Outlook for coal retirements

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NYU Law School

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About SNL Energy

❖ Leading energy news and data provider based in Boulder, CO

❖ Focus on power, coal, and natural gas sectors

❖ 10,000+ stories published each year

❖ In-depth data ranging from company financials to plant operational data to a suite of traded and proprietary commodities indexes

❖ Continuous coverage of the development space with daily tracking of generation, transmission, emissions controls, pipeline, storage, and coal retirement developments
The current environment for coal plants

- Plants face challenges primarily on two fronts

  - **Economics**
    - Competition from CCGT fleet
    - Depressed wholesale power prices and oversupplied market
    - Rising coal transport costs and productive decline for Appalachian coal
    - Rising fixed O&M for an aging fleet

  - **Environmental regulations**
    - MATS
    - CAIR/CSAPR
    - Haze rule
    - 316(b) and wastewater rules
Southern Company’s 3.2 GW Bowen coal plant Cartersville, GA

2006-2010 generated over 21 million MWh with utilization at ~80%

In 2012 generated less than 10 million MWh with utilization at ~34%

In 2012 SOCO’s CCGT fleet saw an average 65% capacity factor
Falling natural gas price outlook

- Pronounced decline in forward curve since 2011
- Gap between forward curves tightens in later years but decline is persistent
Coal variable production costs (gas equivalent)

- Sub $5 gas into 2019 keeps continued pressure on least efficient of Eastern fleet

- PRB and ILB burners largely in the clear under current gas forwards
Rising coal transportation costs

- Coal transportation costs have been rising
- Costs increases exacerbated by switch to longer haul PRB coal
- Increased competition on rails for transportation of drilling equipment
Diesel prices

- Sharp rise in diesel prices since 2009 = upward pressure on transport costs
- Slight decline in prices through 2014 but price levels remain elevated

![Retail diesel prices graph](image)

Source: EIA STEO Feb. 2013
Most markets well oversupplied going into 2015.

Reserve margin of 22% in PJM, 28% in MISO.

On a regional level, most markets can absorb significant retirements.
Forward dark spreads

PJM forward dark spreads

MISO forward dark spreads
Regulations facing coal plants

- **EPA MATS** - Control of acid gases, particulate and mercury (2015 compliance)
- **CAI R/ CSAPR** - Control of NOx and SO2, CAI R currently in place and CSAPR return uncertain
- **Regional haze rule** - Uncertain outcome after CSAPR stay
- **Coal ash and water “effluent guidelines”** - Update to wastewater guidelines and coal ash disposal rules
- **316(b)** - Cooling water intake structures rule (not finalized, expected June 2013)
- **Carbon regulation** - ? Let’s not go there for the moment!
**Makeup of coal fleet**

- Of ~320 GW fleet 88 GW appear fully MATS compliant
- Nearly 59 GW have announced retrofit plans and 33 GW announced to retire
- 126 GW need some retrofits and have no announced compliance plans

![Graph showing makeup of coal capacity (MW) from SNL Energy retirements study](image)
Announced coal retirements through 2022
Makeup of announced retirements

- 33 GW announced to retire in 2012-2021

- Units are smaller in size with lower average utilization

- Generated ~3% of the nation’s electricity in 2011

<table>
<thead>
<tr>
<th>Region</th>
<th>2011 capacity factor (%)</th>
<th>2011 net gen (MWh)</th>
<th>2011 avg. heat rate (Btu/kWh)</th>
<th>Avg. age at retirement</th>
<th>Average size (MW)</th>
<th>Capacity retiring (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MISO</td>
<td>51.02</td>
<td>8,385,505</td>
<td>11,283</td>
<td>57</td>
<td>75</td>
<td>2,333</td>
</tr>
<tr>
<td>SOU</td>
<td>40.19</td>
<td>8,820,138</td>
<td>10,605</td>
<td>51</td>
<td>203</td>
<td>2,638</td>
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<td>SPP</td>
<td>82.09</td>
<td>7,195,771</td>
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<td>All regions</td>
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<td>33,143</td>
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Retrofits considered in SNL Energy study

- **Acid gases:**
  Dry scrubbers, DSI or scrubber upgrade

- **Particulate:**
  Fabric filter or ESP upgrade (3 types)

- **Mercury:**
  Combination of controls, ACI, or halogen additives for PRB coal

- **Fuel switching:**
  Not explicitly modeled but accounted for where known
Retrofit costs under SNL Energy study

Most units need less than $300/kW for compliance.

Less than 10 GW require more than $300/kW.

Only small difference with SNCR required.

Projected capital cost of needed retrofits from SNL Energy study ($2007)

- Base case
- Base case + SNCR

(MW)
Projected retrofits under SNL Energy base case

- 104 GW appear economic to retrofit
- 33 GW of DSI, 19 GW wet scrubbers, 15 GW of dry scrubbers
- ~100 GW install activated carbon injection for mercury control
- 80 GW of fabric filters installed + 29 GW upgrade ESP
Summary of results from coal retirements study

- Base case: Nearly 22 GW of incremental at-risk retirements, 55 GW including announced.
- Total potential retirements drops to 46.6 GW with a $1/MMBtu rise in NG prices.
- Total potential retirements rises to ~60GW with a $.050/MMBtu drop in NG prices.
- SNCR requirement adds ~4GW to at-risk retirements.

| Announced and at risk coal capacity identified in SNL Energy's coal retirements analysis |
|-----------------------------------------------|--------|--------|--------|--------|--------|--------|
| | Base | Base + SNCR | Base + $1 gas | Base +$1 gas + SNCR | Base -$0.50 gas | Base -$0.50 gas + SNCR |
| At risk (MW) | 21,700 | 25,900 | 13,400 | 14,700 | 27,000 | 30,900 |
| Announced (MW) | 33,100 | 33,100 | 33,100 | 33,100 | 33,100 | 33,100 |
| At risk + announced (MW) | 54,800 | 59,000 | 46,600 | 47,900 | 60,100 | 64,100 |
Map of at-risk coal retirements vs. announced retirements

U.S. summary of announced coal retirements and capacity at risk of retiring/repowering

States are shaded by total at-risk and announced coal retirements (2012-2021) as a percentage of the state’s total installed capacity (adjusted for wind availability)
As of Mar. 7, 2013
Source: SNL Energy
Map Credit: Whit Varner/Jesse Bellavance
Regional summary of announced and at-risk coal retirements

- In PJM, most retirements already announced (16 GW) versus 2.5 GW incremental
- Substantial potential increase for MISO (6 GW) with nearly 9 GW total
- Big increase in Southeast with 4 GW in SOU sub region and 3 GW in CENTRL
### Makeup of at-risk coal retirements vs. announced retirements

#### Vital stats for announced coal retirements (2012-2021) in select regions

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Low hanging fruit already announced

#### Vital stats for at-risk coal retirements for select regions under SNL Energy's base case

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<tr>
<td>SOU</td>
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<tr>
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<td>8,898,725</td>
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<td>153</td>
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Overall, at risk coal units are similar in size, age, heat rate and utilization to already announced retirements
So why is all of this not announced yet?

Theory 1: Option theory problem - The greater the uncertainty, the greater the value of the firm’s options to invest, and the greater the incentive to keep these options open.

**Major Sources of uncertainty:**

- Regulation: Not clear how cooling rule and haze rules will play out or what a return of CSAPR would look like.

- Natural gas prices: Many utilities considering conversion to NG and uncertainty remains (i.e. LNG exports) so wait and see strategy may have value.

- Economic uncertainty: Uncertain future for U.S. fiscal policy, economic growth, and the resulting impact on power demand.

Theory 2: Game theory problem - Value to not being the first mover and change in outlook once others have made decisions.
Thank you!