

Determining The “All In” Cost to Continue Operating

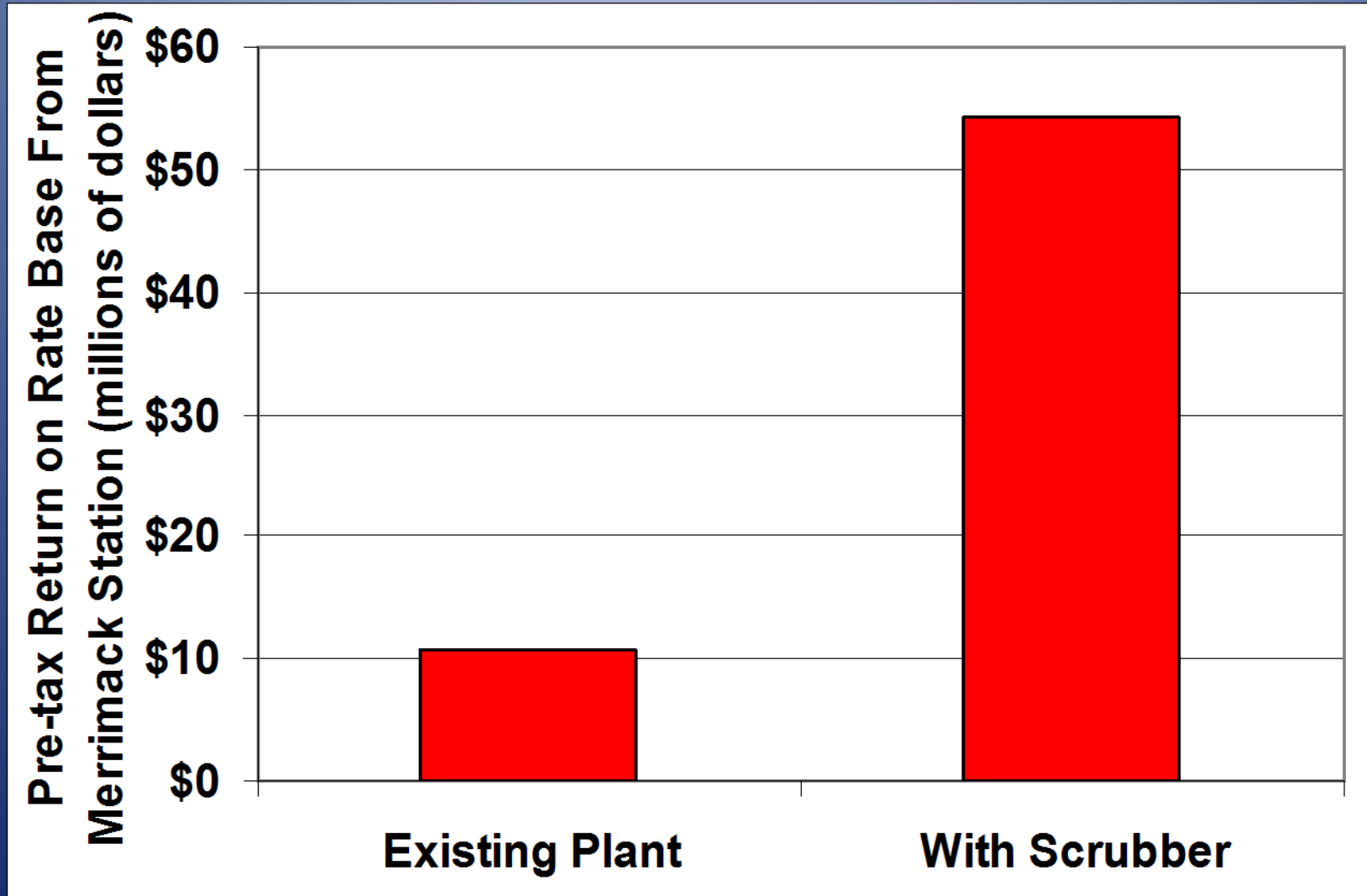
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When to Fold 'Em: Many Old Coal Units Will Be Cheaper to Retire

- December 2009: Progress Energy files with North Carolina to retire 550 MWs of Coal Units rather than retrofit with SO₂ control
- March 9, 2010 Bernstein Research analysis:
 - “... the cost of installing scrubbers will be prohibitive at certain coal fired power plants, particularly those older, less efficient units whose high operating costs, consequently limited hours of operation, and short remaining useful lives make it impossible to recover the capital cost of a scrubber out of the future cash flows of the plant... [a requirement to install a scrubber] would likely result in the retirement of coal fired power plants that today generate 452 million MWh (24% of U.S. coal fired generation), while forcing plants that generate an additional 537 million MWh (29% of total) to install SO₂ scrubbers.”
- Enforcement increasingly resulting in retirement or gas switches rather than pollution control retrofits
 - AMP Ohio Gorsuch Station (4 x 53 MW units to be retired)
 - Duke Indiana Gallagher Plant (2 of 4 units retiring or switching to gas)

Incentive for IOUs to Retrofit



Cost to Retire Occurs **Once**

Cost to Continue Operating Is Cumulative

- Cost to Retire:
 - Cost of Replacement Power
 - Unused Gas CT and CC Capacity
 - Lower Natural Gas Prices
 - Reduced Load Forecasts
- Cost to Continue Operating
 - CO₂
 - Fine PM (PM_{2.5})
 - NO_x
 - SO₂
 - Mercury/HAPs
 - Coal Ash Disposal
 - Water intake and thermal discharges
 - Wastewater treatment plant

Known Knowns and Known Unknowns

“... because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns -- the ones we don't know we don't know.”



- Donald Rumsfeld

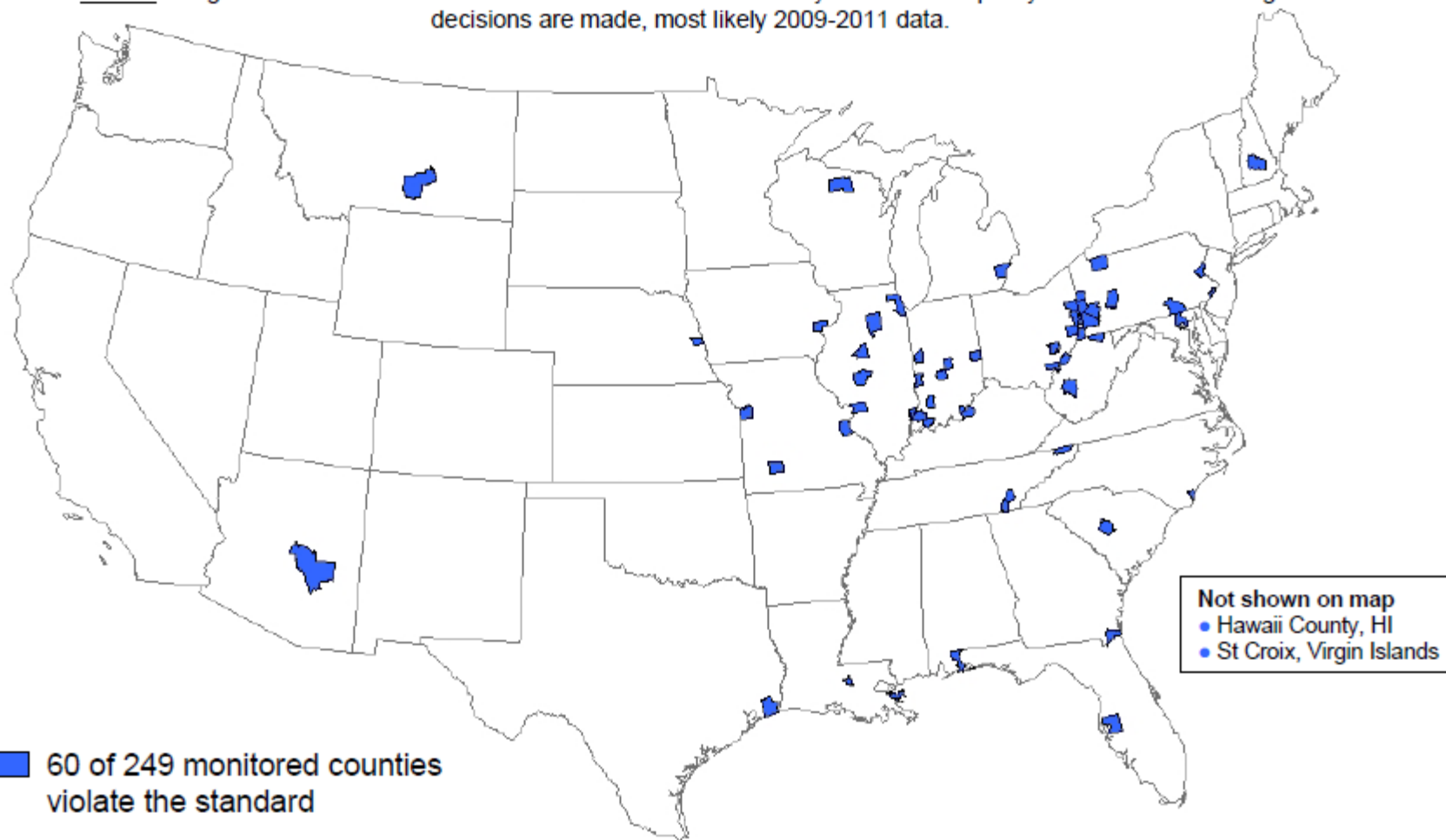
Known Knowns

- EPA Promulgated new NAAQS for 1-Hour NO₂ and SO₂
 - Many existing plants will not meet 1-hour SO₂
- New Carbon Monoxide Standard next year
- Mercury/HAPs regulations will be proposed and adopted next year.
- EPA will tighten ozone and fine PM_{2.5} standards this year
- EPA will adopt a replacement for CAIR
- EPA will adopt Greenhouse Gas Regulations
- EPA will need to revisit BART/CAIR issues

Counties With Monitors Currently Violating the Revised Primary 1-Hour Sulfur Dioxide (SO₂) Standard of 75 ppb

(Based on 2007 – 2009 Air Quality Data)

EPA will not designate areas based on these data but will use the currently available air quality data at the time designations decisions are made, most likely 2009-2011 data.



Notes:

1. Data are shown for monitors that met the following criteria: 75% of the day has valid hourly values, 75% of the days in a quarter are valid, and all 4 quarters for each of the three years are valid as well as other applicable data handling conventions included in 40CFR50 Appendix T.

Known Unknowns

- **How** EPA will replace CAIR
- **How** EPA (or Congress) will regulate Greenhouse Gases
- **How** stringent EPA's Mercury/HAP standards will be
- **What** technology might develop to meet new standards
- **How** EPA will regulate waste (coal ash)
- What will be required for cooling systems (intake and discharge)

Key Assumptions

- Every existing coal-fired boiler will be required to install **some** additional pollution controls
- Most will need to install controls for mercury, sulfur, nitrogen oxides, and particulates
- Some will not be able to meet standards *even with* controls
- The likely required controls will be in phases but installed in the next ~5-8 years.

Yes

- Cost to retire
 - Replacement power selected by modeling analysis
 - (Should include replacement through generation and efficiency savings)
- Cost to continue operating
 - Scrubber:
 - \$420+/kw (average)
 - Smaller than 300 MW will be higher
 - Recent applications for approval at ~\$600/kw
 - SCR
 - \$200+/kw average in 2007
 - Recent applications for approval at ~ \$360/kw
 - Baghouse
 - \$70+/kw
 - Plus operating costs and decreased net generation
 - Conversion to dry ash handling, upgrades to fly ash handling, and landfill
 - \$60-85 million
 - Wastewater treatment
 - \$120-150 million
 - Additional externalized damages caused by coal generation ~ 1.7 – 3.2cents/kwh
 - Range of GHG costs
 - *E.g.*, \$10 and \$20/ton beginning in 2013 and increasing over time.

No

- Cost to retire
 - Replacement power selected by modeling analysis
- Cost of the next pollution control cost in the queue
 - Ensures either stranded cost when the next expenditure is required, or a “money pit” plant.

1) Don't Spread Out Decision Making

2) Continuing Operation Will Be Expensive.

3) The analysis of how much it will cost to keep operating for 10+ years needs to be made before the first investment is made.

"If I know the answer I'll tell you the answer, and if I don't, I'll just respond, cleverly."

- Donald Rumsfeld