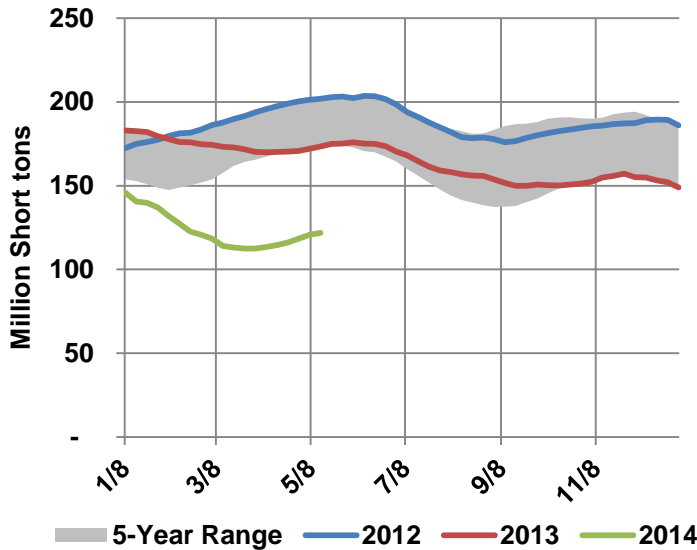


Market Alert

Back in the Black: Coal Makes Comeback

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Figure 1 - Coal Stockpiles at Power Plants



Key Takeaways

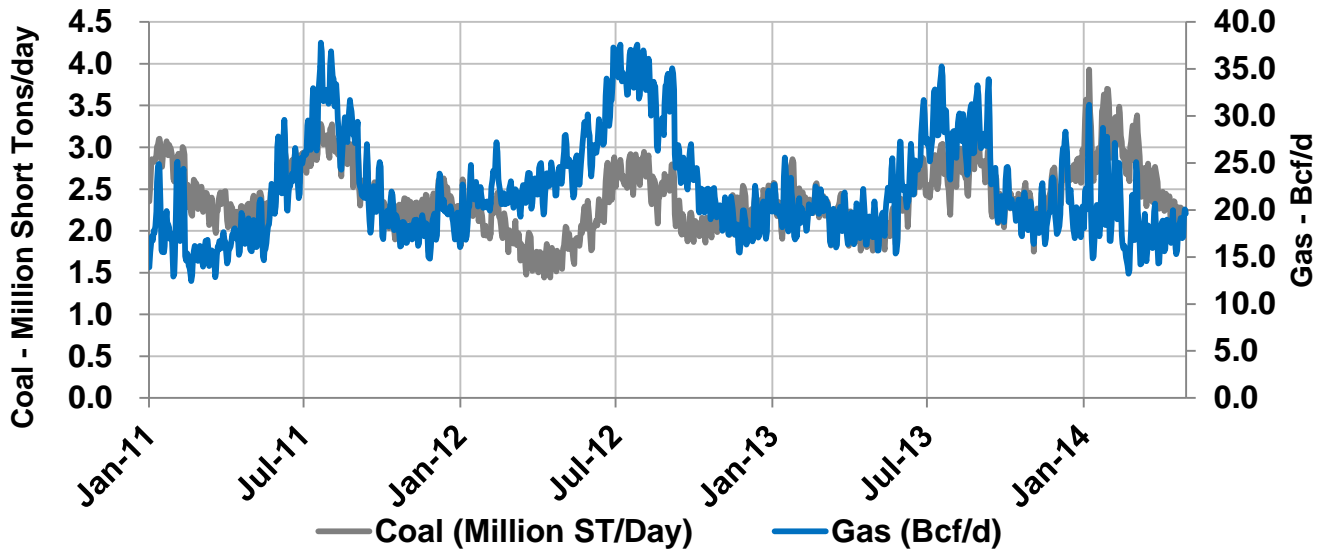
- US coal consumption soared 21% this past winter to 83.7 million short tons a month, and coal's share of the US power market grew to 44% compared to 41% last winter.
- Bentek's *ISO Power Balance* shows coal generation represented 42% of the power on seven US ISO power grids this past winter compared to 38% during the previous winter.
- Coal is expected to remain a reliable, baseload fuel source for power despite environmental pressure and continuing competition with gas.
- US coal emissions equipment additions indicate power companies intend to keep coal as an important source of baseload power.
- Rising consumption and power market share have reduced coal stockpiles at power facilities to levels not noted since 2006 (see Figure 1).

Overview

Coal is making a significant comeback in the power market this year and is expected to remain an important and reliable fuel source for the power sector, despite declines in power market share due to an onslaught of emissions regulations and the impact of the shale gas revolution. The past winter provides a clear example of how important coal remains in the power market. Record cold brought electricity load to peak summer levels, forcing reliance on all generating sources but particularly coal. Even in regions where natural gas was not constrained due to pipeline infrastructure, coal still came to the rescue as power load and heating demand soared and natural gas prices rocketed higher. Coal consumption through April 2014 was up 25% (67-million short tons) from the same period last year to a total of 334-million short tons. Average daily coal consumption rose to 2.8-million short tons a day this past winter, compared to 2.3-

million short tons per day in the winter of 2012-13 and 2.1-million short tons in the winter of 2011-12. These year-over-year increases are in contrast to a long series of market-share declines in recent years. While coal has been the dominant fuel source for US power generation for more than 60 years, its share of the power market dropped 12 percentage points over the past 10 years from a 53% power market share in 2003 to 41% in 2013.

Figure 2 - Total US Gas & Coal Demand from Power Generation



Coal is fighting an uphill battle against natural gas, which has been gaining significant ground in the power sector because of its abundance and environmental benefits. The shale gas revolution proved that the US has an ample supply of natural gas, and this realization provided an economic incentive, in addition to the environmental incentives, to increase gas-fired generation nationwide over the past decade. According to Bentek's *North American Power Plant Databank*, 25 GW of coal-fired power generation was retired from 2005 through 2013, and over that same period gas-fired generation capacity increased by a net 92 GW. Natural gas' share of US power generation climbed from 17% in 2005 to 26% in 2013.

Emissions restrictions have been a major reason gas has gained power market share. Multiple regulations handed down by the US Environmental Protection Agency (EPA), including the Clean Air Interstate Rule of 2005, the Cross State Air Pollution Rule (CSAPR), and the Mercury and Air Toxics Standards (MATS), have promoted greater reliance on gas-fired generation and retirement of coal-fired power plants or expensive retrofitting of emissions control equipment on coal plants. Gas generation also is a natural choice for grid operators seeking to balance the intermittency of renewable power generation because gas-fired power plants have ramp-up times that are faster than most coal-fired power plants. As a result, the coal industry has taken a back seat to natural gas.

While these trends are expected to continue, coal still is expected to retain significant power market share for several reasons. Coal is abundant in the US, with major supply sources such as the Powder River Basin in Wyoming, the Appalachian and Illinois basins and other important production areas. While power market share losses over the past decade forced coal producers to scale back production and shutter mines, resulting in a 15% production decline from 2006 to 2013, production is up slightly (1%) this year.

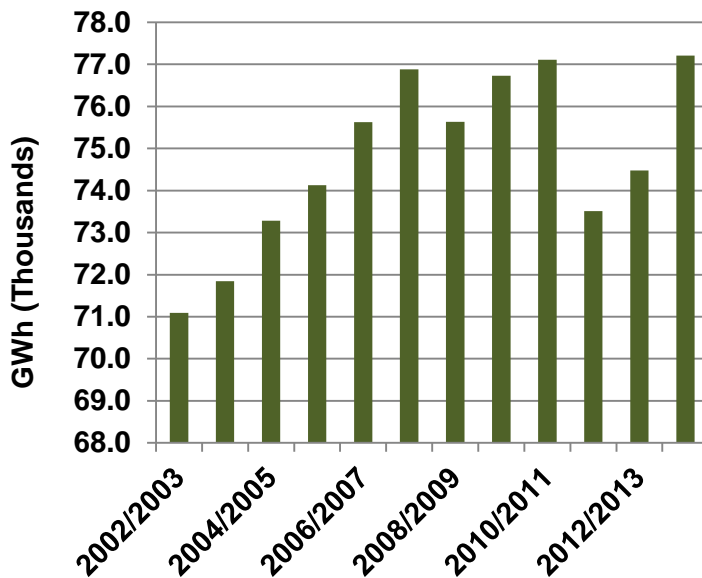
Rail and stockpiling onsite also make coal among the most reliable generation fuel sources. Coal can be stored near the power plant, which ensures reliability. However, the recent surge in consumption has depleted coal inventories across the nation. Coal stockpiles were down to only 113.0-million short tons in March, compared to a 5-year average of 177.9-million short tons.

This Market Alert examines these coal market trends and conditions, and their impact on natural gas demand from power generation. In addition, Bentek has added significant coal production, consumption and inventory data to its [US Power Burn](#) report and to [Platts Coal Trader](#) market report to closely monitor the coal market and its relationship to the natural gas market.

Consumption Trends

The cold winter pushed US electricity load to an average of 77,200 GWh/week, the highest level in 12 years (see Figure 3), which led to high generation levels from all fuel sources and a major increase in coal

Figure 3 - Total Winter GWh

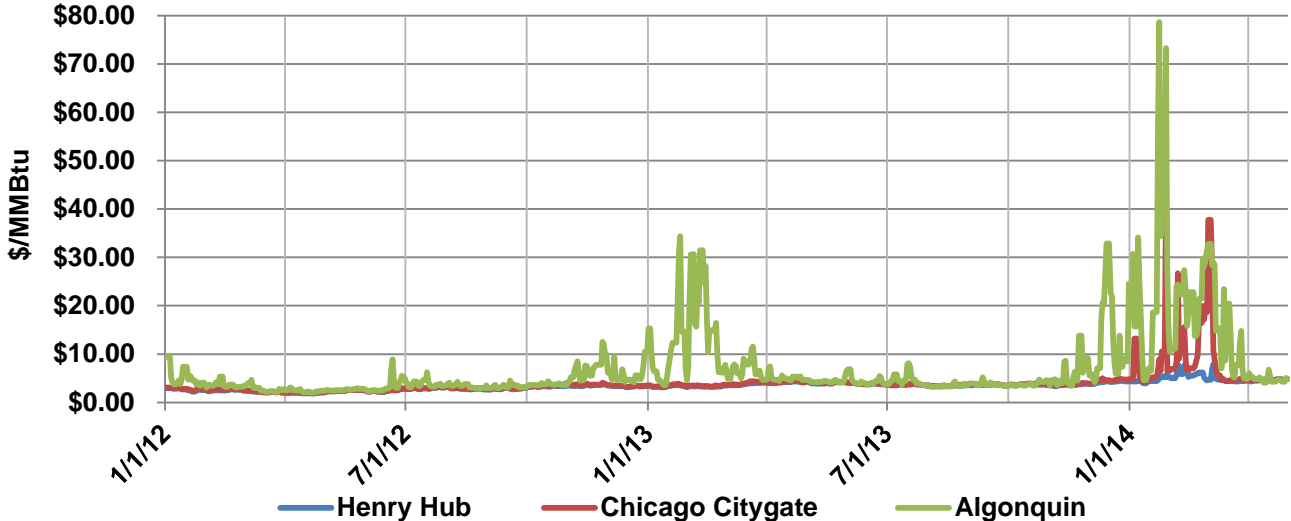


consumption. Coal consumption increased 17% during the winter compared to the previous winter, and coal-fired power generation accounted for an estimated 44% of the total US power stack, compared to 41% during the previous two winters. By comparison, natural gas generation held steady at 24% of generation compared to last winter, and declined 2% compared to the winter prior.

While gas demand from power generation increased about 0.25 Bcf/d from the previous winter to an average of 19.6 Bcf/d, the extreme cold also led to strong gas demand for heating, creating competition between the power and heating demand sectors. Henry Hub gas prices climbed to an average of \$4.60/MMBtu during the

winter compared to \$3.46 during the previous winter and \$2.75 in winter 2011/12. Gas prices soared much higher in several major market areas, averaging \$10.20 in New York and \$13.99 in New England in particular, as well as \$6.86 in Chicago and \$11.46 in Southern California during the winter (see Figure 4). Higher gas prices and delivery constraints limited the gas demand gains for power generation. While gas demand from power increased from the average during the previous winter, it was still about 0.8 Bcf/d less than during the winter of 2011-12 when gas prices were much lower. Higher gas prices gave coal a window of opportunity to recapture power market share.

Figure 4 - Natural Gas Prices



According to Bentek’s *ISO Power Balance*, coal generation represented 42% of the total generation dedicated to US independent system operator (ISO) power grids during the winter while gas averaged 20% of generation (see Figure 5). Last winter, however, coal represented only 38% of the total generation stack, while gas held 20%, and in winter 2011-12, when gas prices were much lower, coal captured only 33% of the total ISO generation stack while gas held a 24% share. This shows the substantial market share gains by coal this winter. These gains come in contrast to the major shift in the generation stack over the past eight years in response to abundant cheap natural gas, environmental regulations, government renewable portfolio standards and consumer-driven changes that have reduced coal’s dominance in many regions.

MISO is one of the nation’s largest coal-consuming ISOs, accounting for roughly 25% of total US coal consumption, and this past winter the region consumed 36% more coal (26.8-million short tons) than during the previous winter, reaching an average monthly coal consumption of 20.4-million short tons. MISO’s geographic location gives it easy access to both Powder River Basin and Illinois Basin coal. Coal generation in MISO climbed to 34,483 GWh per month during the winter compared to 25,346 GWh per month during the previous winter and 24,105 GWh per month in winter 2011-12. In addition, coal’s power market share in MISO this past winter averaged 60% compared to 56% during the previous winter and 54% during winter 2011-12. Meanwhile, gas generation in the region rose 105% this winter to 5,330 GWh per

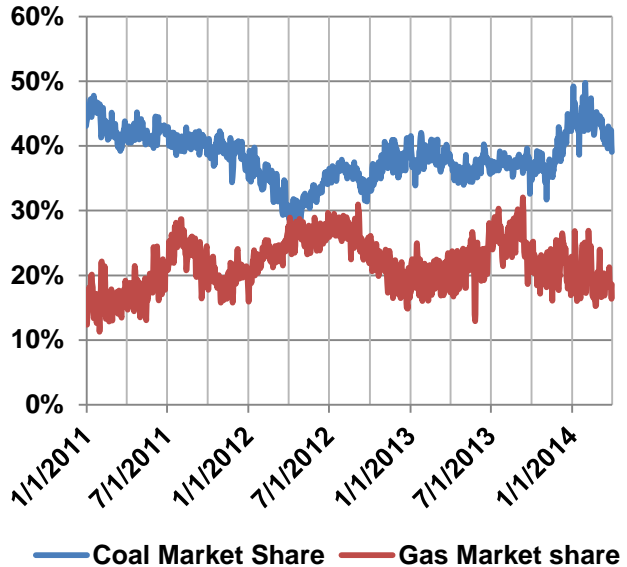
month compared to 2,604 GWh during the previous winter and 3,146 GWh during winter 2011-12. Gas demand from power generation rose to 1.3 Bcf/d this winter from 0.65 Bcf/d last winter and 0.78 Bcf/d in winter 2011-12.

The integration of Entergy in December 2013 gave MISO access to more gas-fired generation that can help balance its growing wind power supply in the Midwest and Plains states. However, the ISO's abundant coal generation capacity enabled it to export gas-fired megawatts from the Entergy region to PJM this winter when PJM margins were tight during the polar vortex. This winter highlighted the importance of coal in the region and made it clear that the fuel will remain a dominant part of the generation stack for some time.

Coal and gas generation have been nearly equal in ERCOT in recent years. Texas has its own coal supply and has access to coal from the Powder River Basin, making the fuel a reliable power source, but the state also is well positioned to grow its gas generation because of substantial production from the Eagle Ford Shale, the Permian and the Anadarko basins, and the sprawling pipeline grid in the state that has ample spare capacity available during winter. Wind and peak power load in the summer also favor growing gas generation. Over the past several years gas-generation capacity has increased while coal capacity has declined. However, this past winter coal generation and consumption increased. Coal-fired generation climbed to 10,953 GWh per month during the winter compared to 9,648 GWh per month in winter 2012-13 and 9,140 GWh per month in winter 2011-12. Coal consumption increased to 37.8 million short tons this winter compared to 34 million last winter and 33 million in winter 2011-12. Meanwhile, gas generation fell to 47,862 GWh per month from 42,386 GWh per month during the previous winter and 47,592 during winter 2011-12, and gas demand from generation dropped to 2.37 Bcf/d from 2.1 Bcf/d during the previous winter and 2.36 Bcf/d during winter 2011-12 (assuming a 7.5 MMBtu per MWh heat rate).

Despite a decline in coal generation since 2006, SPP still accounts for roughly 9% of total US coal consumption. The ISO is centrally located to both coal and natural gas production and sits in one of the most wind abundant regions of the country. This natural resource has sparked the rapid development of wind generation capacity since 2008 and has put downward pressure on thermal-fueled power plants in the region. This winter, when load soared, coal represented 63% of generation, averaging 11,941 GWh a month. Coal averaged 11,625 GWh a month during winter 2012-2013 and 11,020 GWh a month during the

Figure 5 - Percentage of ISO Generation



winter of 2011-2012, small changes considering the vastly different market dynamics from year to year. As a percentage of market share, coal accounted for 64% of generation last winter and 59% of generation during winter 2012-2013. Gas in the ISO has held fairly steady, representing only 19% of generation during the winter of 2013-2014, 19% during the winter of 2012-2013 and 20% over the 2011-2012 winter. Going forward, coal is poised to retain a large share of the SPP market.

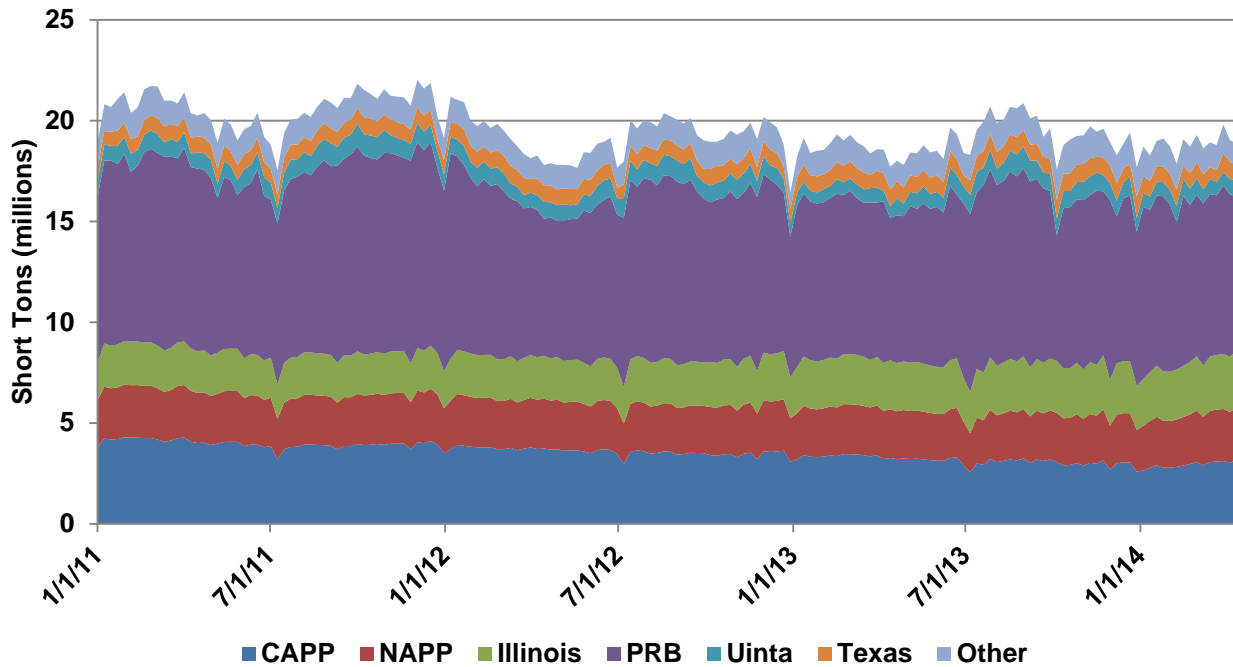
PJM, which serves portions of the Mid Atlantic area of the East Coast and Midwest, once relied on coal for roughly 70% of generation. Starting in the summer of 2008, coal began to lose market share. From 2006 to June 2008, coal represented 66% of the generation stack while gas averaged 6%. A steady decline of coal's market share followed, and coal generation bottomed out in the spring of 2012 when it accounted for 34% of total generation. In 2012, gas' market share climbed to 20% of total PJM generation. However, the trend reversed this past winter as coal's market share rebounded to 42% and has hovered in that range this spring.

Similar trends also have taken place in the Northeast region. While MATS regulations and soaring natural gas production in the Marcellus and Utica shales have positioned gas well in the Northeast, coal still remains a vital supply source for the security and reliability of the power grid. The winter of 2013-14 in the Northeast highlights coal's dependability. In the New York ISO operating area, coal represented 16% of the generation stack in 2006, but by 2013, coal's share of the power market had fallen to a meager 3%. Gas in NYISO averaged 25% in 2006 and increased to 30% in 2013. However, this winter coal generation in the ISO sprung to life, peaking at 12% on Jan. 22, 2014 when generation from gas dropped to 22%. In the New England ISO, coal averaged 14% of the generation slate in 2006, but declined to only 5% in 2013. During the winter of 2013-14, coal fared much better, averaging 9% of the power stack, or 33 GWh/d compared to 7% during the previous winter when it averaged 25 GWh/d.

Production Trends

The massive increase in coal burn by power plants this winter occurred at a time of declining US coal production and a shift in regional coal supply dynamics. Coal production peaked in 2006 at 22.5-million short tons per week, and since that time production has declined more than 15% to just more than 19-million short tons per week. Production from the nation's largest coal-producing basin, the Powder River, declined by an average of 1.557-million short tons per week since production peaked in 2008, representing a 15% drop. Central Appalachian (CAPP) coal production has also noted significant declines, falling more than 34% since 2008, losing roughly 1.6-million short tons of production per week (see Figure 6). Meanwhile, Illinois Basin coal production has increased 28%, bucking the general downturn.

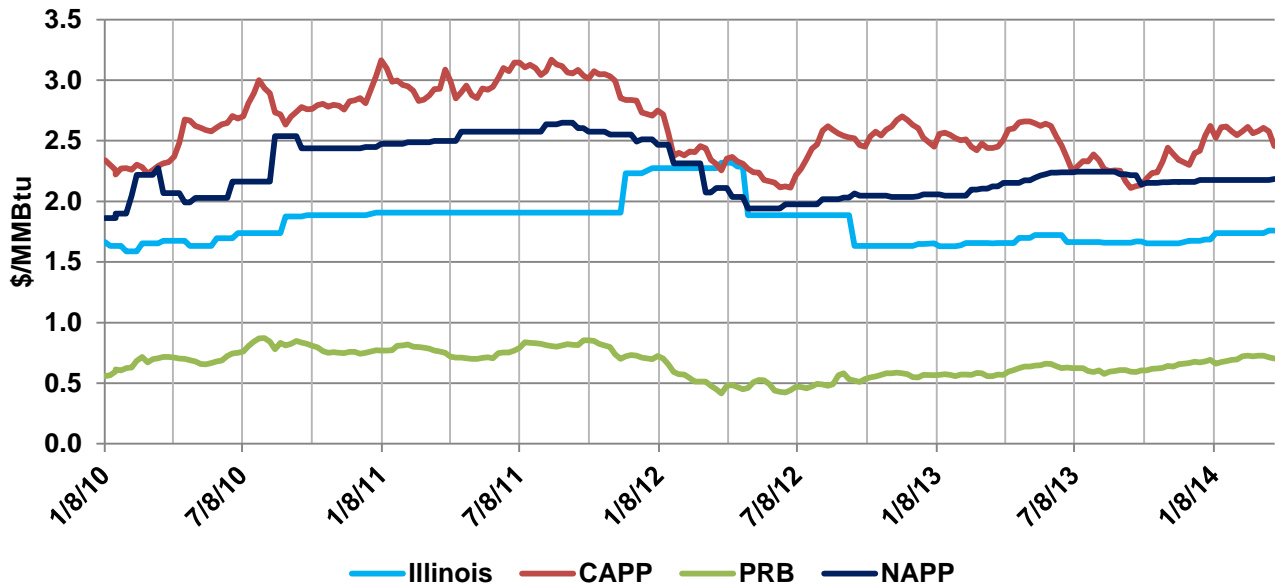
Figure 6 - US Coal Production by Basin



Greater competition between coal and natural gas and the resulting loss of coal’s power market share have been the main factors behind the production declines. CAPP coal, however, also has become more expensive to extract, as accessible coal seams that can be mined profitably have become harder to find. CAPP coal historically was distributed all over the eastern United States. From 2008 to 2013, the coal produced in the region that was delivered to power plants declined by 71%, representing 131-million short tons.

In contrast, Illinois Basin coal is cheaper and easier to extract than CAPP coal, and production in the Illinois Basin has increased every year since 2010 (see Figure 7). The basin also is closer to major demand areas in the Midwest and parts of the Southeast where coal remains a dominant fuel in the generation mix. Illinois, Kentucky, Ohio, the Carolinas and Florida have absorbed most of the Illinois Basin’s production gains while some has also been exported to international markets. Coal plants in these areas have been actively installing scrubbers and other emissions control equipment to comply with environmental regulations, such as MATS, enabling them to burn the Illinois Basin’s high-sulfur bituminous coal with less environmental impact. According to EIA data, 64% of coal-fired generating units installed the needed environmental control equipment to bring emissions in line with MATS requirements as of Dec. 31, 2012. As a result of these upgrades, many coal-fired plants in the Midwest and Southeast can take cheaper Illinois Basin coal and still comply with emissions requirements.

Figure 7 - Coal Price by Basin



Despite these gains in the Illinois Basin, US coal supply was unprepared to handle the consumption gains noted this winter. The massive increases in consumption required power plant operators to dig deep into onsite stockpiled coal inventories, leaving the industry’s onsite supplies significantly depleted.

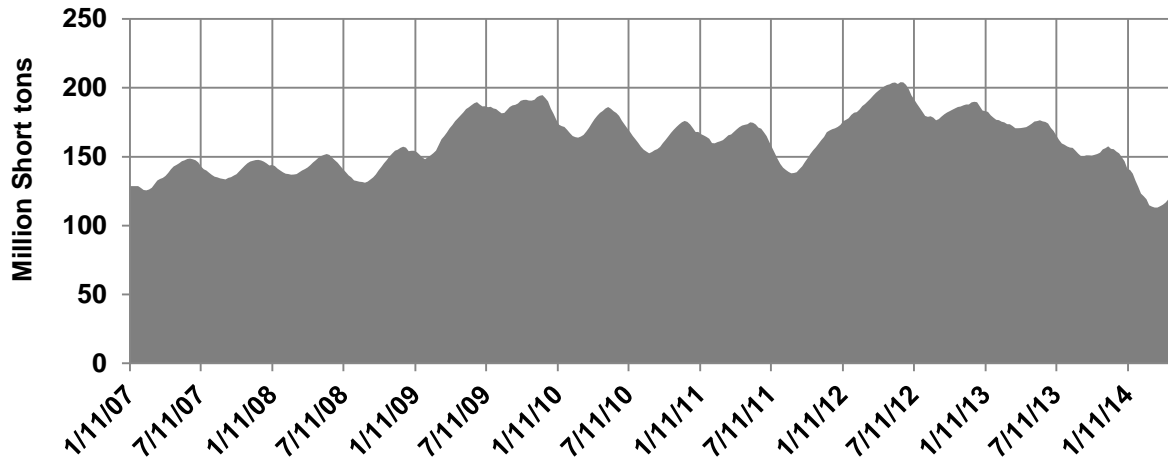
Stockpiles

Declining coal production and soaring coal demand this past winter left US coal stockpiles at their lowest levels in many years. Coal stocks reached historic highs shortly after the winter of 2012 as a result of a mild winter, sustained record-low gas prices and extremely weak coal demand. Coal consumption was at its lowest level in April 2012, totaling 1.44-million short tons on April 15. Stockpiles peaked in mid-June 2012, but since that time stockpiles have decreased 40% to the current level of 123-million short tons (see Figure 8).

While this decline is significant and stock levels are low relative to the 5-year average, lower coal inventories make sense given recent coal market trends and market share losses. Current stocks are a reversion to pre-2008 levels and the shale gas boom, and are not expected to greatly affect coal generation. With 16 GW of coal retirements between 2012 and 2013 and 25 GW planned for 2014-2016, some coal plants also are allowing stockpiles to diminish in anticipation of shutting plants. However, low

stockpiles are likely to have some impact on power plant dispatch this summer, resulting in some additional gas-fired generation.

Figure 8 - Coal Stockpiles at Electric Power Facilities

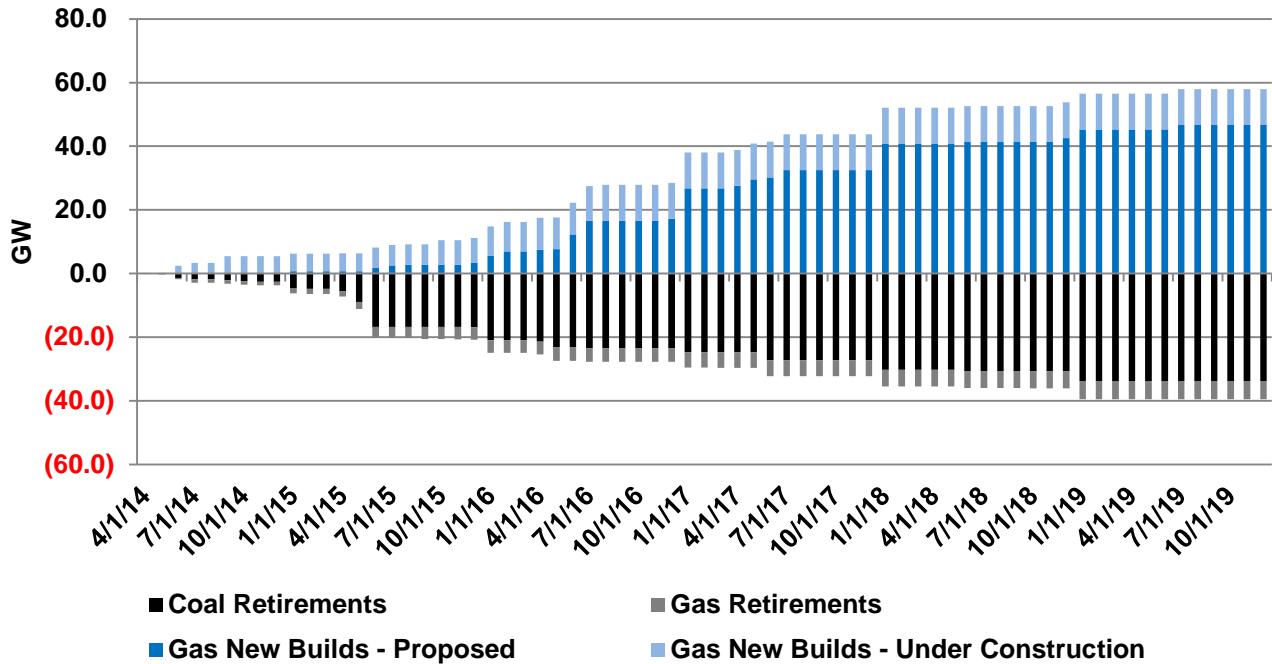


Outlook

These trends point to a significant recovery in the coal market in 2014 as natural gas prices remain high and utilities and power companies are buying more coal to produce power and replenish coal stockpiles. Coal stockpiles typically peak in mid to late June just prior to the height of the summer cooling season. Coal stocks now have roughly a month to continue a strong build before a slight summer decline followed by another short build in the fall. Weekly builds are expected to average about 2.5-million short tons over the next month based on historical trends, which indicates that stockpiles will reach only about 136-million short tons by the end of June, or about 18-million short tons less than the 5-year minimum. This is likely to force some power companies to scale back coal consumption and run gas plants more, resulting in higher gas demand than expected from power this summer. Gas demand from power generation is expected to be higher than last summer despite expectations of higher gas prices this summer. Bentek's current forecast for gas demand from power generation during the months of June, July and August is about 28.3 Bcf/d, which compares to about 27.5 Bcf/d over the same months last summer when gas prices averaged \$3.63 at Henry Hub. Coal exports also could be reduced in the short term, as coal is diverted to power generation and replenishing stocks. A hot summer at a time of short-term inventory deficits of both coal and natural gas is likely to lead to power price increases and ripple effects beyond the electric power industry as industries face a supply squeeze. These conditions will highlight the need to maintain coal's strong position in the US power market.

However, additional environmental regulations, including EPA’s MATS rule and the Supreme Court’s recent ruling upholding EPA’s CSAPR regulations, will continue to put pressure on the coal industry, forcing more coal-fired generation to either add environmental mitigation or be shut down. Many coal power plant retirements already are planned (see Figure 9). From April 2014 through December 2019, a total of 34.5 GW of coal-fired power generation capacity is scheduled for retirement, and over that same time period only 5.9 GW of gas generation capacity is scheduled for retirement while about 61 GW of gas-fired generation capacity is either planned for construction or already under development.

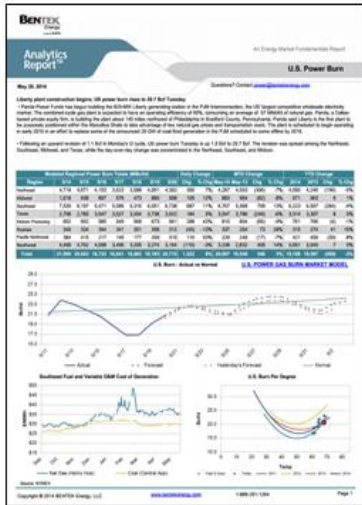
Figure 9 - Coal Plant Retirements Offset by Gas Capacity Additions



Despite the current gas storage deficit, natural gas supply also is expected to remain abundant. Numerous shale gas plays are growing and still hold tremendous potential. US natural gas production has increased 20% or 10.8 Bcf/d over the past five years to an average of 64.9 Bcf/d in 2013, and Bentek expects it to grow another 24% from 2014 to 2019 or 15.9 Bcf/d to 83.5 Bcf/d on average in 2019. Consequently, natural gas is expected to remain a dominant and growing fuel source for the US power market.

Nevertheless, coal will still have a long-term future as a foundational component of the US power market. While the longer-term trends of declining power market share, falling consumption and downward pressure on coal production are expected to resume, coal is expected to retain a significant share of the US power market. EIA projections show coal capturing an average market share of 36% through 2040, slightly below 2012 levels when gas generation was king. Coal is an abundant and inexpensive US power fuel source,

and coal-fired generation is a large and an important component of the US power mix that ensures reliability. Environmental mitigation measures are economically viable for many plants and achieve desired emissions results. The combination of these factors, as well as the large amount of coal-fired generation capacity in many regions, will ensure that coal remains a major component of the US power sector. To monitor coal's ongoing position in the US power market and its relationship with natural gas, see the substantial coal market fundamental data Bentek has added to its [US Power Burn](#) report and to [Platts Coal Trader](#) market report.



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