of the relatively more successful companies in recent years should be acknowledged for their reluctance to increase investment in coal assets compared with those that did.

3 Defined in this case as those with a market capitalisation above $500m at the end of 2005, being CONSOL Energy, Peabody Energy, Alliance Resource Partners, Alpha Natural Resources, Arch Coal, Walter Energy and James River Coal, the reference basket of companies that will be used in chart throughout this note

Table 3: US coal companies, share price performance and selected financials

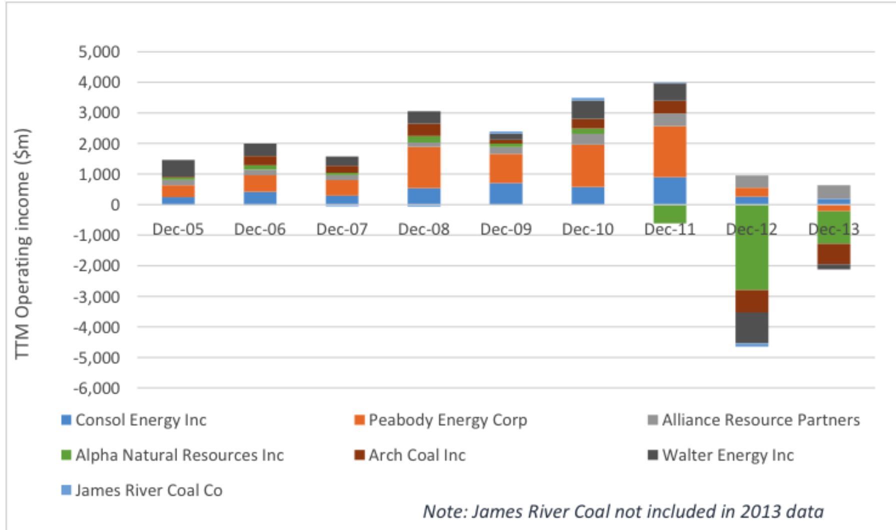
Company	1 year share price performance (%)	4 year share price performance (%)	Net debt (30 June 2014) ($m)	TTM EBITDA (30 June 2014) ($m)	Net debt/EBITDA (30 June 2014)	Major acquisitions at market peak
Westmoreland Coal Co	71%	144%	792	76	10.4x	-
Hallador Energy Co	39%	-4%	-7	34	-0.2x	-
Alliance Resource Partners	5%	16%	780	764	1.0x	-
Oxford Resource Partners Lp	-4%	-95%	169	37	4.6x	-
Consol Energy Inc	-17%	-40%	3,124	823	3.8x	-
Cloud Peak Energy Inc	-49%	-61%	406	169	2.4x	Youngs Creek Mining Co - $241m (Jun 2012)
Peabody Energy Corp	-60%	-88%	5,496	915	6.0x	MacArthur Coal - $5.2bn (Nov 2011)
Arch Coal Inc	-64%	-96%	4,155	-279	-14.9x	International Coal Group Inc - $3.4bn (Jun 2011)
Alpha Natural Resources Inc	-79%	-98%	2,462	38	64.6x	Massey Energy Co - $8.4bn (Jun 2011)
Rhino Resource Partners Lp	-82%	-91%	33	41	0.8x	Elk Horn Coal Company - $128m (Jun 2011)
Walter Energy Inc	-91%	-99%	2,603	85	30.6x	Western Coal Corp - $3.4bn (Apr 2011)
James River Coal Co	-97%	-100%	N/A	N/A	N/A	International Resource Partners LP - $519m (Apr 2011)
Foresight Energy Lp	N/A	N/A	1,292	N/A	N/A	-

Source: Bloomberg, CTI analysis 2014

Geographic exposure is also a factor; the historically important Central Appalachian region has struggled with geological depletion of reserves and high production costs to the extent that it is difficult for it to viably supply to the US power market or compete in a tough international metallurgical coal market, resulting in loss of value for those producers heavily exposed there. Those in the lower cost Illinois and Powder River Basin (for example Cloud Peak and Westmoreland), however, have generally fared relatively better.

Despite the steep decline in met and thermal coal prices from 2011 onwards, producers' earnings were buffered to an extent against even more substantial declines in revenue as a result of previously signed long-term contracts delaying the impact on revenues of falling prices. More significant than recent declines in revenue, then, have been declines in operating profits. Aggregate operating profits for the basket of US coal companies are shown in the chart below; note the decline in income after 2008 being followed by a recovery and then a steep fall since 2011.

Figure 8: Operating income, 2005-2013

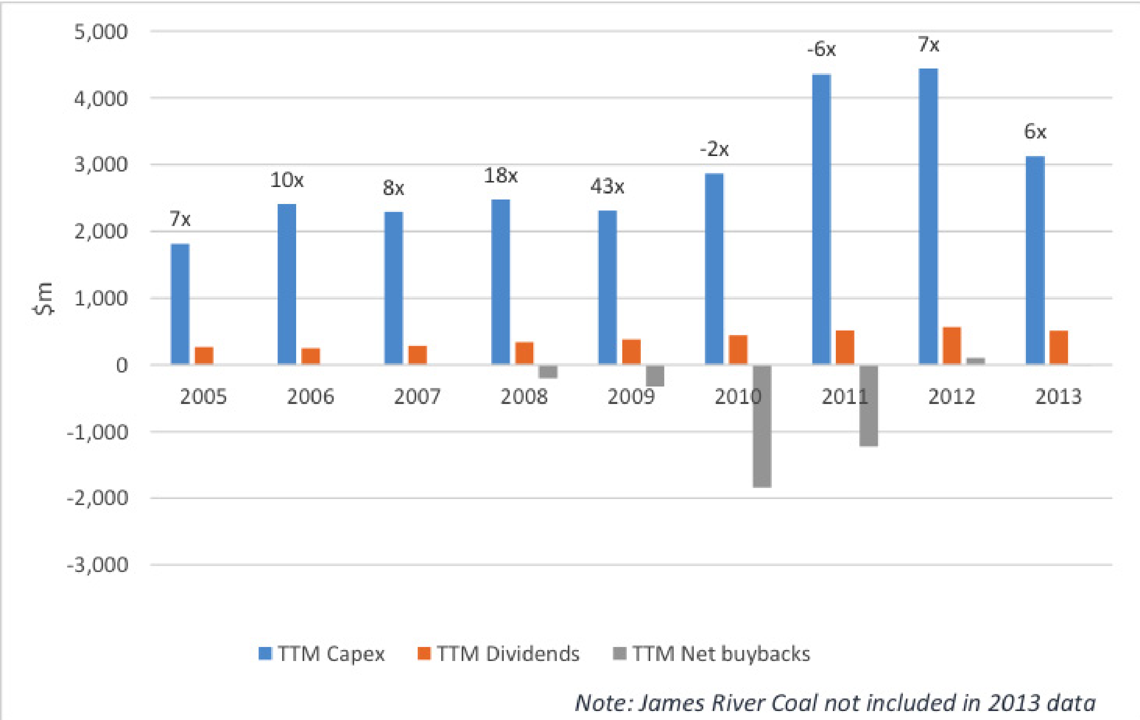


Source: Bloomberg LP, CTI/ETA analysis 2014

Comparing capital expenditures with cash returned to shareholders either as dividends or share buybacks also reveals interesting trends. As might be expected, capex and income trended upwards in the period up to the GFC in late 2008, as did dividends paid. As some companies started to run into trouble after this period we begin to see share issues, with 2010 and 2011 in particular marked by large share issues by James River and especially Arch Coal.

A 40% increase in sector income was outstripped by an 88% rise in capex over the period 2009-2011, although capex then remained at high levels in 2012 as earnings collapsed. Capex budgets were reduced in 2013 but remained at historically high levels on a sector basis, although 2013 spend is nearly 50% accounted for by CONSOL Energy which dramatically increased capex on gas production relative to the previous year as it continued to shift away from coal. Sector dividends also show steady growth throughout the period, over doubling from 2005 to 2012, although driven primarily by Alliance and CONSOL; if these two companies are stripped out, dividends actually fell over the 2005-2008 period, before peaking at an increase of 37% over 2005 levels in 2011.

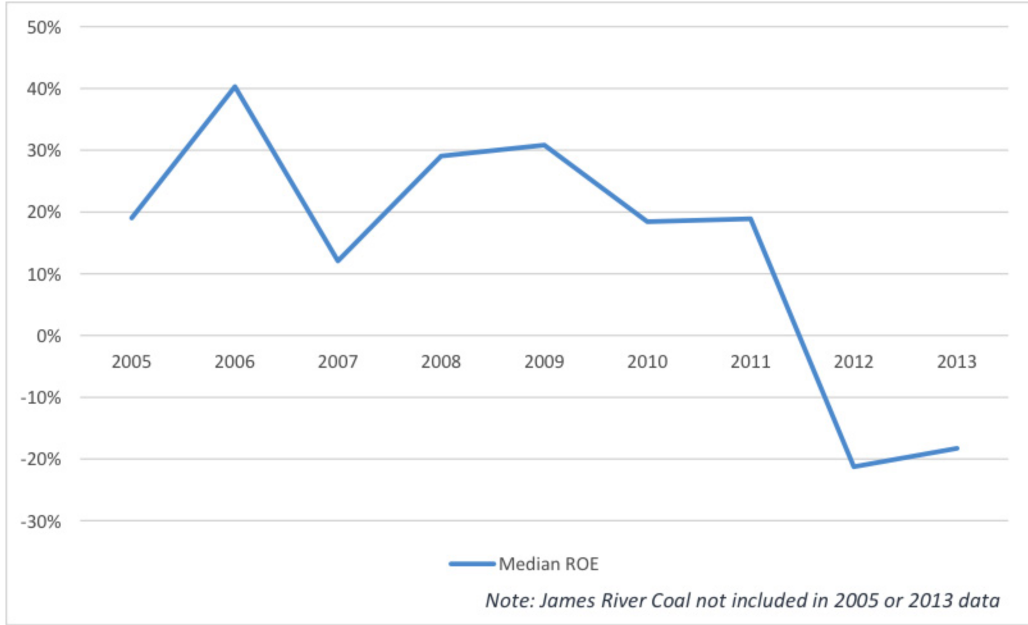
Figure 9: Capital expenditures compared to aggregate dividends and net share repurchases, 2005-2013



Source: Bloomberg LP, CTI/ETA analysis 2014

This fall in income and relatively resilient capex levels accordingly translated to falling returns, as shown in Figure 10, below, measuring median ROE for the basket of US coal companies.

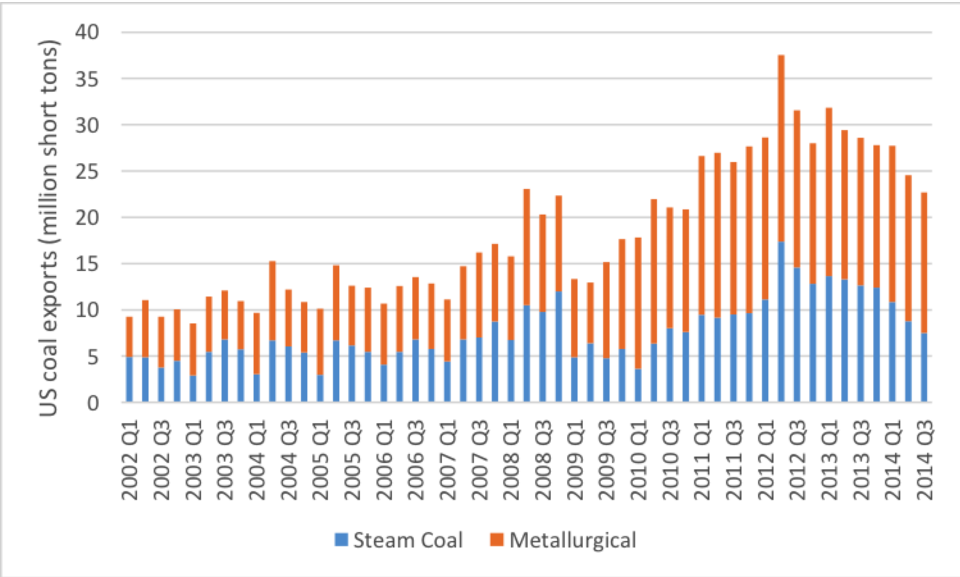
Figure 10: Median ROE, 2005-2013



Source: Bloomberg LP, CTI/ETA analysis 2014

The state of coal demand in the US meant that companies were left hoping for increased exports of coal to other markets. However, these hopes have been disappointed as: (1) the international market has been facing a similar state of oversupply simultaneously; (2) meaningful levels of export could only be achieved by companies with significant presence in certain, appropriate US coal basins, e.g. Powder River Basin; (3) low-cost production from Indonesia, Australia and South Africa has made it difficult for US coal producers to compete on price; and (4) US dollar strength has exacerbated their poor competitive position in the short term. Consequently, US exports of coal (thermal and metallurgical) have fallen steadily since Q2 2012, and in any case only ever accounted for a small minority of US production (currently c.10% at present, although up from just 4% in the period 2001-2006)[ix].

Figure 11: US coal exports, 2002-2014



Source: EIA

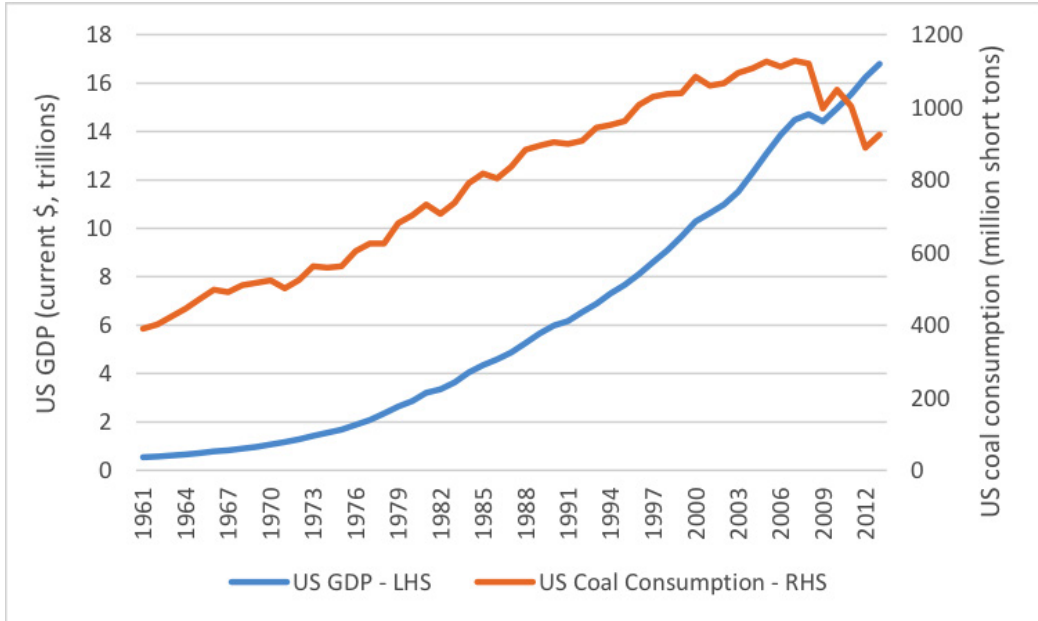
A number of signals suggest there is little hope of a turnaround for US exporters in the seaborne market, the hopes for which rely almost exclusively on demand growth from China and India, which since 2000 have together accounted for approximately 80% of global increases in coal demand. China recently announced its intention to peak its greenhouse gas emissions by 2030, which will require its coal demand to peak around 2020 (and many analysts think that this may indeed happen rather sooner, if it hasn't already). Similarly, India have announced plans for huge renewable energy capacity additions over the next five years[x] while auctions for coal blocks have sold better than expected[xi], meaning the domestic market is likely to capture more of the seaborne market than previously believed.

Furthermore, global oversupply seems set to persist with limited efforts by some producers to cut production being offset by productivity gains elsewhere (for example at BHP's Australian operations) and the ramping up of large projects. Oversupply in international markets is reflected (along with other factors) in the share prices of pure play coal producers in Australia which, in contrast with most US producers, export most of their production – a chart of selected Australian coal producers' share prices is shown in the appendix, along with that of Coal India as an example of a coal producer where isolated domestic market factors have provided it with somewhat better fortunes.

The Key Drivers: Risk Factors

As shown above, the US coal industry has been hit particularly hard compared to global peers. Looking specifically at the US from a macro point of view, a perspective on this becomes apparent. Whilst historically economic growth in the US has consistently driven increased coal use, there is now clear evidence of a decoupling of the two. In fact, domestic coal use peaked in 2007 and has been on a declining trend since despite GDP continuing to rise, whilst gas production has gone in the opposite direction.

Figure 12: US GDP compared to US coal consumption, 1961-2013



Source: World Bank, EIA

This suggests that, rather than the crash being a pure down side of the classic commodities cycle, there has been some sort of fundamental shift in the US market. This decoupling appears to be primarily due to two key local forces for lower coal demand:

1. Technology - Lower prices for natural gas precipitated by the shale gas "revolution" in the US, increasing its attractiveness as an energy source relative to coal; and

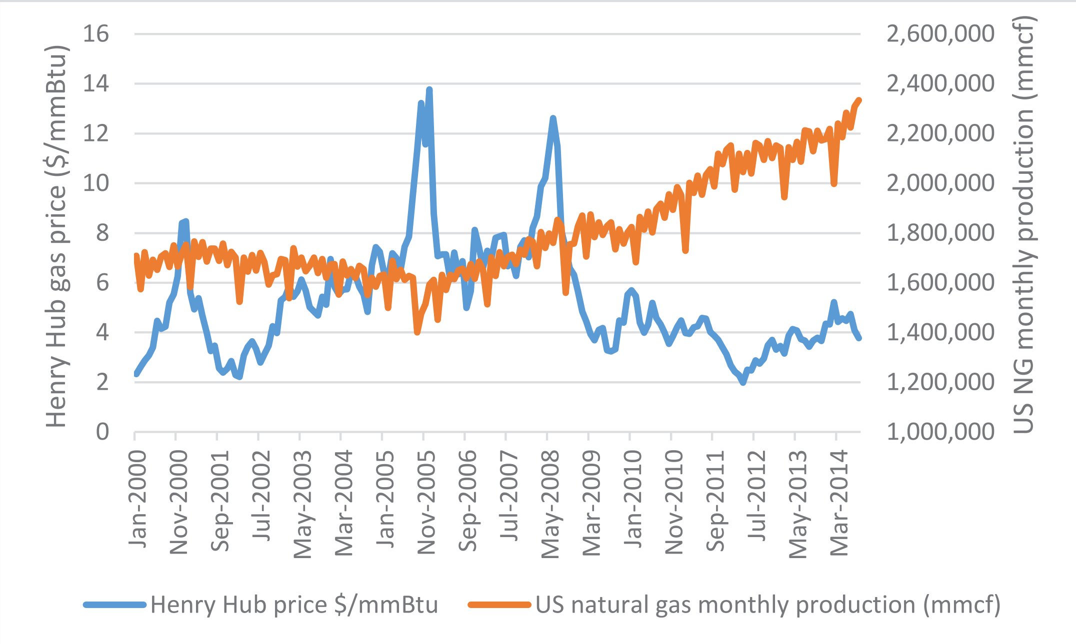
2. Policy - Increased EPA regulations restricting the use of coal in power plants.

These factors, in effect risk factors from an ongoing basis, are discussed below, with a mention of other, more minor, contributory factors.

Cheaper gas substituted for coal in power generation

As has been well-publicised and thoroughly discussed elsewhere, the advent of horizontal drilling and slickwater hydraulic fracking techniques have allowed companies in the US to commercially access oil and gas resources previously locked in the US's extensive shale deposits. The resulting "boom" has led to high levels of drilling activity across a number of plays, with a sharp increase in production of natural gas compared to a previous pattern of plateau or decrease. The ensuing supply glut has led to the price of natural gas in the US (measured by reference to the benchmark Henry Hub price) falling from its July 2008 high of nearly $14/MMBtu to reach a low of less than $2/MMBtu in April 2012. After rising to above $4/MMBtu in the second half of 2014, it has fallen along with other energy prices to a current price of c.$2.8/MMBtu.

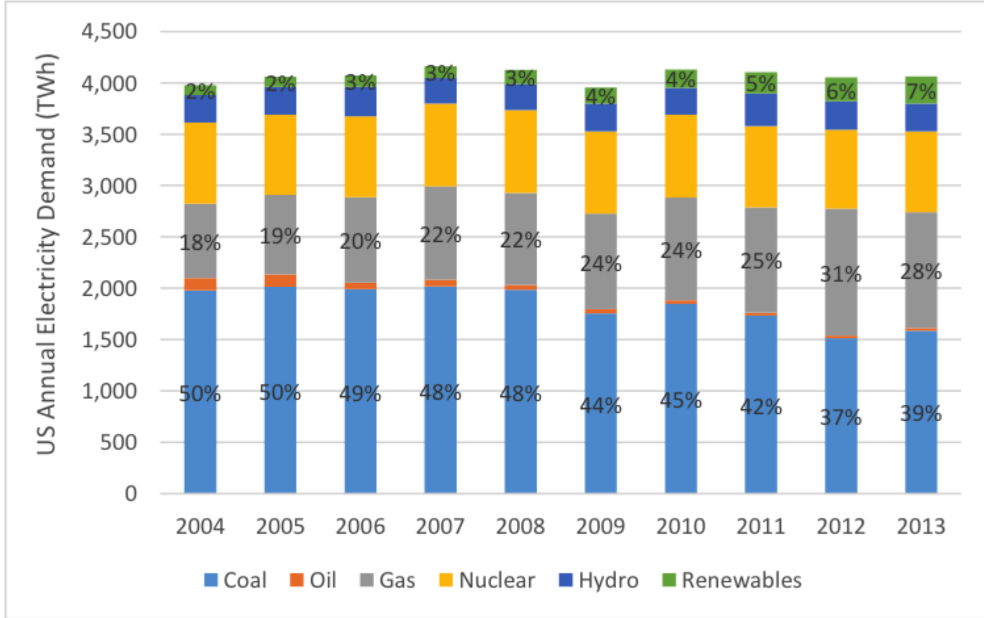
Figure 13: US natural gas production and pricing



Source: Bloomberg LP, EIA, CTI/ETA analysis 2014

This lower pricing has resulted in greater competitiveness of natural gas-fired power plants in the US relative to those fired by coal (particularly in the East of the country), and hence reduced demand for coal in power generation. Figure 14, below, shows the use of coal in electricity generation falling in absolute terms and as a percentage of overall demand, whereas gas shows the opposite trend.

Figure 14: US annual electricity demand



Source: EIA data

According to the EIA the ratio of electricity generated by coal to that generated by natural gas was 2.25 in 2007; this dropped to 1.70 in 2011 and to 1.16 in the first 7 months of 2012[xii]. Over the decade to 2013, the proportion of renewables in the US energy mix more than trebled from 2% to 7%. As coal-fired plants switched to gas, the competition has hastened the retirement of ageing coal plants. EIA figures show that in 2011, 2,456 MW of total coal-fired net summer capacity retired at an average age of 63; in 2012, this quadrupled to 10,214 MW at an average age of 51[xiii]. More generally, total US 2008-2013 retail electricity sales (which consumes 93% of total US coal consumption) declined 0.2% CAGR further serving to suppress demand for thermal coal[xiv].

EPA pollution regulations increasingly constrained demand

Another driver of lower coal demand in the US has been regulatory interventions from the US EPA aimed to mitigate a number of the detrimental environmental and human health consequences of coal burning. In theory, regulatory amendments can drive more structural changes within a sector than economic changes due to their longer-term nature. EPA regulations served to do just that across the period in question with regular policy additions serving to eventually build a portfolio of seven regulations attacking pollution, which consequently constrained US coal demand. This served to complement economic shifts occurring simultaneously within the US energy sector, as highlighted above.
Those enacted and proposed regulations that had a particularly significant impact on the coal industry crash, in chronological order, included:

MERCURY AND AIR TOXICS STANDARDS (MATS):

MATS sets numerical emission limits for mercury, particulate matter (PM) and hydrochloric acid (HCl) requiring all coal fired power plants to install Maximum Achievable Control Technology (MACT). It is estimated the MATS will save thousands of lives and prevent more than 100,000 heart and asthma attacks each year[xv]. Coal burning is a huge contributor of the hazardous pollutants in question but about 40% of US coal-fired units don't use the necessary advanced controls (approx. 1,100) covered by the rule[xvi].

COOLING WATER INTAKE STRUCTURES RULE (CWIS):

The CWIS Rule sets a mortality standard to protect aquatic life from impingement and entrainment. Each power plant facility withdraws at least 2 million gallons per day of cooling water and this regulation could impact 1201 coal units, accounting for a vast 252GW of US coal-fired capacity, who use once-through cooling systems[xvii].

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS):

The 1990 Clean Air Act also required the EPA to set NAAQS for pollutants considered harmful to public health and the environment. Standards for a number of these pollutants already existed before this date, however, since the Clean Air Act increasingly stringent limits have been set with great regularity for:

- Lead strengthened 12 November 2008;
- Ozone strengthened 6 January 2010;
- Sulphur dioxide strengthened 2 June 2010;
- Particulate Matter (PM) strengthened 14 December 2012;
- Nitrogen Dioxide strengthened 7 March 2013;

COAL COMBUSTION RESIDUALS RULE (CCR):

The EPA's CCR Rule sets higher standards for the management of ash and other waste by-products of coal burning. It is believed 128.5GW of current coal-fired power generation capacity will incur greater ash disposal costs[xviii].

CROSS-STATE AIR POLLUTION RULE (CSAPR):

The CSAPR addresses the long-range transport of pollutants contributing to downward non-attainment of fine particulate and ozone. This is estimated to result in $120-280 billion in annual benefits[xix]. It will affect 91% of coal-fired capacity in the 28 states in which it applies.

CARBON NEW SOURCE PERFORMANCE STANDARDS (NSPS):

The Carbon NSPS requires new coal units to meet a standard of 1,000lbs CO2/MWh, which was increased to 1,100lbs CO2/MWh on 20 September 2013. This effectively requires the use of "advanced technologies like efficient natural gas units and efficient coal units implementing partial carbon capture and storage (CCS)"[xx].

CLEAN POWER PLAN:

On 2 June 2014, President Obama announced the proposal to enforce a 30% reduction in carbon dioxide (CO2) emissions from existing power plants on 2005 levels by 2030. This regulation will have significant health and climate benefits, equal to $55-93 billion in 2030[xxi]. This is equivalent to 25% below the EPA's forecast of what would happen without the standards.

These regulations are set to make a significant contribution to reducing the levels of pollutants that are hazardous to human and environmental health in the US. Coal burning is a significant contributor of such pollutants and so utilities have been forced to internalise the external costs of coal consumption which served to constrain demand.

Interestingly, only two of these seven influential regulations were openly designed to tackle climate change, while the other five sought to mitigate other forms of hazardous pollution. This goes to show that coal combustion as a form of power supply is exposed to a vast range of downside demand drivers that are driving an energy transition, not just national level climate regulation.

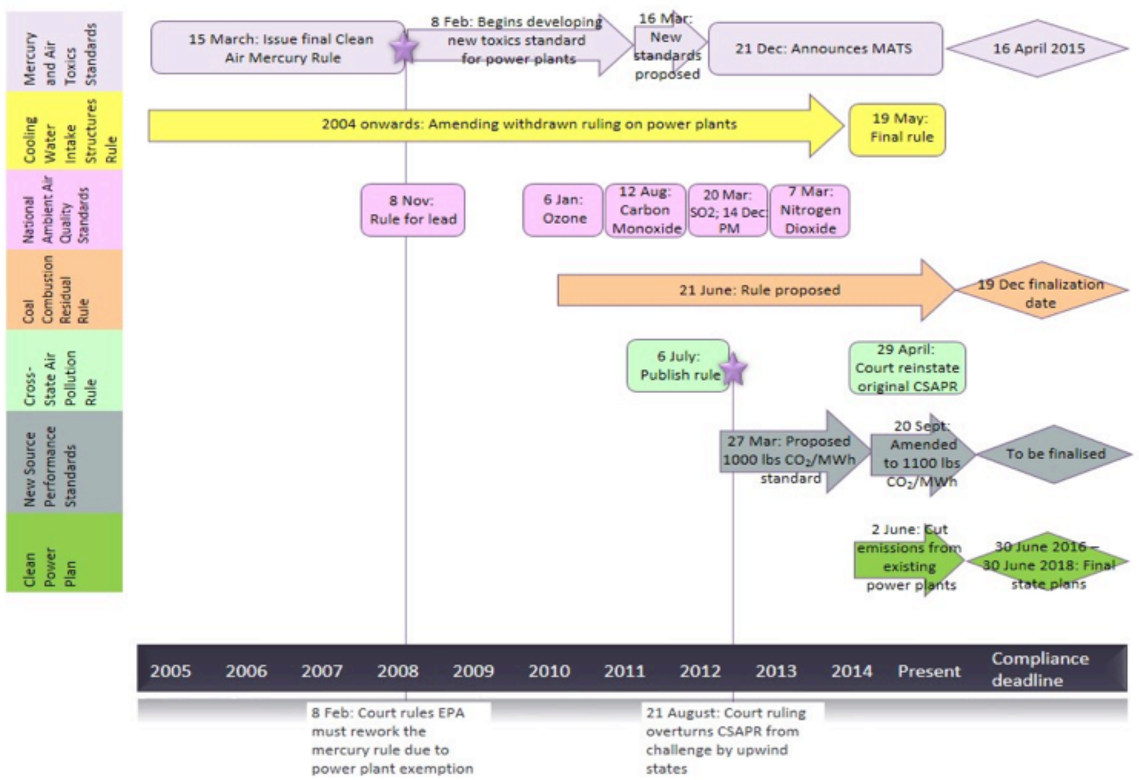
How might risk perceptions of US coal have differed across regulatory timelines?

Regulations are slow to implement. It takes a great deal of time for regulations to go through the stages of proposal, consultation, issuance, compliance and implementation, while all the time being susceptible to amendments which can alter this process. Perceptions of risks posed by each US EPA regulation vary with interpretations of their certainty and severity along this timeline - initial regulatory proposals create a baseline level of perceived risk that increases with each legal challenge they overcome and the closer they come to being finalised.

For example, at the time of its proposal, South Company – a major US utility – publicly articulated their perception that the Carbon NSPS for new power plants was a strict standard with high associated risk by stating it 'essentially eliminates coal as a future generation option'[xxii]. Risk is also deemed to be greater with those regulations with the most stringent and least flexible compliance periods – in August, 2011 the CEO of American Electric Power called the timetable for complying with the EPA regulations proposed at the time, as 'close to lunacy as you can get'[xxiii].

The portfolio of EPA regulations that has constrained the US coal sector are all at different stages of implementation (Figure 15) making it difficult to distinguish their individual impact. Instead this suggests that no single regulation singlehandedly caused the crash, rather, the steady addition of regulatory hurdles may have served to incrementally increase the risk profile of US coal.

Figure 15: US EPA regulation timeline (2005-present)



A few significant high-level trends emerge from Figure 15:

- There are a number of environmental regulations forcing utilities to internalise additional costs resulting in constrained demand for coal;
- The frequency and severity of these rules has increased from approximately 2010 onwards, suggesting these regulations had an impact on the resulting downturn of this period;
- The number of regulations with issuance dates and compliance periods still outstanding suggests the pain is far from over.

EPA regulations added to the headwinds

These seven enacted and proposed regulations, in particular, required higher standards of operations which served to incur additional costs for utilities burning coal. This meant US utilities had to decide whether to retire coal plants as they became too uneconomic to operate, to retrofit the plant with the necessary technologies and absorb the additional costs or switch to alternative power sources.

The tables below give an indication of the significant cost increases incurred as a result of EPA regulations mitigating hazardous air pollutants, e.g. MATS, NAAQS. Table 4 shows that these emissions controls add an estimated 51% to the operations and maintenance costs of a new pulverized coal plant, while also adding a noteworthy barrier (+16%) to the initial capital costs of construction.

Table 4: Emission controls costs as a percentage of total costs for a new pulverized coal plant[xxiv]

	Percentage of total cost	
	Plant capital cost	Plant O&M cost
SO2 controls	12%	29%
NOx controls 2%	2%	12%
Mercury controls	1%	9%
Total for emission controls	**16%**	**51%**

Source: Energy Ventures Analysis, Inc

By the end of 2013, the cumulative cost to those utilities opting to continue operating coal-fired facilities was $118bn since 2010 – refer Table 5 below.

Table 5: Annual capital cost for emission controls ($Millions)[xxv]

Year	SO2	Particulate	NOx	Annu. Total	Cum. Total
2010	$44,540	$19,779	$33,565	$97,884	$97,884
2011	$4,291	$587	$1,077	$5,956	$103,840
2012	$4,703	$441	$775	$5,919	$109,759
2013	$7,616	$18	$655	$8,289	$118,047

Source: Energy Ventures Analysis, Inc

Many US utilities did not opt to pay these additional compliance costs but chose to switch more towards natural gas power supply instead, a fuel which, although not explicitly specified in the EPA regulations, was effectively set as the key benchmark for power due to lower levels of pollutants. Another option available to US utilities was to retrofit plants to a coal-to-gas conversion facility, the cost of which is highly dependent on the age and efficiency of the power plant in question.

On the whole, the US coal fleet was old and so retirement was the other option chosen by many utilities who would construct gas power plants in their place. However, isolating those retirements driven predominantly by the EPA's regulations from the total 14.1GW closed from 2010-2012[xxvi] is difficult because of uncertainties quantifying causality. It is highly probable that each of the seven regulations specified above will have served to increase the risk profile (and therefore decrease the viability of investment) of coal-fired power generation to some degree.

Estimating individual regulation impacts

A number of estimates have attempted to digest this variation of risk perception and quantify the impact of specific EPA regulations. These, however, have shown little agreement. The US EPA provides regulatory impact analyses with each regulation proposal, which in some cases include estimates of their likely impact on coal capacity retirements. At the time of proposal, the US EPA estimated: 1) MATS will cause 4.7GW of coal-fired capacity to become uneconomic to maintain by 2015[xxvii]; 2) the US Clean Power Plan will render 30-49GW uneconomic by 2020[xxviii]; and iii) the CSAPR will retire 4.8GW of coal-fired capacity by 2020[xxix]. Broker and industry efforts, however, seem to suggest these estimates are on the low side.

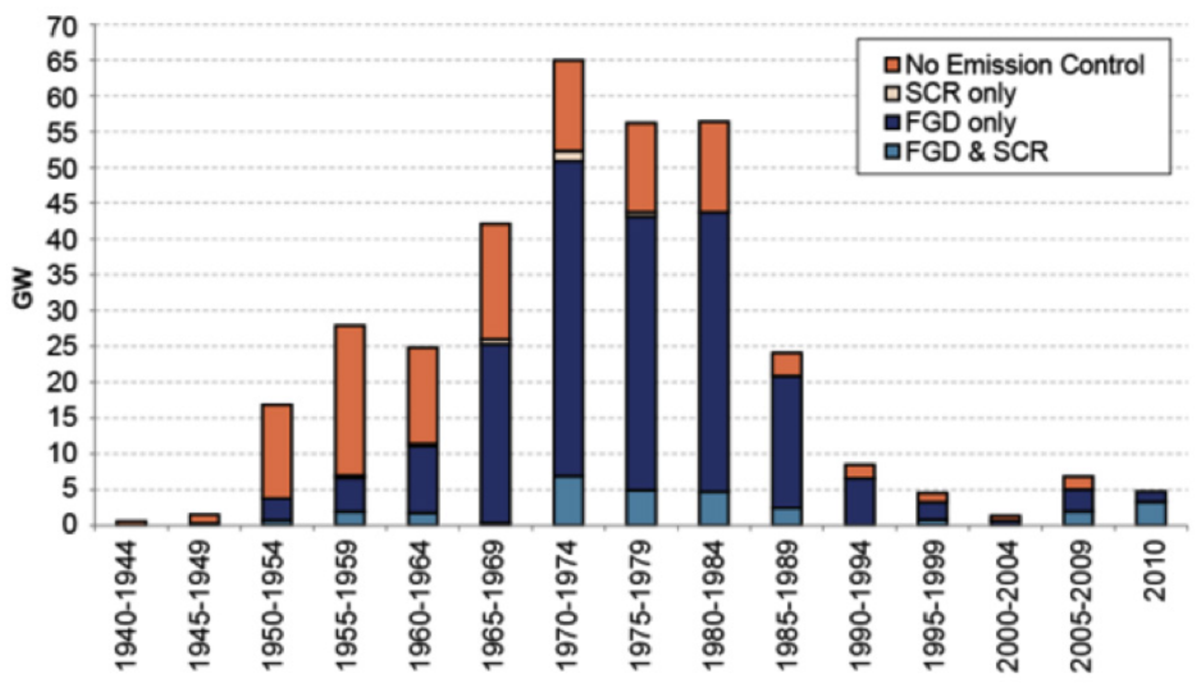
Table 6: Estimates of EPA regulations leading to retirements

	Institution	By when	Retirements
All	Deutsche Bank	2020	60GW
	Deutsche Bank[xxx]	2030	92GW
	Edison Electric Institute[xxxi]	2020	56-72GW
	EIA AEO[xxxii]	2020	60GW
MATS & CSAPR	American Coalition for Clean Coal Electricity[xxxiii]	2020	48GW
	Institute for Energy Research	2020	25GW
Clean Power Plan	American Coalition for Clean Coal Electricity[xxxiv]	2020	45GW
	US EPA	2020	30-49GW
	NERA[xxxv]	2020	83GW
MATS	NERA[xxxvi]	2015	23GW
	US EPA	2015	4.7GW
	Bernstein Research	2020	50GW
CSAPR	US EPA	2020	4.8GW
CWIS Rule	NERC[xxxvii]	2020	2.5GW

Table 6 shows that estimates for individual regulations' impact on coal capacity vary widely, highlighting the difficulty in isolating such influence.

In theory the impact of the MATS regulation is one of the easiest to estimate, given the required flue-gas desulphurisation technology can take up to three years to install, providing a clear timetable for when retrofitting will need to begin to meet the compliance deadline of 16 April 2015. Further, it is relatively well understood how much of the ageing US coal fleet needs retrofitting – between 1940 and 1969, 110GW of coal capacity began operating, two thirds of which does not have the required scrubbing technology as of 2011[xxxviii] – refer to Figure 16 on the following page.

Figure 16: Coal plants by age and emission controls



Source: Congressional research service

Nevertheless, great uncertainty remains – Bernstein Research analysis finds that MATS will retire 45.9GW up to and including 2015, i.e. the year of compliance[xxxix]. This is at greats odds with the EPA's estimate of 4.7GW up to 2015[xl].

Therefore, even in those instances where specific decision timings and compliance deadlines are in place there remains a wide range between estimates. However, this is to be expected in light of 1) the inherent uncertainty when making any future estimate; 2) when risk perceptions up to the compliance date are intangible and subjective; and 3) where a number of options are available to utilities when deciding whether to comply or retire, which may not reach the logical outcome.

GALLATIN COAL PLANT CASE STUDY: UNPREDICTABLE DECISION-MAKING

The 976MW Gallatin coal-fired power plant was built in the 1950s in Nashville. Due to the MATS and anticipated forthcoming regulations such as the CCR Rule, it was deemed necessary to conduct an environmental impact assessment. The decision was taken to invest $1.1bn in upgrades rather than convert to gas – deemed to be 'subject to wide price swings and supply shocks' – or conversion to biomass, which could have added only $500 per kilowatt of energy rather than $1,000/kW for upgrading as coal, or retirement. This highlights that even when all signals seem to point towards one option, it does not mean this outcome will transpire. At the time many saw this as a huge gamble of consumer money on an uncommitted US EPA. We have observed since this decision that the EPA has only gone on to strengthen its stance against pollution from coal generation in the US energy mix.

Source: TVA Environmental Impact Assessment[xli]

One must be aware of the potential synergistic impacts of US EPA regulations and how this could have altered risk perceptions

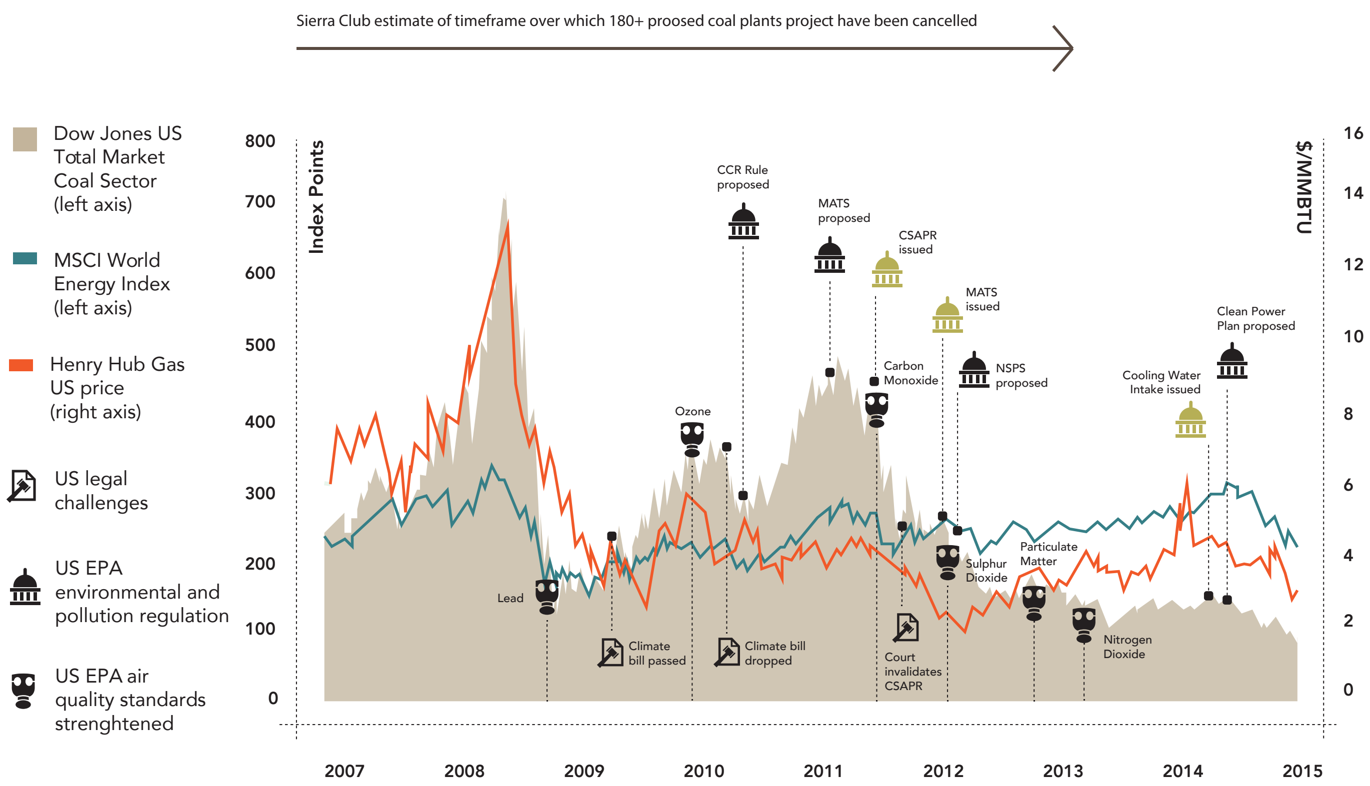
While a number of institutions have made estimates about the potential impact of discrete EPA regulations, as has been illustrated above, this analytical approach neglects the fact that the market responds to the total level of risk perceived to be posed to an industry. Therefore, it is logical to assert that the impact of numerous regulatory drivers applying downward pressure on coal demand simultaneously could have served to increase the risk profile of the US coal industry, and caused action to be taken by utilities, more than the impact of each individual regulation on its own.

As Figure 17 demonstrates, since 2008 a perfect storm has occurred for the US coal industry, with the emergence of these seven regulations and the introduction of a cheaper fuel source. Therefore, it is clear why many electric power companies opted to retire coal capacity.

How did these factors influence US coal sector market performance?

To explore the potential influence of the emergence of natural gas and US EPA regulations on the US coal sector more closely, the graph below plots all the key intervention points discussed above against the performance of the Dow Jones US total Market Coal Sector Index.

Figure 17: Exploring coal industry index responses to different demand factors
(01/01/07 – 20/01/15)



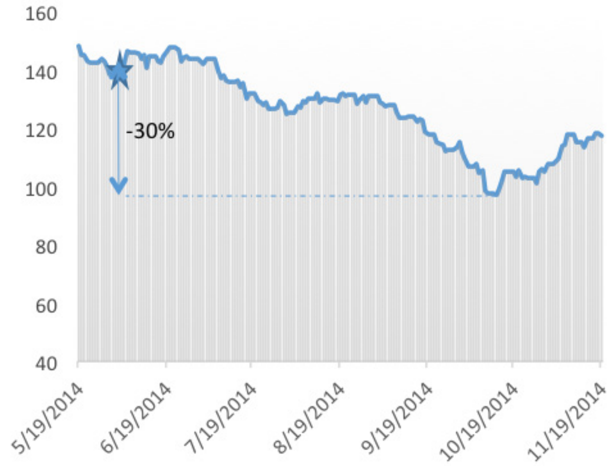
Over this 8 year period, the Dow Jones US Total Market Coal Sector Index lost 78% of its value whereas the MSCI World Energy Index has steadily risen since the GFC. Overlaying regulatory interventions and the US gas price points to the following possible relationships:

1) The graph above shows strong correlation between the performance of the US coal industry index and US gas prices up until the beginning of 2011. While one must be tentative when drawing conclusions over this post-GFC period where a number of quantitative easing measures were being implemented, Figure 17 certainly suggests that the increasing gas price into the start of 2010 was a key driver in the temporary resurgence of the US coal industry.

2) The substantial downturn that occurred in the Dow Jones coal index between April 2011 and June 2012 stands-out from Figure 17. This "crash" seems to derive from the simultaneous fall in gas prices and the numerous and regular EPA regulatory proposals and issuances that are applicable to the US coal sector and occurred over this period. Evidently there is no single regulation-driven shock that stands out to have realigned the value of the US coal sector and its constituents. Rather it appears the steady stream of regulatory interventions seems to have sustained a consensus that the US coal sector has an increasingly challenging future combined with the economics of a gas switch.

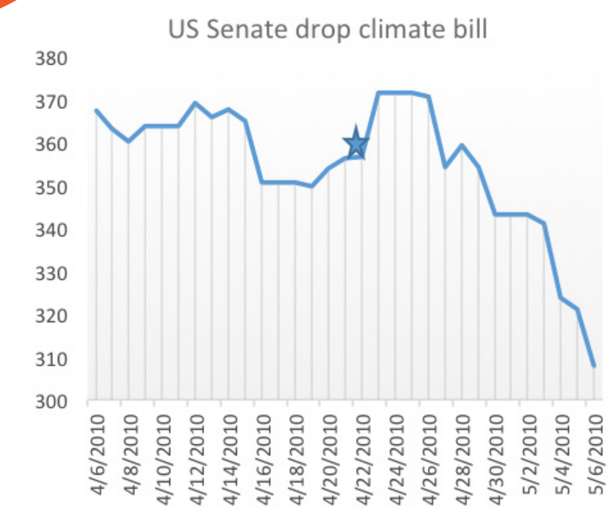
3) Critically, following this downturn, the gas price seems to decouple from the US coal industry where it once was largely correlative. From around February 2012, the gas price rose consistently to the second half of 2014. However, the US coal industry in no way rebounded across this period. This suggests that the drip-drip-drip of US EPA regulatory constraints has had a structural influence on the coal industry. In the last few months however, both coal and natural gas prices have fallen sharply in sympathy with oil.

4) Finally, President Obama's Clean Power Plan proposal is significant because of the scale of this intervention, which combined with the CWIS rule being issued shortly before, have had a noteworthy impact on the US coal industry. Since June 2nd 2014 when this regulation was proposed, the value of the Dow Jones US coal sector index fell to a low 30% below the level at this announcement (see graph on the rigth) – presently, the index remains 16% below June 2nd levels. Much of this trend should be attributed to the risks perceived to be posed by the Clean Power Plan. Absolute Strategy Research highlight that President Obama's proposal 'helped cut 20% from the market value of the US coal sector'[xlii], while Bernstein Research estimate that up until 2020 the US Clean Power Plan will reduce coal consumption by 165mt, retiring 44.6GW (24% of current US coal-fired generation)[xliii].

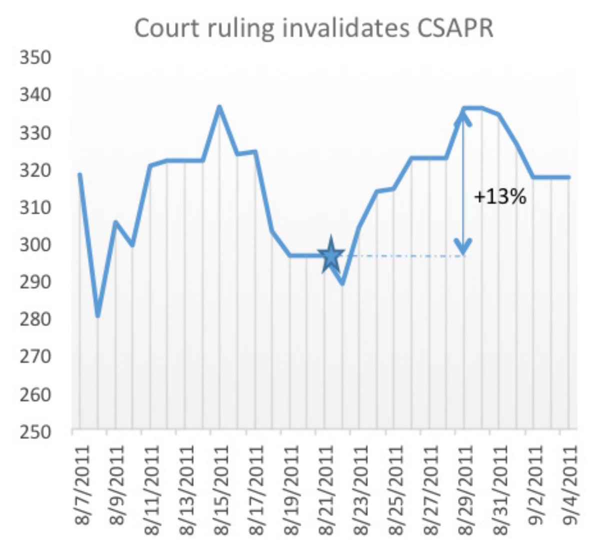


Political events and legal decisions

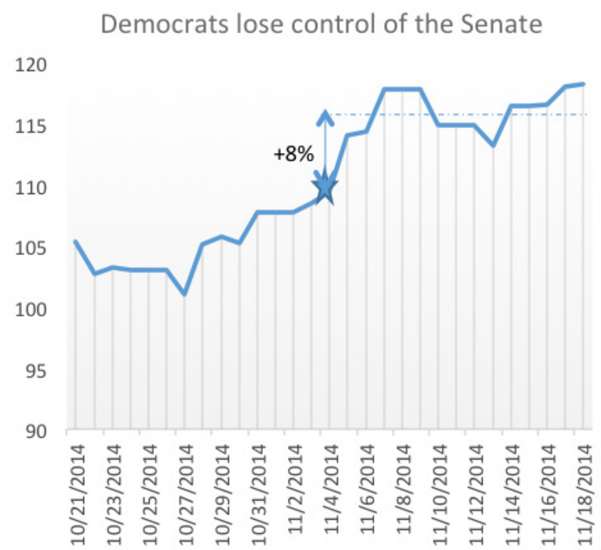
Figure 17 above reveals a great deal about the numerous interactions driving changes in the US coal industry. Given the complexity of the inter-relationships underpinning these changes, it can be difficult to isolate the likely correlation between regulatory interventions, such as those from the EPA, and the coal industry. However, looking at those policy interventions that serve to support the industry, rather than those factors that suppress it, can shed more light on this relationship. The following graphs plot key political and legal events in the middle of one month time periods of the Dow Jones US Total Market Coal Sector.



An immediate jump of 4% lasts for three days before a curious drop off – a number of policy experts said that despite this defeat, it was widely expected regulation would still target coal pollution.



Nine days after this court ruling, the US coal industry index had gradually risen by 13%



Index increased by 8% during the following three days and then maintained an average of 116.3 for the next seven days, compared to 109 on the day of the vote.

These focused graphs show more clearly than Figure 17 that the US coal industry index is attuned to relevant political and regulatory events, confirming that those seven EPA regulations highlighted thus far are highly likely to have been influential in the coal sector crash. The clear influence of regulatory implementation and its interaction with natural gas consumption in particular suggests a structural shift rather than a cyclical phenomenon.

Other domestic factors affecting the US coal industry

A range of other factors may have also contributed to the US coal industry crash, for example:

- Non-EPA Renewable Energy Policy Support - other regulations outside those set by the EPA have been significant in the US coal sector crash. In particular, the Renewable Portfolio Standards (RPS) issued by some states has been particularly influential in coal's share of total power supply falling by 10.5% while renewable energy's (including hydropower) share rose by 4.1% between 2005 and 2013.

Table 7: US power supply by type (2005 – 2013)

TWh	Total	Coal	Oil	Gas	RE
2005	4055	2013	122	774	100
2013	4058	1586	27	1126	266
% Change: 2013 - 2005	**0.1%**	**-21.2%**	**-77.9%**	**45.5%**	
As percent of total generation					
2005	100.0%	49.6%	3.0%	19.1%	2.5%
2013	100.0%	39.1%	0.7%	27.8%	6.6%
Change		-10.5%	-2.3%	**+8.7%**	**+4.1%**

Source: EIA, 2014

In participating states, which together represent the majority of US electricity demand, the RPS require utilities to supply a minimum percentage of their retail electricity sales from renewable sources. To date, states accounting for 65% of total US electricity demand have adopted such mandates which help to scale-up demand for renewable energy sources. It appears to have had a beneficial impact, with 67% of all non-hydro renewable capacity additions from 1998-2012 occurring in states with active/impending RPS compliance obligations[xliv].

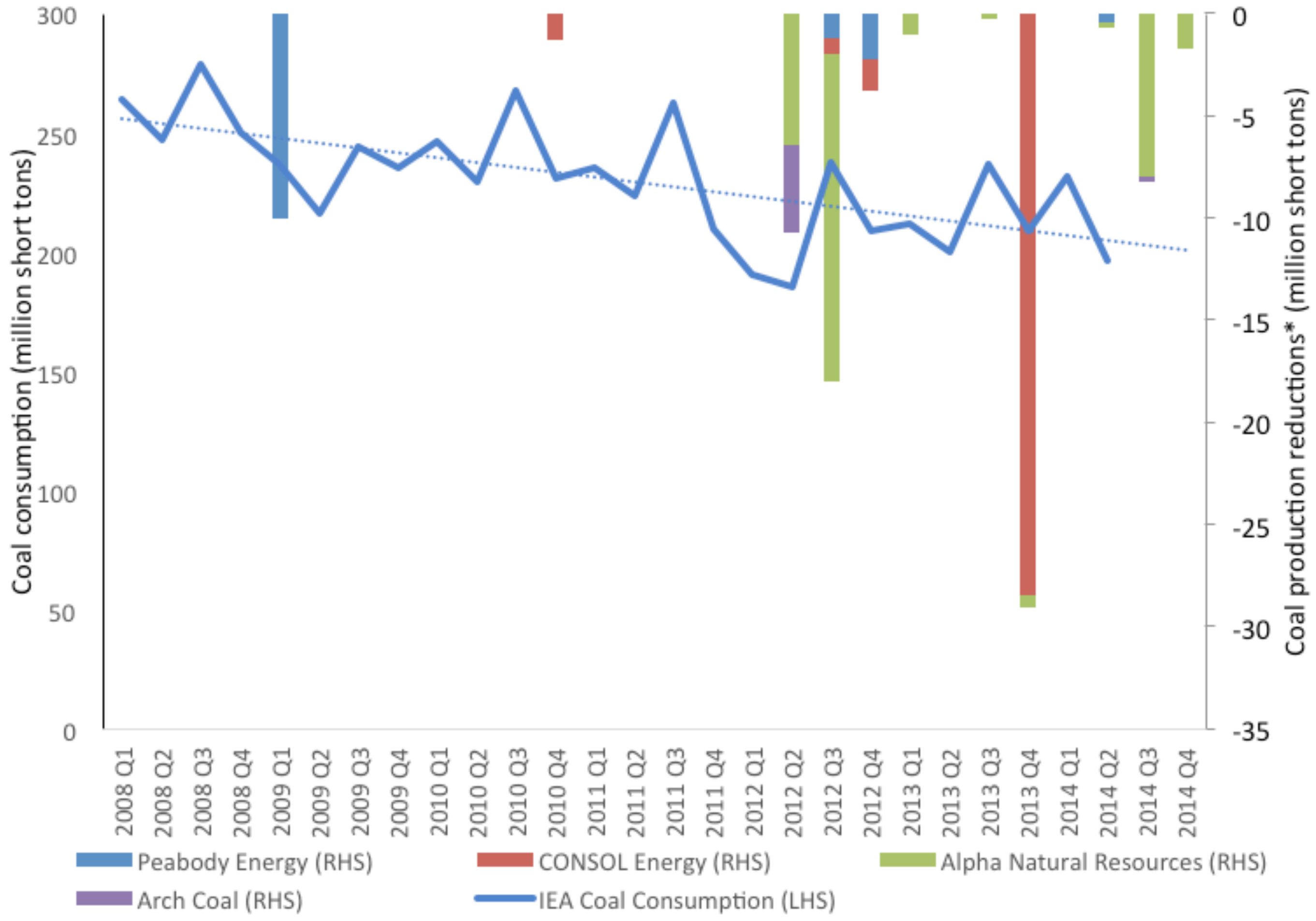
- **Lowering cost of renewable energy technologies** – The cost of power supplied from renewable energy continued to fall causing the speed of renewable energy uptake to continue to steadily rise. This has continued into last year when 74% of all new electricity capacity installations in the US in 1Q2014 were solar power. Furthermore, rooftop solar PV is currently at grid parity in 10 states, a reality predicted to be achieved across all 50 states by 2016. There are, therefore, few signs that the perceived risk surrounding US coal will diminish as a result of weaker competitiveness of renewable energy technologies in the near-term.

- **Energy efficiency gains** – Over the five years from 2008 to 2013, a period over which US GDP grew by 5.9%, total electric generation in the US contracted by 1.5%, falling by 61MWh. While a number of factors are at work during this period, energy efficiency gains will have certainly contributed to lowering power demand. Over the 2000s, 28 US states adopted Energy Efficiency Portfolio Standards, which require energy providers to meet a certain portion of their electricity demand through efficient sources.

- **Temporary factors** – A number of coal industry bodies pointed to the mild winter experienced in the US in 2011/12 as a factor in lower demand for coal and hence lower price. CTI see the more structural changes detailed above as more influential overall.

The net result of these factors has been a fall in the amount of coal used in electric power generation (see Figure 18) and the closure of numerous US mines, particularly since Q2 2012: the EIA state that 264 coal mines across the US closed between 2011 and 2013 (from 1,325 to 1,061)[xlv]. More recent data is not available yet, but Figure 18 suggests that this trend has continued.

Figure 18: US electric power sector coal consumption against coal production closures and reductions (2008-2013)



**Note: Coal production reduction figures are for selected companies, include mine closures, idling and reduced production based on best available data*

Source: IEA 2014 [xlvi]

The Future of US Coal: Evidence of a Structural Inflection Point

Investors who did not foresee the US coal crash lost significant value in the bankrupted coal companies and plummeting share prices of those that have managed to survive. It is imperative that those invested in US coal are more prepared and assess their resilience to the impacts should those prove structural – as we believe it appears – and should the industry's fortunes continue to trend downwards in the long term (with cyclical ups and downs overlaid) in the future.

The only way is down for US coal

Crucially, there are signals that suggest the only way is down for US coal in the near-term. For example, Bernstein Research estimate that by the end of the decade, cumulative coal demand by US power plants will decline by as much as 228mt (50GW) of generation capacity is retired with no additions [xlvii].

To a large extent, we expect the direction of travel in the US coal environment to be dictated by the same factors that govern it at the moment. As such, a lower coal demand future could continue to develop from the combined impact of:

- The continuation of cheap US shale gas production;
- The finalisation and issuance of EPA regulations currently in proposal;
- The continued growth of renewable energy capacity additions; and
- Additional greenhouse gas regulations both domestically and internationally.

Indeed, one could see more positives for the coal industry - nuclear expansion seems less of a threat now than it might have been previously, a period of sustained higher natural gas pricing (e.g. occasioned by increased exports of LNG) could encourage some switching back to coal, and the recent Saudi willingness to take-on the US shale sector could prove blessing for coal companies.

However, the constant threat of substitution by gas should provide a new ceiling for coal prices, as coal-to-gas switching has shown itself to be highly price sensitive and can occur quickly. Also, the speed at which shale wells can be drilled and completed means that any period of higher gas pricing is likely to be met with a rapid production response and hence prove only temporary.

The regulatory environment will continue to play a part, whether this be the enactment of further restrictive legislation, or the repeal of those already in force. The market appears to agree with the share price gains seen in response to Republican success in the recent midterm elections being rapidly overwhelmed by longer term view of ever-increasing regulation (despite changes in Washington) and market forces continuing to work against coal.

US utilities are the 'canary in the coal mine', but are being ignored

The comments from the US utilities that coal was being taken out of the picture, should have been a warning sign. In hindsight, the mismatch between US utilities retiring coal plants and US coal miners still being bullish on demand is an obvious contradiction. Investors must be incredibly cautious because evidence suggests that this dynamic has not shifted. For example, Peabody Energy state in their January 27 2015 8K report that they expect utility coal usage in the US 'to increase 10 to 30 million tons' over 2014 levels by 2017 [xlviii]. We expect the drivers highlighted above to cause coal consumption to decline.

The seaborne market flatters to deceive US miners

Some US producers were hoping that increasing their international exposure through exports would help them avoid the downturn in the US coal sector. This did not materialise and a similar pattern of structural decline is emerging in the future seaborne coal market. OECD thermal coal demand is clearly declining and there are significant doubts that growth in other markets – particularly China and India – will significantly outstrip that decline[xlix]. Further, weak seaborne trade prices means much US exported production is barely covering costs with future demand offering little improvement.

Somewhat predictably, US coal producers are presenting investors with a different vision of the future. Peabody Energy announced in January 2015 that they expect for 'global coal demand to rise 500 million tonnes by 2017… [with] an estimated 8 to 10% increase in seaborne thermal coal demand'.[l]

Demand destruction challenges future projects and capex

Investors must be aware that with markets for coal demand growth seemingly in short supply, significant amounts of future US miner capex and production become uneconomic. In our recent report "Carbon Cost Curves: Evaluating Financial Risk to Coal Capital Expenditures", we examined the long term equilibrium break even coal price (BECP – accounting for all potential future production, costs, and revenues, a mine's BECP is the price that delivers an asset-level net present value of zero assuming a 10% real internal rate of return) levels by basin resulting from IEEFA's demand forecasts[li]. These regional break even prices and current regional benchmark prices are shown in Table 8, on the following page:

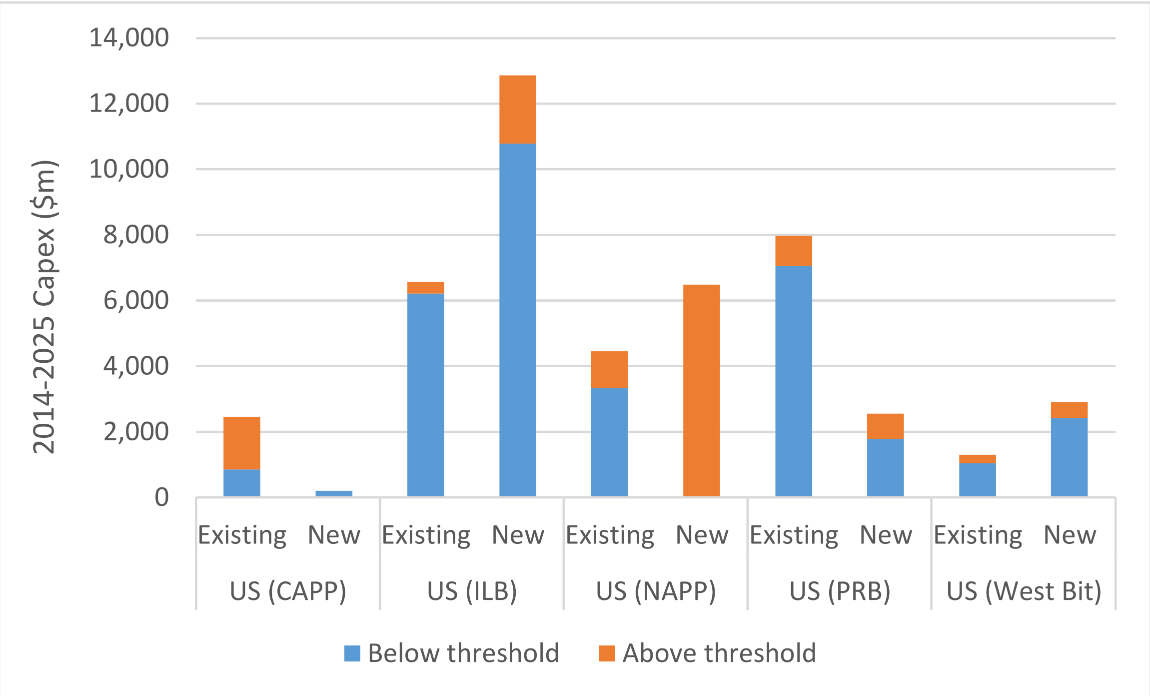
Table 8: Regional equilibrium break even prices vs current benchmark prices

US producing region	Long-term equilibrium breakeven price ($/t)	Current price ($/t – 20 January 2015)
Central Appalachian (CAPP)	$74	$45.17
Illinois (ILB)	$53	$45.32
Northern Appalachian (NAPP)	$58	$63.13
Powder River Basin (PRB)	$17	$11.55
Western Bituminous	$39	$38.13
Overall US	$53	-

Note: price shown for ILB relates to mid-sulphur benchmark
Source: IEEFA, Energy Economics, using Wood Mackenzie Global Economic Model and CTI/ETA analysis 2014, Bloomberg, EIA

Comparing these long-term equilibrium BECP thresholds to individual project BECPs, Figure 19 below, shows the amount of 2014-2025 potential capex across the major basins that could be "out of the money" on this basis.

Figure 19: 2014-2025 potential capex on domestic thermal coal by breakeven price (BECP) level



Source: IEEFA, Energy Economics, using Wood Mackenzie Global Economic Model and CTI/ETA analysis 2014

In aggregate, some $4.2bn is at risk in the next decade on existing mines (sustaining and expansion), with a further $9.8bn at risk on new projects.
At a company level, the more levered producers will need to reduce their debt burdens, a process that will take years at current prices. Despite this, there seems to have been a relative lack of asset disposals, maybe suggesting low buyer confidence and a limited market for US coal assets. Producers have taken steps to cut costs and idle mines, and we would not be surprised to see more capacity being put on care and maintenance as a challenging environment persists.

Other sectors and geographies can learn from this crash

Companies and investors largely underestimated the risks in US coal and did not see the way the wind was blowing until it was too late, suffering significant material loss because of it. Additionally, other international fossil fuel markets should acknowledge the extent of stranded assets incurred in the US coal sector. They should use this case study to build their understanding of, and resilience to, the potential value destruction that could result if stakeholders miss the evident trends of ever-falling costs of renewables and improved energy efficiencies driving the transition to a lower-carbon energy system.

In the US, there was no need to wait for a global deal on climate, or even federal regulation labelled carbon/climate, for the coal industry to take a hit. In fact, the factors that undermined coal demand in the US were not primarily driven by the desire to lower carbon emissions but in fact it being overtaken by lower-cost gas and renewables and constrained by a number of regulations tackling environmental pollution broadly. These are precisely the sort of drivers that will contribute to reduced use of high carbon energy sources globally.

Absent a profound reversal of technology and policy trends, we believe the market has fundamentally changed forever and bets on a return to business as usual are speculative. As Goldman Sachs pronounced in January 2015:

'Just as a worker celebrating their 65th birthday can settle into a more sedate lifestyle while they look back on past achievements, we argue that thermal coal (used in power plants) has reached its retirement age'.[lii]

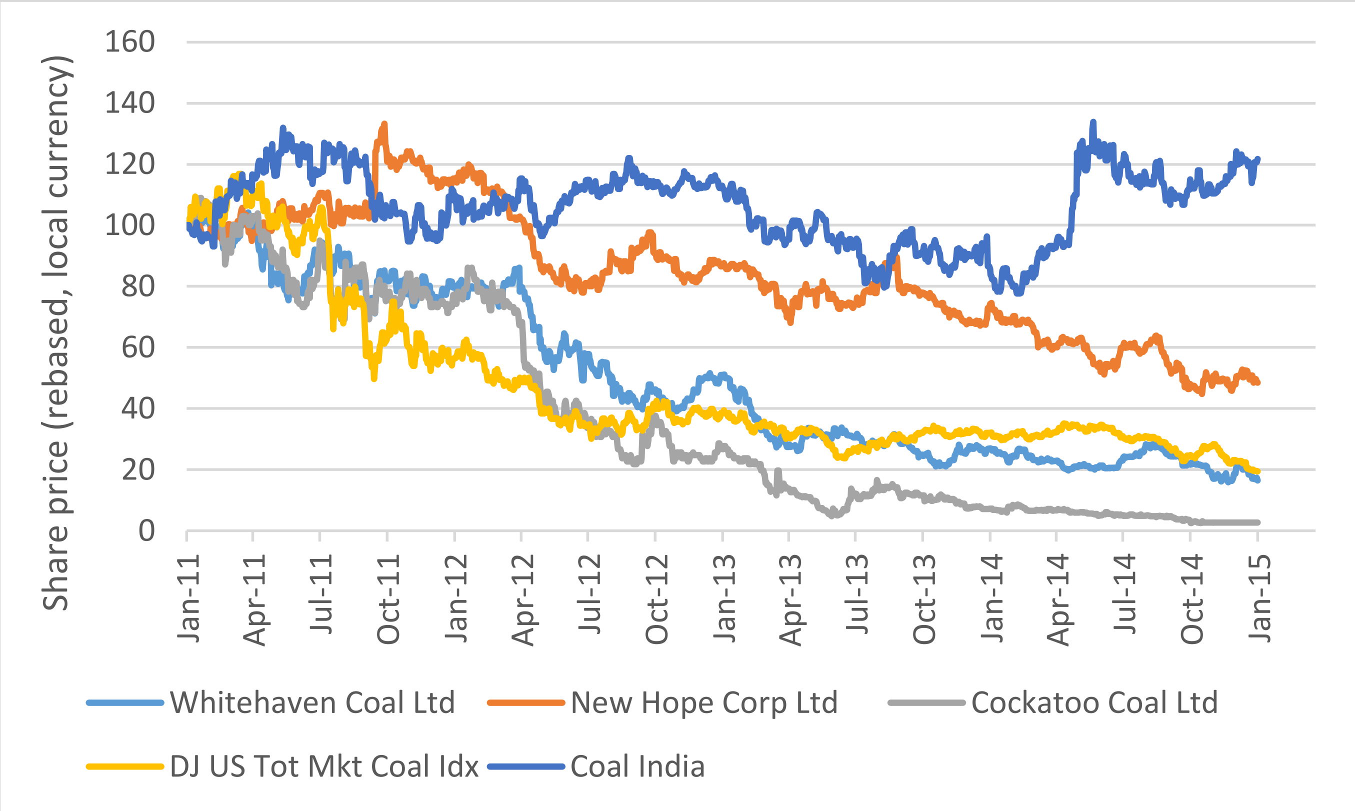
For companies involved in fossil fuel extraction, portfolios can be given increased downside protection by demanding higher hurdle IRRs before sanctioning projects. This will have the effect of ensuring that the projects they enter have lower breakeven prices, and thus are more resilient to volatility. We believe that investors should expect greater capital discipline from companies, and challenge capex on high-cost projects. The risk premium of fossil fuel project development has been raised.

Investors can't say they weren't warned.

Appendix

Comparison with Selected International Coal Producers

Figure 20: Share price performance of Australian pure play coal producers, Coal India and Dow Jones US Total Market Coal Index (local currency), January 2011 – January 2015



Source: Bloomberg, CTI Analysis

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