

CONSOL Energy and the States of the U.S. Coal Mining and Coal-Fired Electric Generation Industries

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- Overview of CONSOL Energy Inc.
- U.S. coal-fired power industry
 - Factors affecting the industry
 - Current state of the industry
- Impacts on U.S. coal mining industry
- CONSOL Energy's forecast of the consumption of coal and natural gas by the U.S. power industry
- Concluding thoughts

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CONSOL Energy Overview

The Leading Diversified Fuel Producer in the Eastern United States

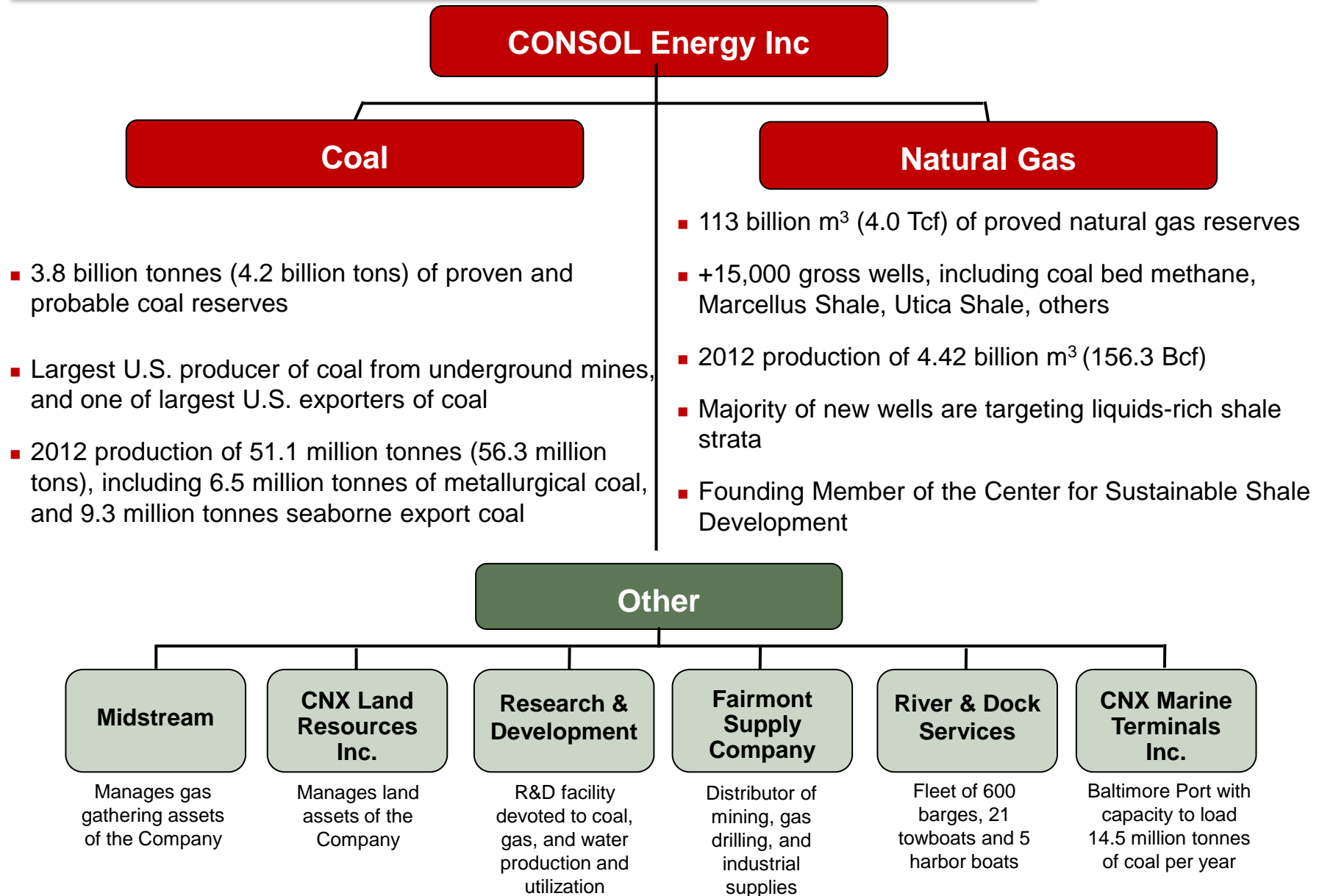


- Ticker: CNX
- Headquartered in Pittsburgh, Pennsylvania
- Company founded in 1860
- Approx. 9,000 employees
- Market cap = \$7.5 Billion⁽¹⁾
- 2012 revenue = \$5.4 Billion
- 2012 capex + \$1.6 Billion

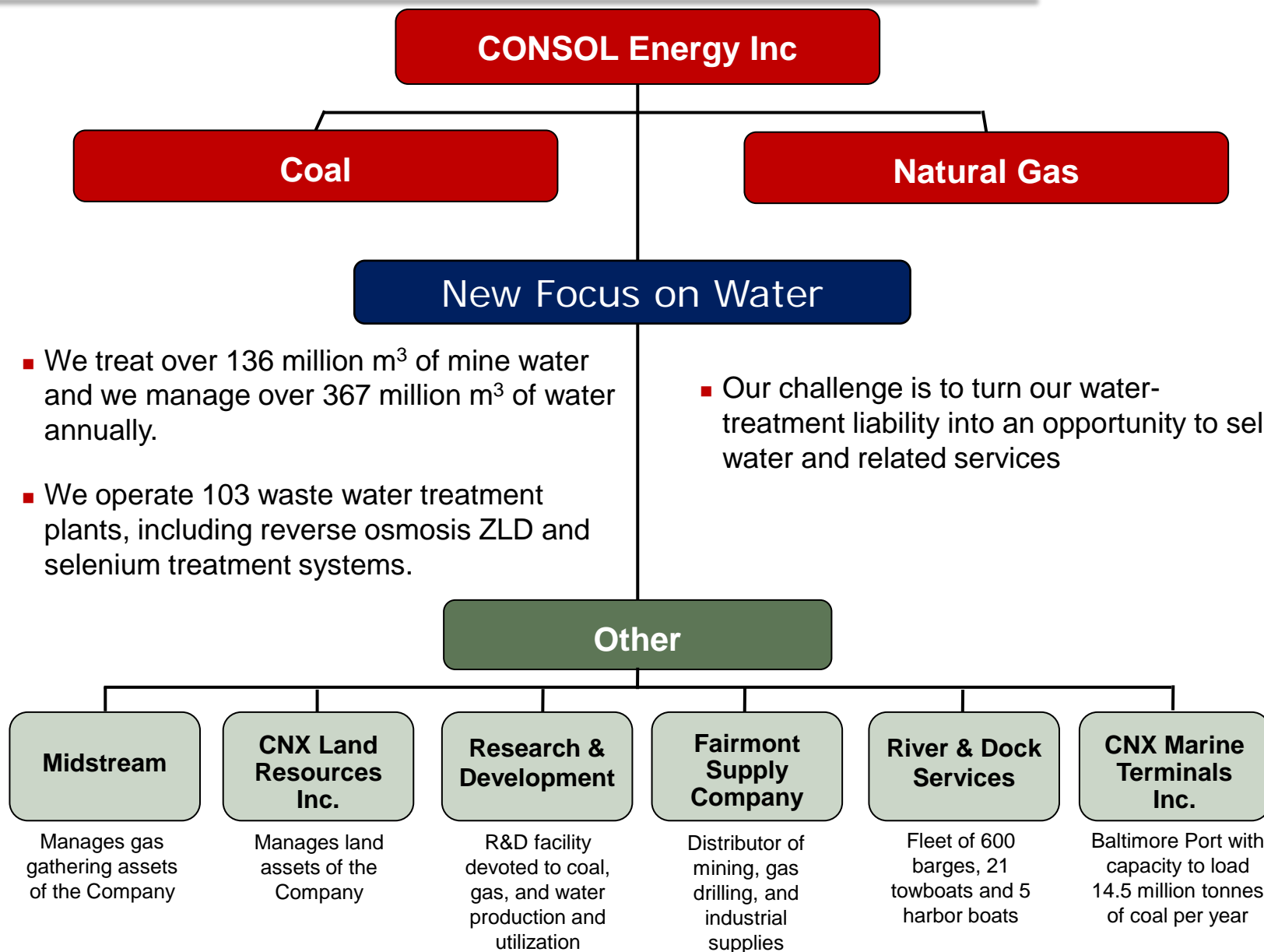


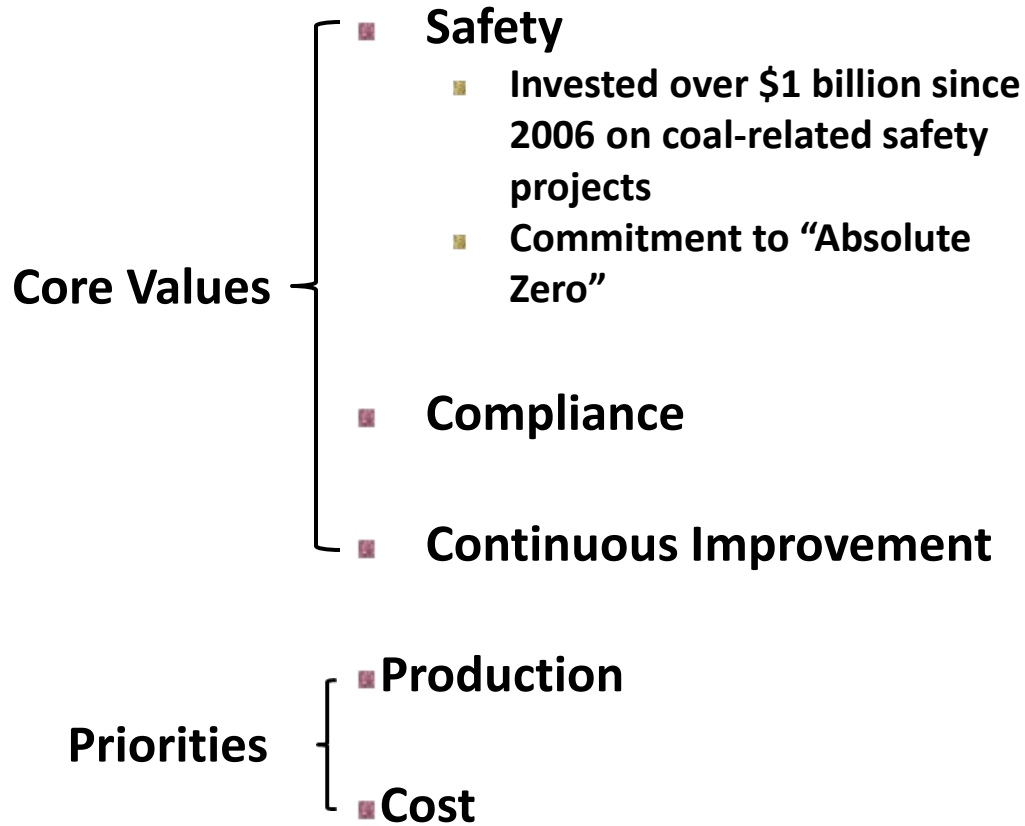
(1) As of February 12, 2013.

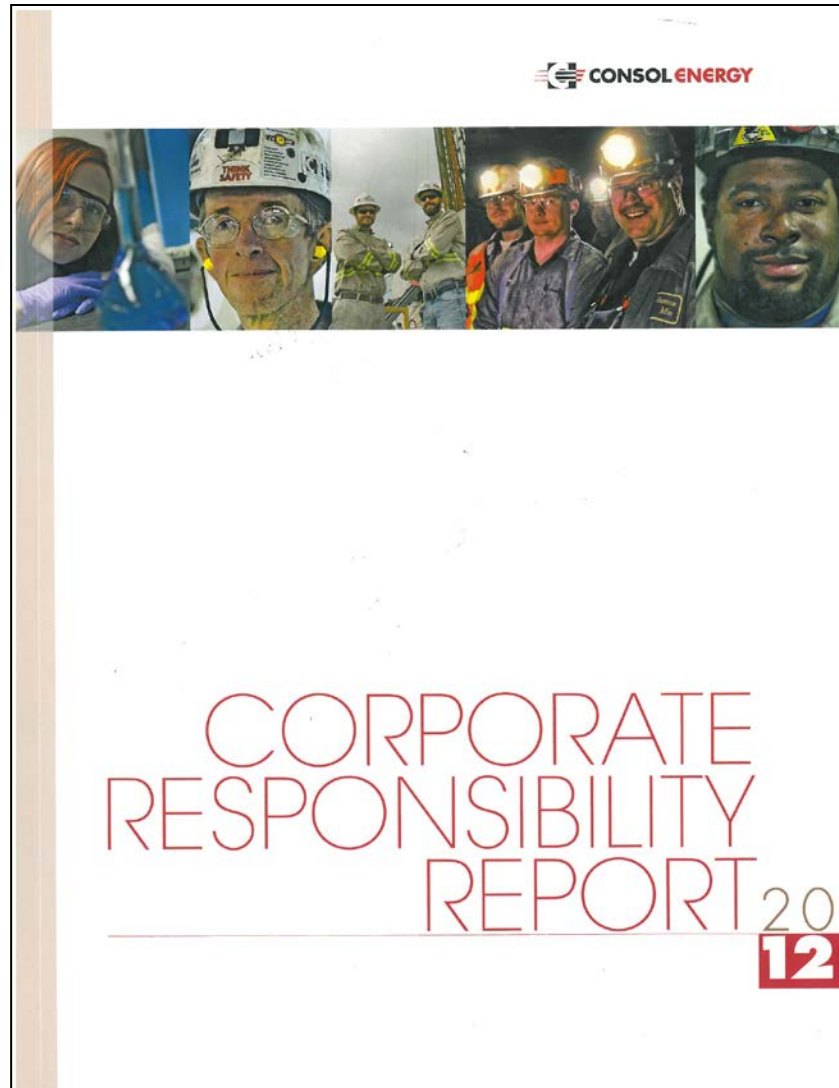
Coal and Gas: Rich Asset Base With Some Vertical Integration



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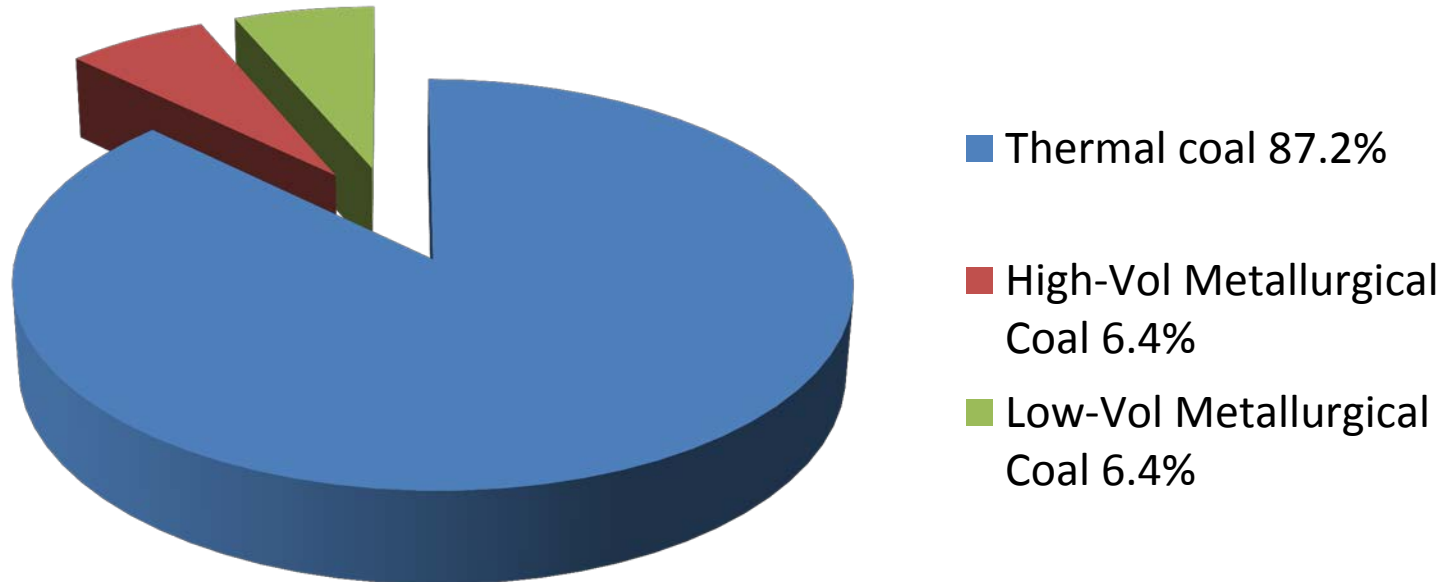




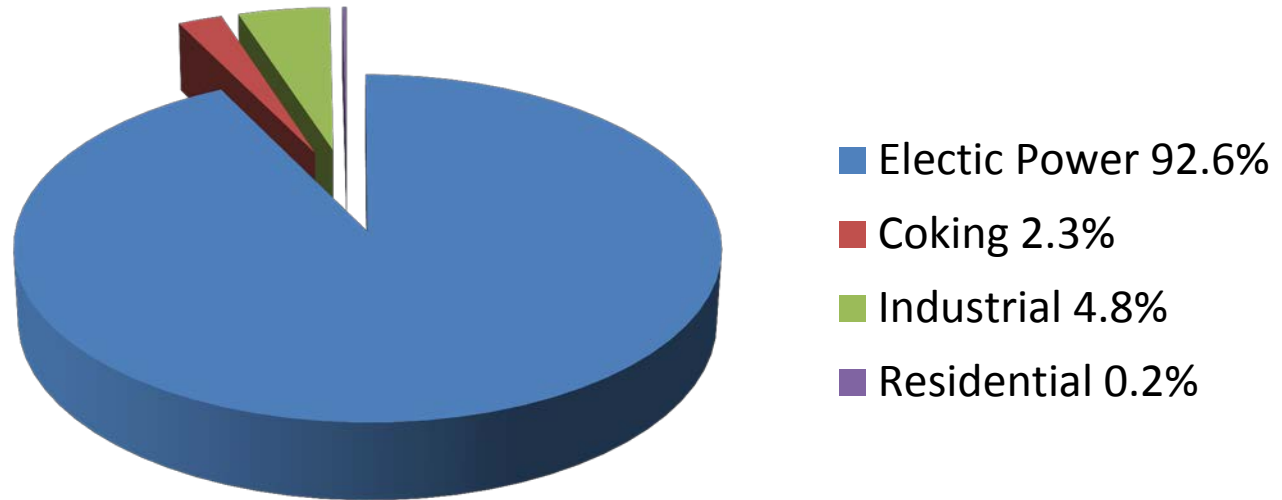


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51.1 million tonnes

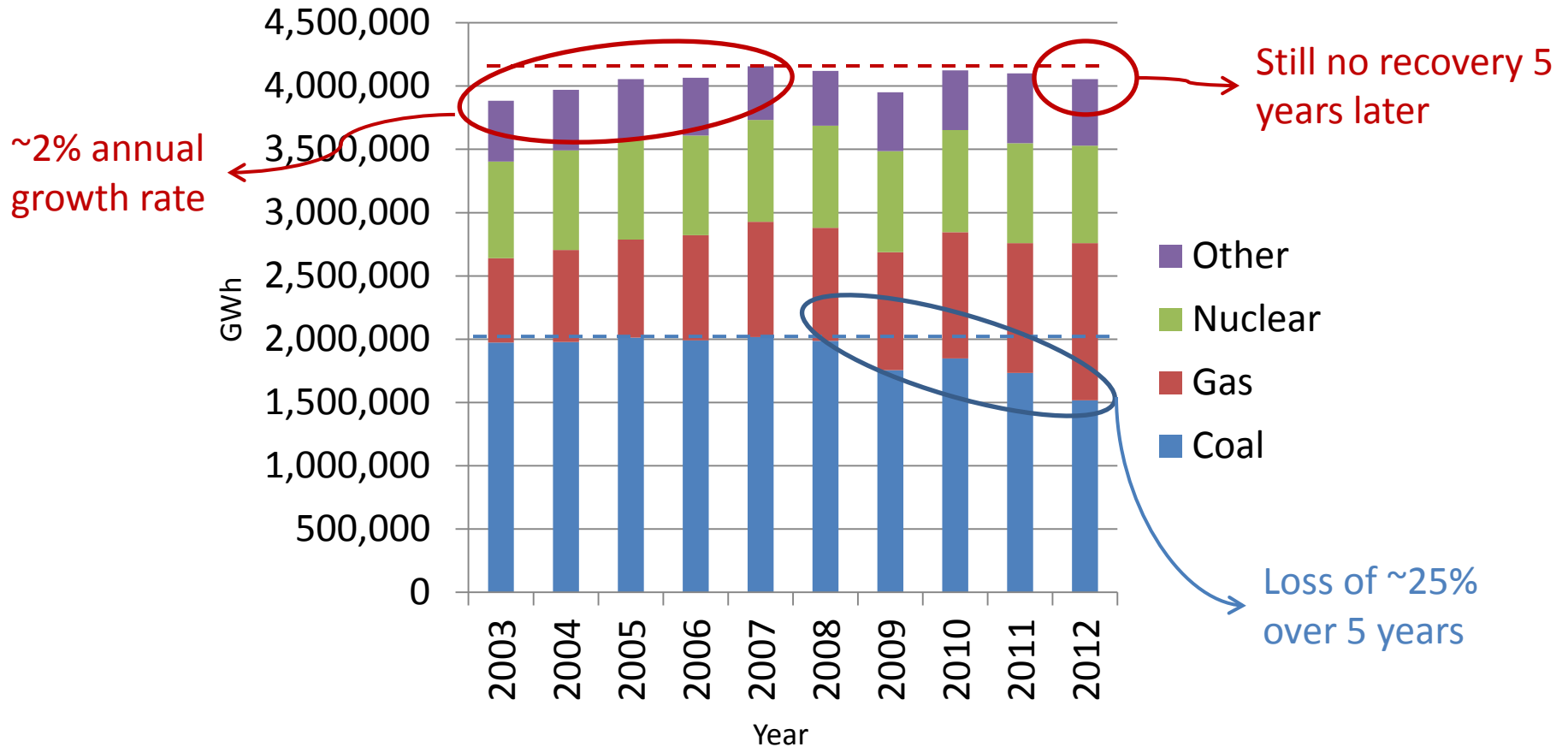


807.834 million tonnes



- 1. Business recession of 2008**
2. Newly proposed and promulgated EPA regulations
3. Low price of natural gas

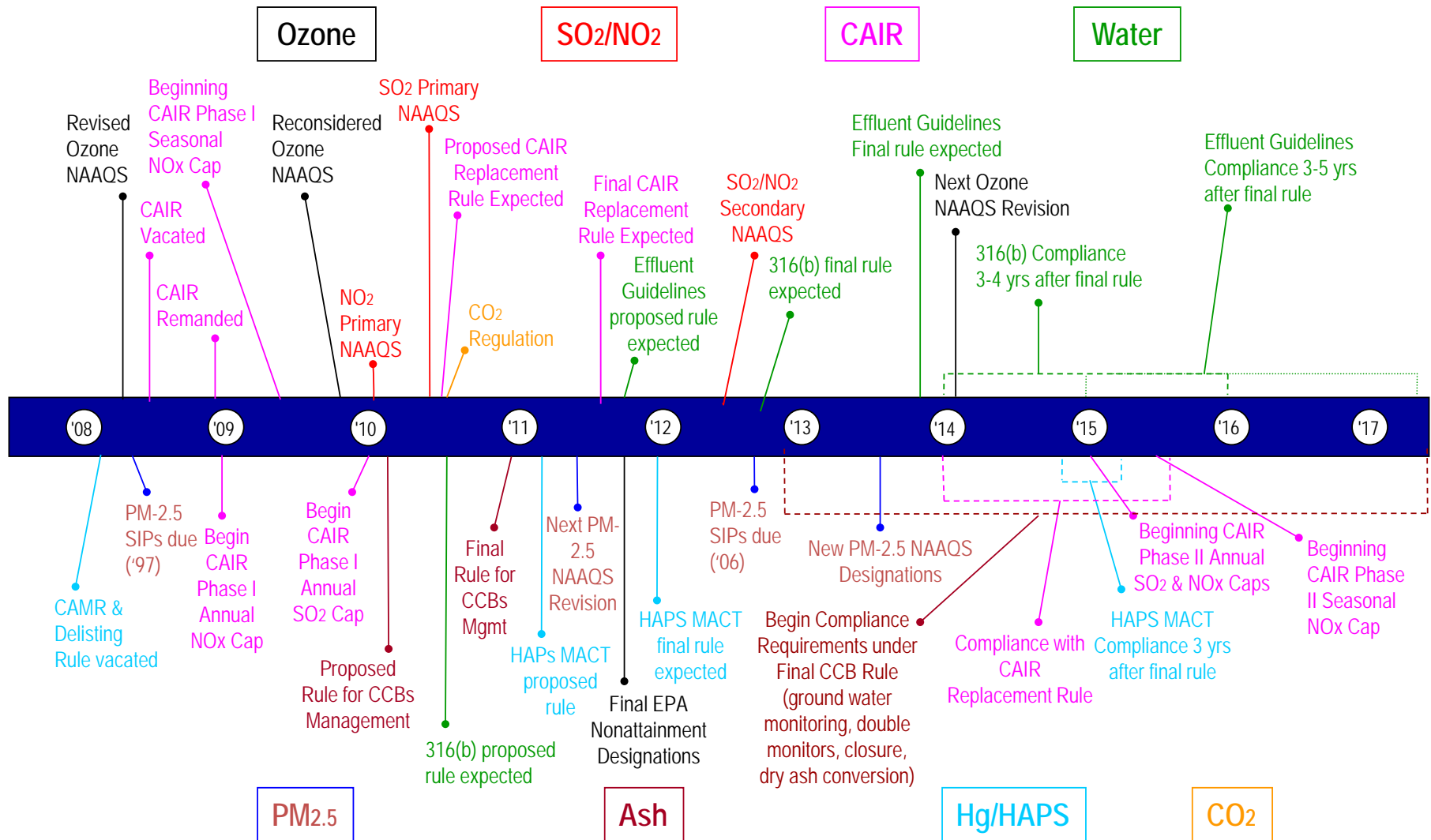
From 2% annual growth to no growth, beginning in 2008



Source: U.S. Energy Information Administration

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EPA's Regulatory "Train Wreck"



EPA Regulations Affecting Coal-Fired Power Plants: Recently Proposed/Promulgated

- National Ambient Air Quality Standards (NAAQS)
- Mercury and Air Toxics Standard (MATS)
- Cross State Air Pollution Rule (CSAPR)
- Carbon Pollution Standard for New Power Plants
- Carbon Pollution Standard for Existing Power Plants
- Coal Combustion Residuals (CCR) Rule
- Standards for Cooling Water Intake Structures [316(b)]
- Water Effluent Guidelines

Capital Costs for Air Pollution Control Retrofits

\$/kW (2010)

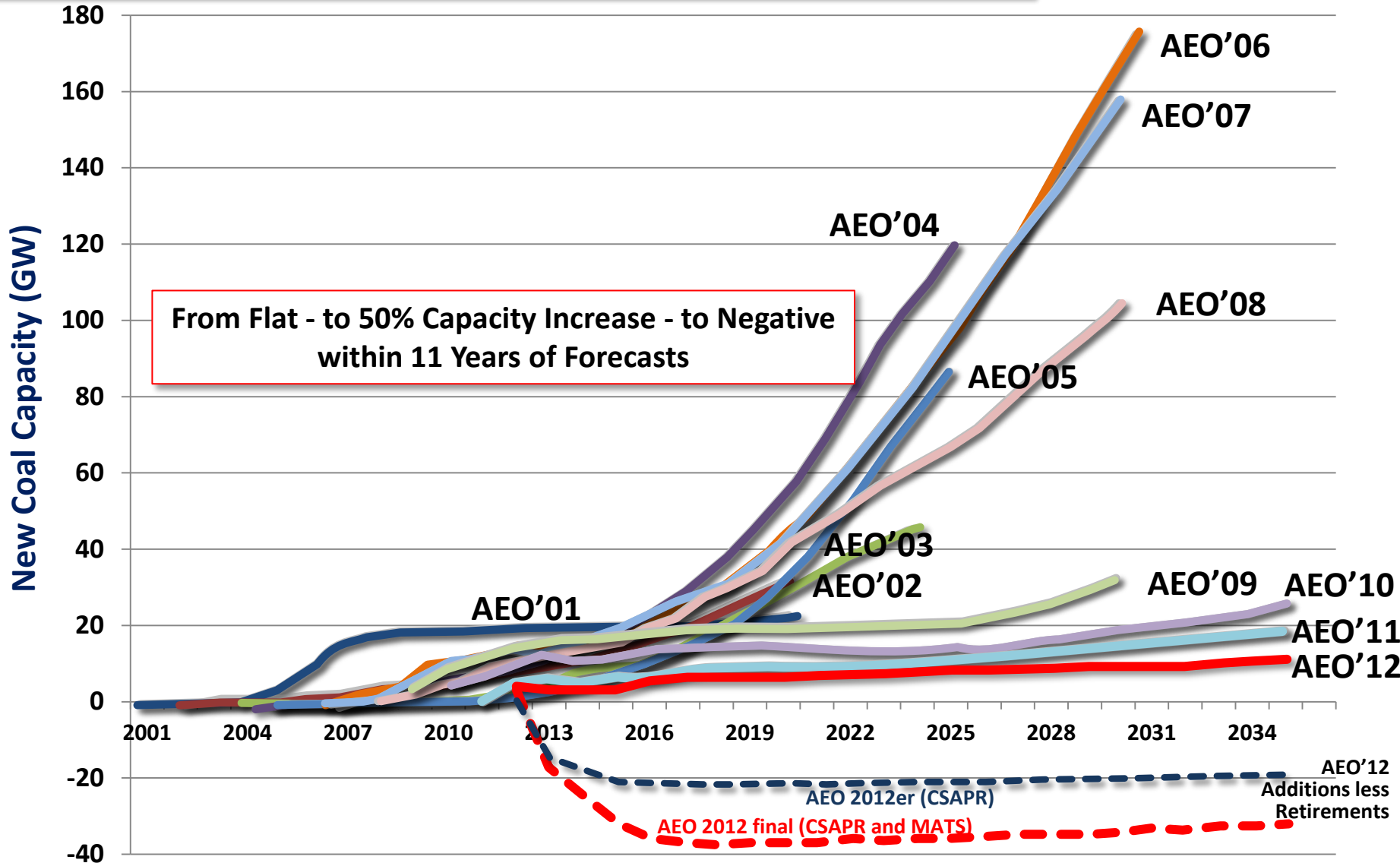
	500 MW	300 MW	100 MW
Wet Flue Gas Desulfurization	538	622	850
Selective Catalytic Reduction	201	217	268
Activated Carbon Injection	8	12	30
Fabric Filter	170	187	230
Dry Sorbent Injection	43	61	134

Source: U.S. EPA

Capital costs for pollution control retrofits can exceed the capital cost for a new natural gas combined cycle power plant

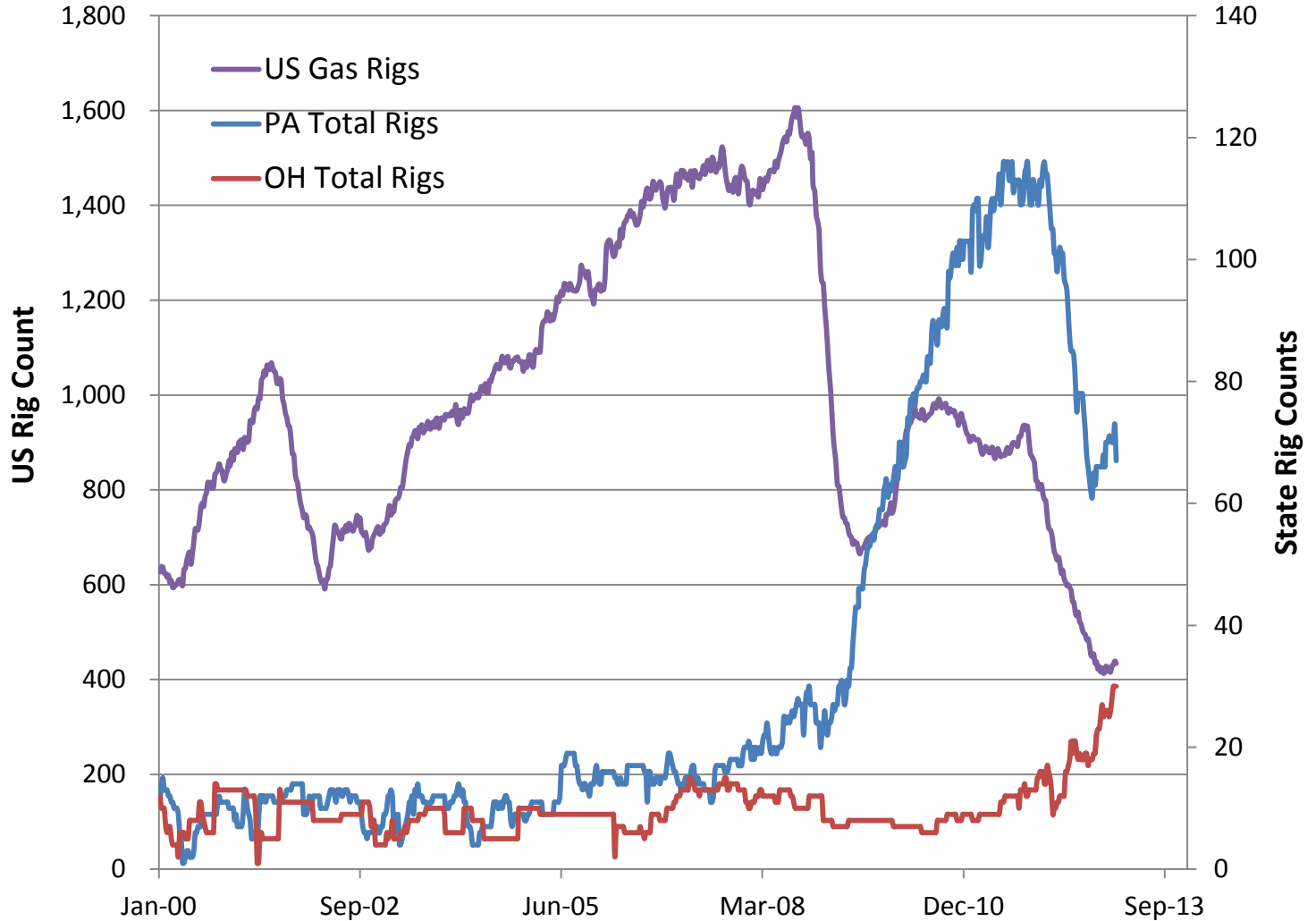
U.S. EIA Annual Energy Outlook Coal Capacity

Addition Forecasts

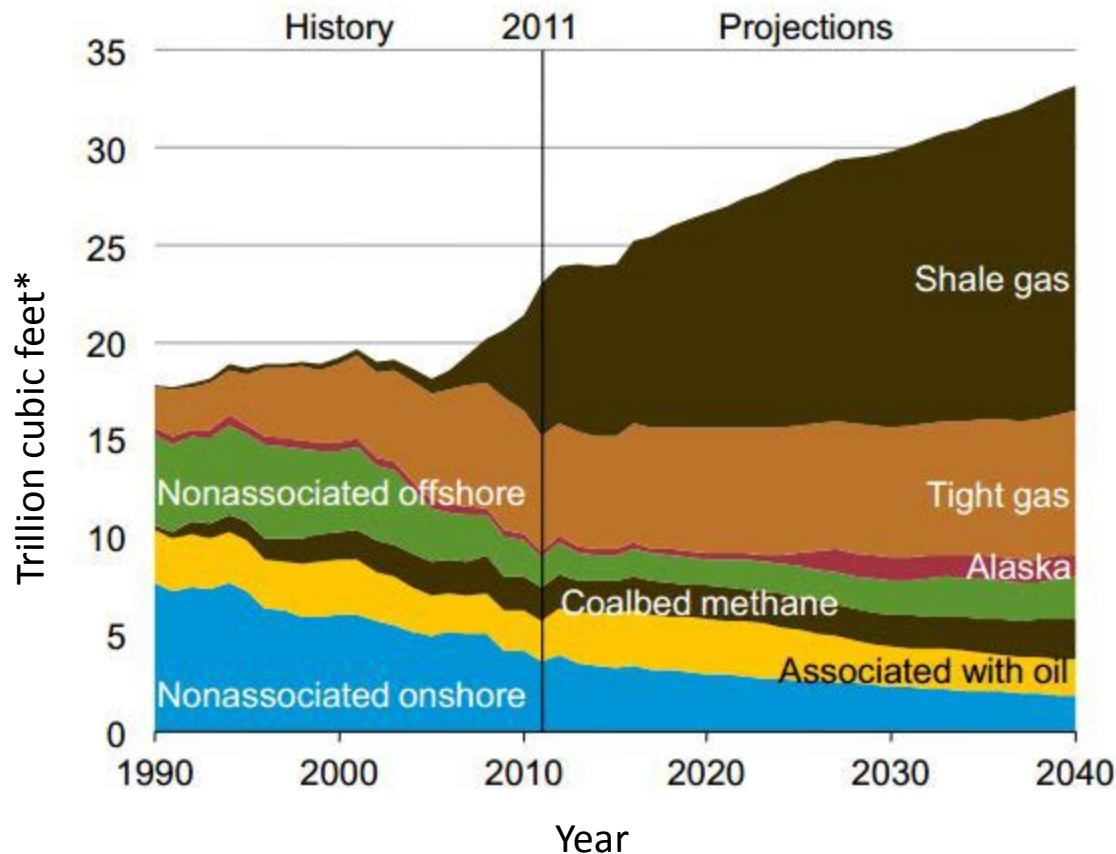


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Drilling Rig Counts



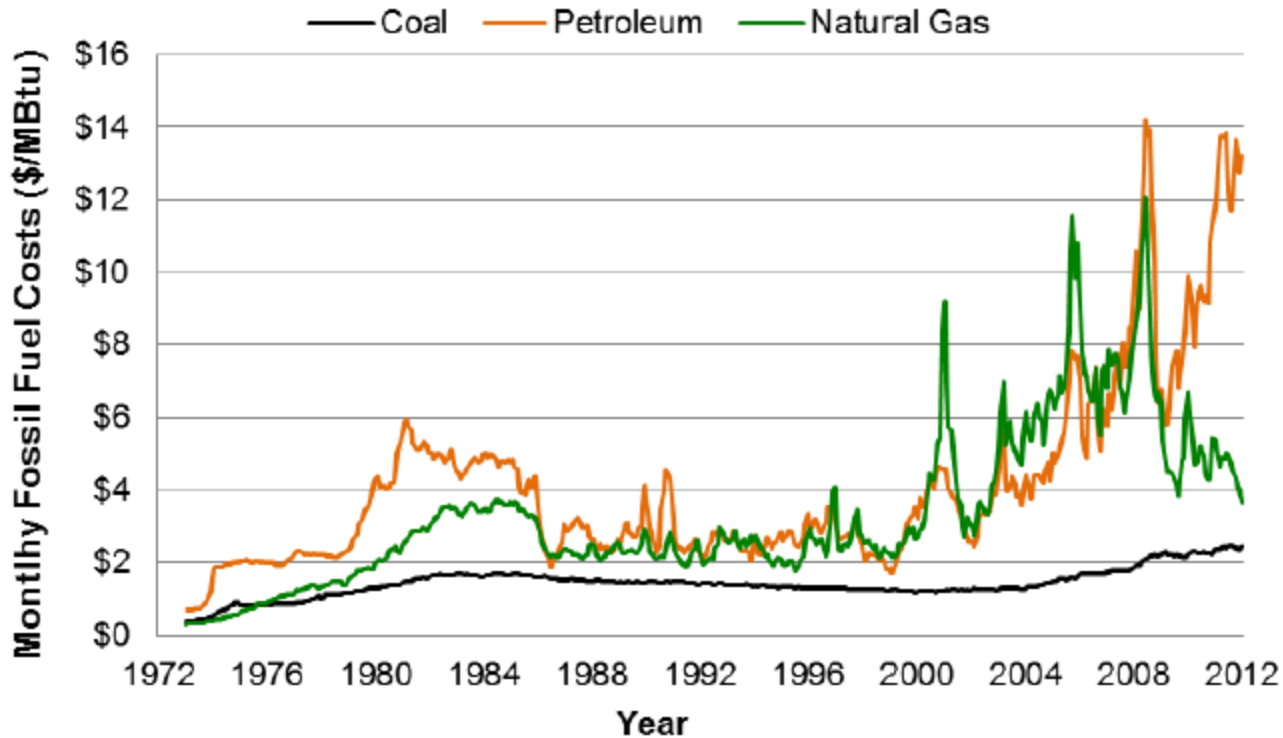
Shale Gas Production Brings a Sustained Increase in Natural Gas Supply



Source: EIA AEO2013 Early Release Overview

* 1 Tcf = 28.3 billion m³

As a Result, Natural Gas Prices are Declining, Converging with Coal Prices ...

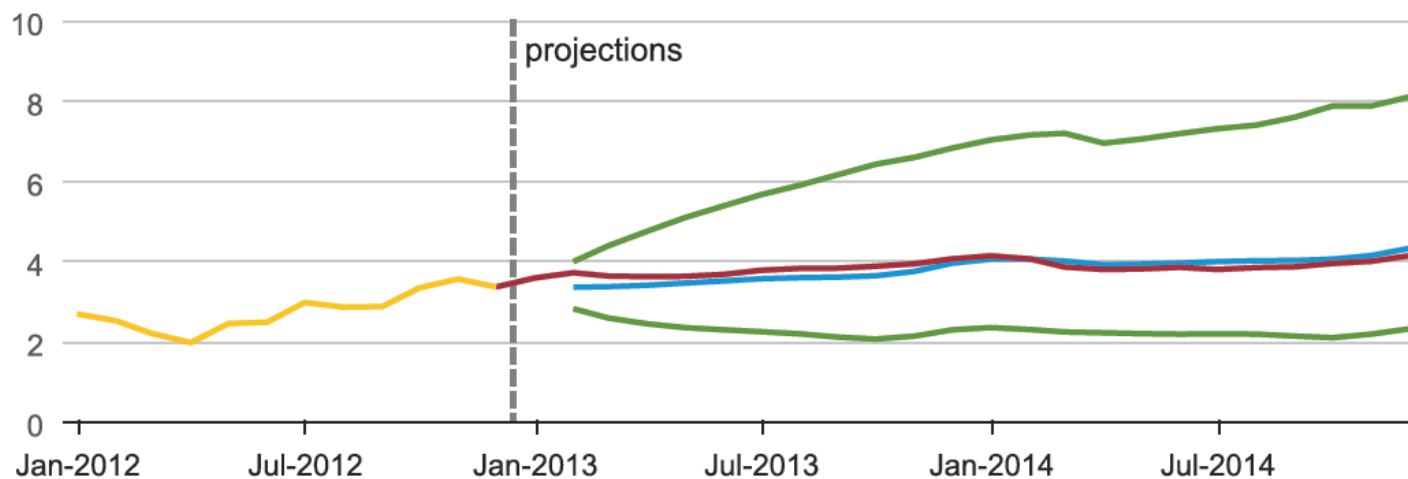


\$1/mmBtu = \$0.95/GJ

...and Projected to Remain at Moderate Levels in the Coming Years

Henry Hub Natural Gas Price

(dollars per million Btu)



- Historical spot price
- STEO forecast price
- NYMEX futures price
- 95% NYMEX futures upper confidence interval
- 95% NYMEX futures lower confidence interval

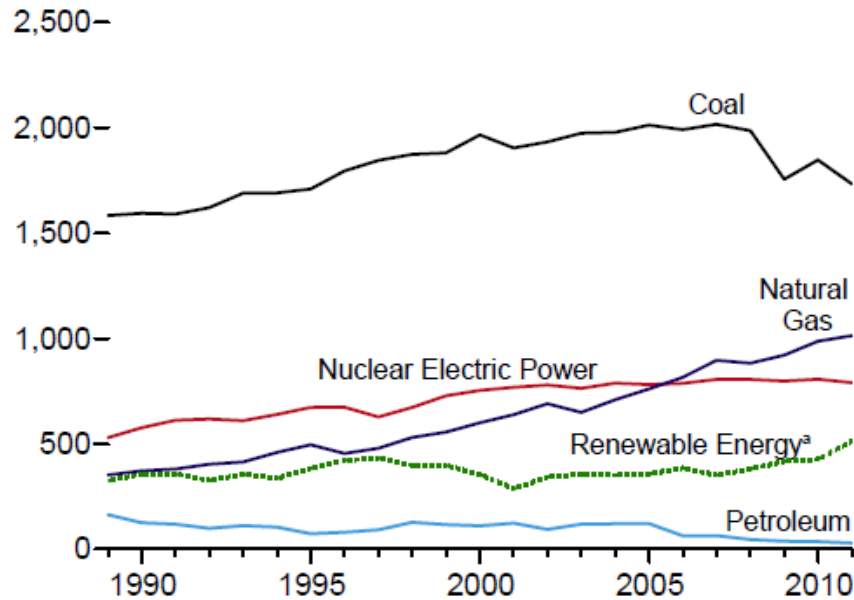


Source: Short-Term Energy Outlook, January 2013

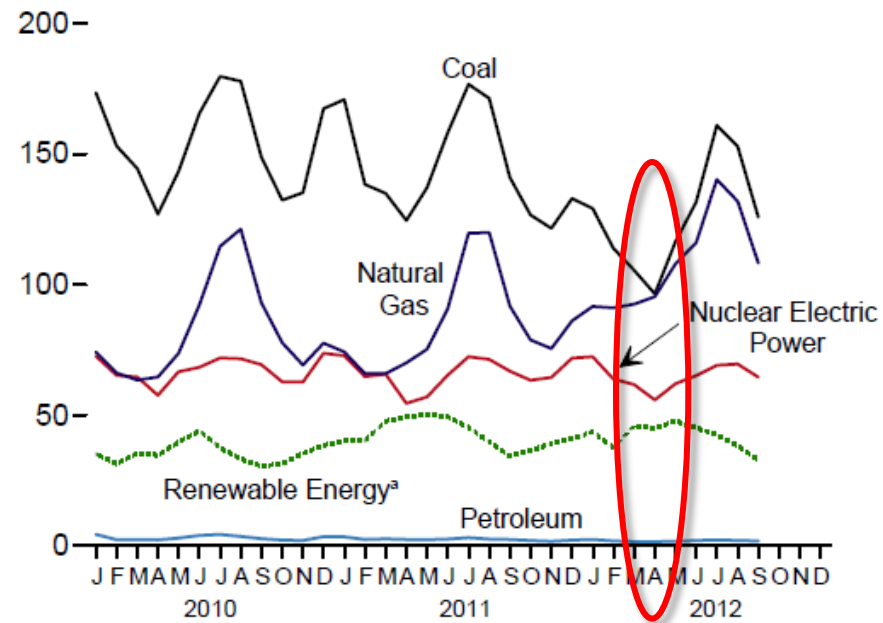
\$1/mmBtu = \$0.95/GJ

U.S. Net Electricity Generation, TWh

Total (All Sectors), Major Sources, 1989-2011



Total (All Sectors), Major Sources, Monthly



Source: U.S. EIA, *Monthly Energy Review*, December 2012

2008-2011: The Onset of Change

2008 U.S. Coal Fleet	
Units	1,091
Average unit age	40.1 yr
Net capacity	306.1 GW
SO ₂ emissions	0.73 lb/mmBtu
NO _x emissions	0.28 lb/mmBtu
Capacity factor	72%
Net generation	1,942 TWh
Coal consumption	1,045 mm tons



2011 U.S. Coal Fleet		
Units	1,047	-4%
Average unit age	41.9 yr	+4%
Net capacity	311.2 GW	+2%
SO ₂ emissions	0.49 lb/mmBtu	-32%
NO _x emissions	0.20 lb/mmBtu	-28%
Capacity factor	64%	-11%
Net generation	1,740 TWh	-10%
Coal consumption	941 mm tons	-10%

1 ton = 0.907 tonnes
 1 lb/mmBtu = 0.43 kg/GJ of fuel

2008-2011: What Happened?

- 65* coal-fired units retired, quit operating, or converted to natural gas fuel before 2011
 - 4.8 GW of capacity
 - Average unit: ~75 MW, ~47 years old, ~40% capacity factor
- 1 coal-fired unit restarted
 - 0.1 GW of capacity
- 20 new coal-fired units came online through 2011
 - 10.6 GW of capacity
 - Average unit: 528 MW, 70% capacity factor
- 180 units installed SO₂ controls, 64 installed NO_x controls

*37 units (3.6 GW) retired or converted to NG; 28 units (2.2 GW) quit operating

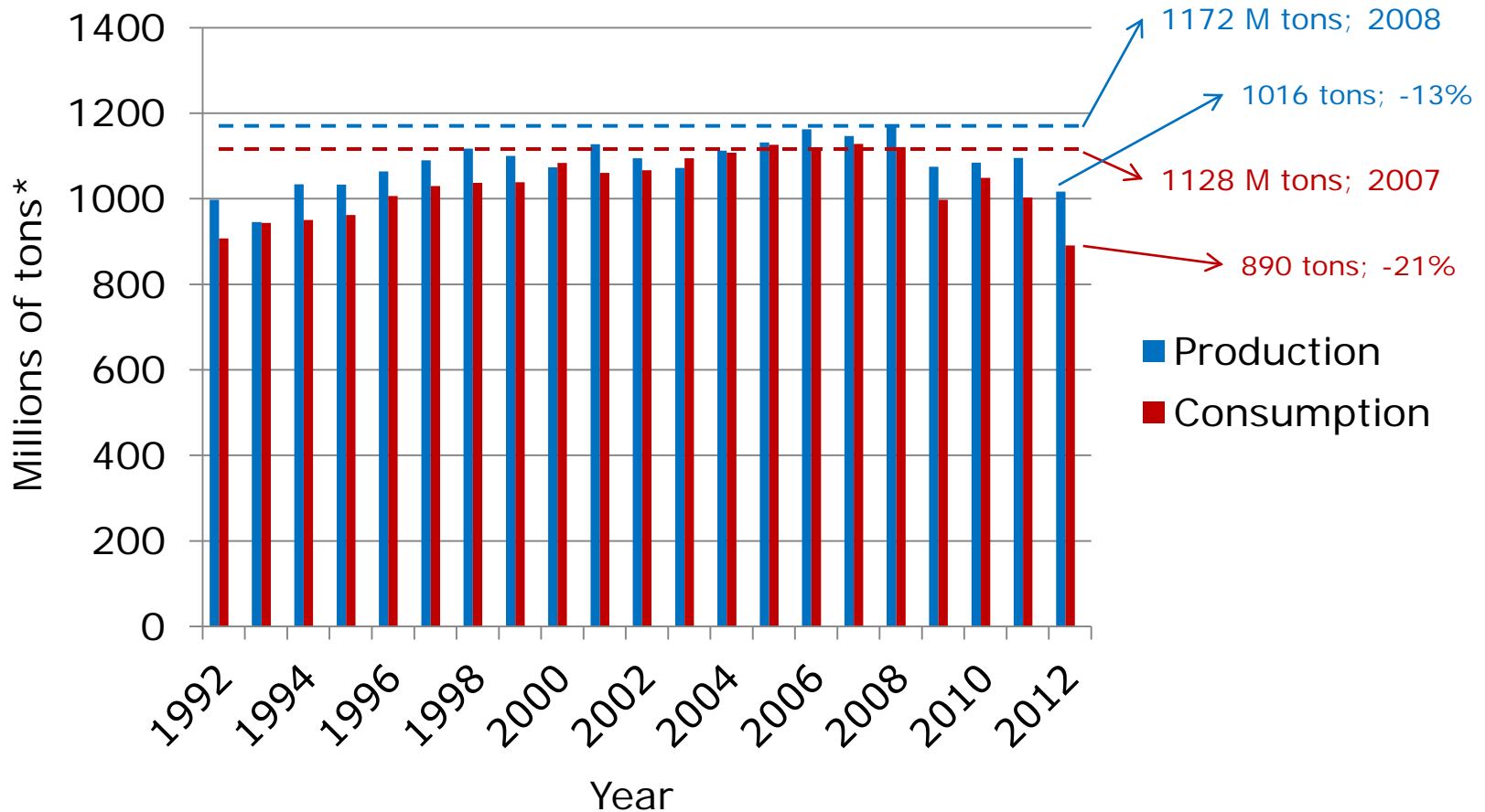
Case Study: AES Greenidge Unit 4

- 107 MWe; Dresden, NY; commissioned in 1953
- Retrofitted with hybrid SNCR/SCR, ACI, CDS, and FF in 2006
- Significant emissions reductions achieved:
 - $\geq 95\%$ for SO_2 , SO_3 , and H_2S
 - 98% for Hg
 - 0.1 lb/mmBtu for NO_x
 - < 0.001 lb/mmBtu for Pb
- Plant also completed turbine overhaul, superheater replacement, and control system upgrade



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U.S. Coal Production and Consumption by Year



*1 ton = 0.907 tonnes

Source: Energy Information Administration and National Mining Association, *International Coal Review*, June 2013

Impact of Collapsing Market on Number of Mines and Employment

	<u>2008</u>	<u>2012</u>
Number of coal mines	2,129	1,865
Coal mining employment	133,827	137,361

- As expected, the number of mines decreased by 12%
- However, there was a surprising 2.6% increase in coal mining employment
- We presume this is due, in part, to new requirements imposed by the Mine Improvement and New Emergency Response (MINER) Act of 2006

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Beyond 2011: What's Next?

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Average unit age	41.9 yr
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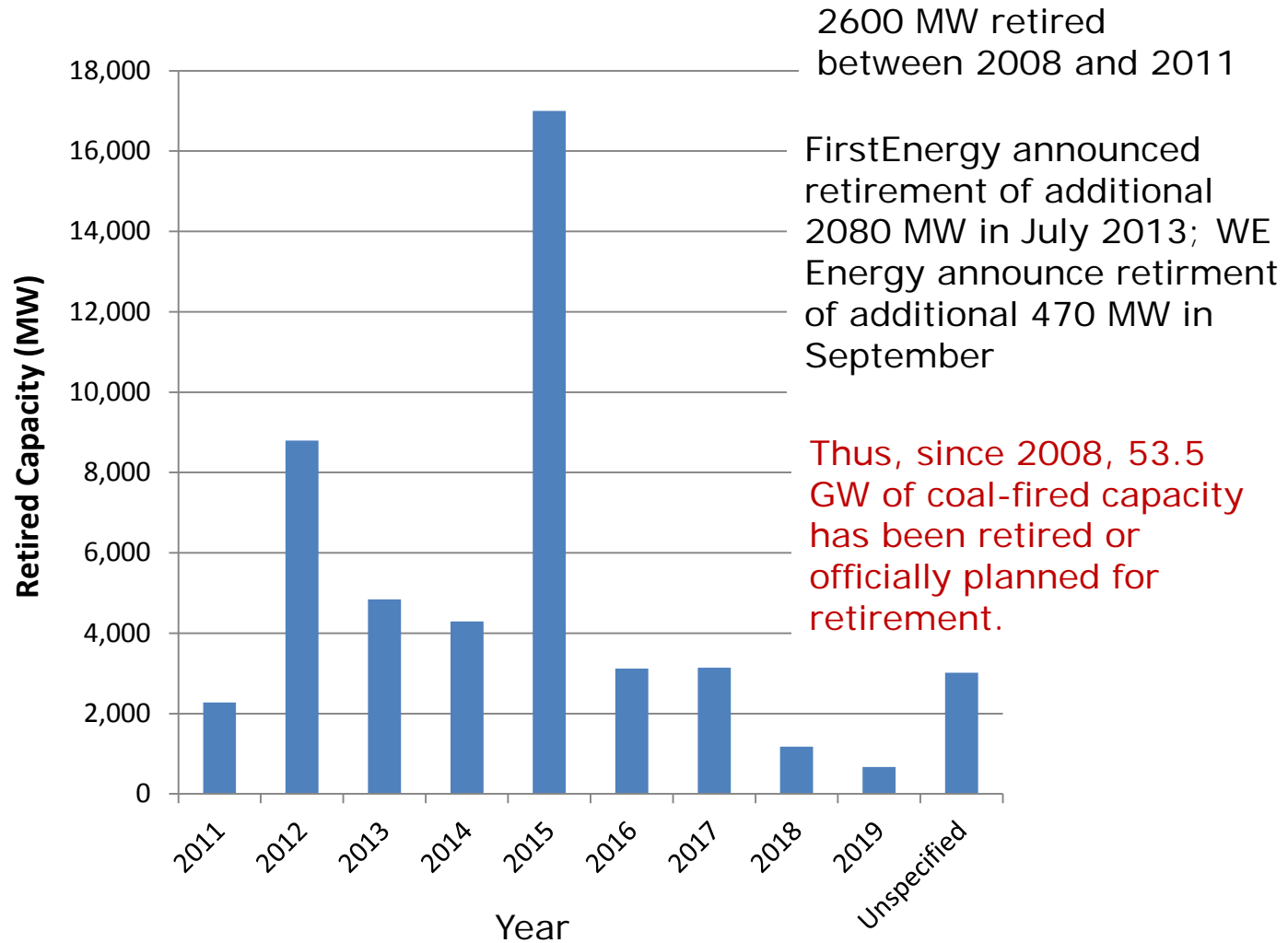
Coal Unit Retirement Projections (2012)

Analyst	Prediction (GW)	Comment
Alliance Resource Partners LP	33	
NERA Economic Consulting	38	
S&P	35-50	
Alpha Natural Resources Inc.	42.6	
Wells Fargo	43	
EIA	49	
ICF International	50	↑ from 40 GW
GAO	46.1-55.6	
FBR Capital Markets	50-55	↑ from 50 GW
Joint Institute for Strategic Energy Analysis	30-80	
Sanford Bernstein	58	
McKinsey & Co.	58	
Union of Concerned Scientists	59	
SNL	60	
Black and Veatch	64	↑ from 52 GW
Fitch Ratings	50-80	↑ from 51 GW
Brattle Group	59-77	↑ from 50-67 GW 127-149 GW with CO ₂
Goldman Sachs	70	
Wood Mackenzie	78.7	↑ from 60 GW

We Modeled the Net Impact of Retirements on U.S. Coal and Gas Demand

- Assume 2011 baseline, with zero growth in electricity demand
- Changes arise from:
 - Coal unit retirements that already have occurred (2011 and 2012)
 - Additional projected coal unit retirements (including announced retirements) at the 70 GW level
 - Auxiliary load resulting from air pollution control (APC) equipment retrofits
 - New coal capacity additions

Actual/Announced Coal-Fired Unit Retirements 2011 - 2019 (320 units, 48.3 GW total)



Typical Unit Characteristics (2011 data)

	Units Retired in 2011-2012 (87 units)	Additional Units Retired at 70 GW Level (437 units)	Remaining Units Not Retired at 70 GW Level (523 units)
Net capacity (MW)	127	135	461
Age (years)	55	51	34
SO ₂ Emissions (lb/mmBtu)	1.3	1.05	0.44
NO _x Emissions (lb/mmBtu)	0.41	0.33	0.19
Capacity Factor (%)	34	47	69

1 lb/mmBtu = 0.43 kg/GJ of fuel

New U.S. Coal-Fired Generating Units

These units started up in 2012 or 2013, or are under construction

Unit	State	Capacity, MW	Year of Start-Up
Prairie State Energy Campus 1	IL	800	2012
Virginia City Hybrid Energy Center	VA	586	2012
Prairie State Energy Campus 2	IL	800	2012
John W Turk Jr Power Plant 1	AR	609	2012
Cliffside 6	NC	825	2012
Sandy Creek Energy Station	TX	937	2013
Edwardsport IGCC Station	IN	600	2013
Plant Ratcliffe	MS	600	2014

Total = 5,757 MW

Coal and Natural Gas Demand Under 70 GW Retirement Scenario

	Capacity (GW)	Net Generation (TWh)	Coal Demand (million tons)	Electric Power Natural Gas Demand (Tcf)
Baseline Data: 2011	311.2	1,740	942	7.6
Coal unit retirements: 2011-2012	-11.1	-33	-17	+0.3
Projected retirements: 2013-2019	-59.0	-245	-133	+1.9
Derates from air pollution control retrofits	-1.3	-8	0	+0.1
New coal capacity additions	+5.8	+40	+19	-0.3
Projection: 2020	245.6	1,494	811	9.5
	(-21%)	(-14%)	(-14%)	(+25%)
Potential additional generation if remaining units run at 2008 capacity factor	0	+182	+94	-1.4
Projection: 2020	245.6	1,676	905	8.1
	(-21%)	(-4%)	(-4%)	(+6%)

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1 Tcf = 28.3 billion m³

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Concluding Thoughts

- The U.S. coal industry is being squeezed from both ends
- It seems unlikely that there will be any new coal-fired power plants built in the next 10-15 years in the U.S.
- At least 53.5 GW and probably 70 GW of coal unit retirements are likely before 2020, but the loss in coal demand could be significantly less severe than the loss in capacity
- U.S. coal production largely depends on:
 - U.S. economic growth – return of manufacturing
 - Natural gas prices
 - Coal export market
- CONSOL Energy's path forward:
 - Protect the existing coal fleet
 - Look to natural gas as an engine for growth