A Sustained Coal Recovery? "When You Get There, There's No There There"

Institute for Energy Economics and Financial Analysis
IEEFA.org

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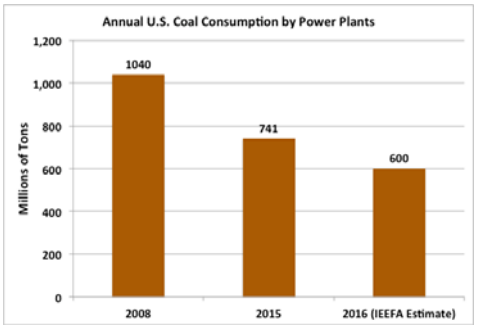
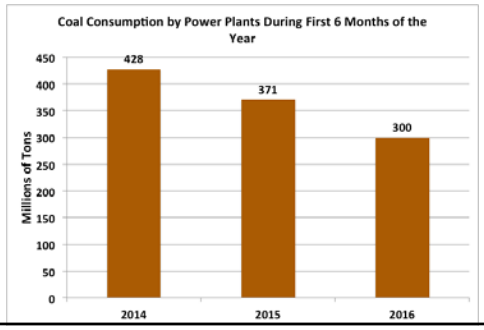
A "Perfect Storm" of Market, Technological and Regulatory Developments are Undermining the Financial Viability of Many Coal-Fired Generators

- Continued low natural gas and energy market prices.
- Dramatically increased competition from wind & solar.
- Flat or nearly flat peak demands (MW) and energy loads (MWh) – *More Competition for the same amount of pie.*
- Electricity from coal-fired generators displaced by output from renewable and natural gas-fired units.
- An aging coal fleet.
- Volatile capacity market prices.
- EPA regulations

Declining U.S. Coal Consumption





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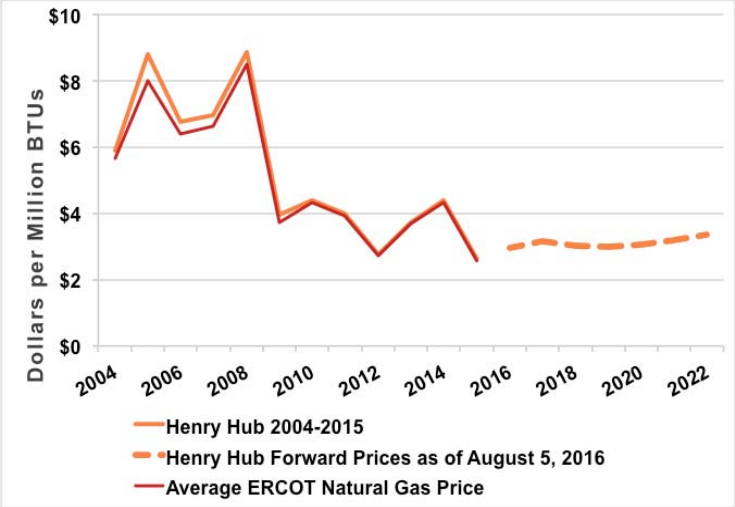
Natural Gas Prices Have Declined Since 2008 and Are Expected to Remain Low



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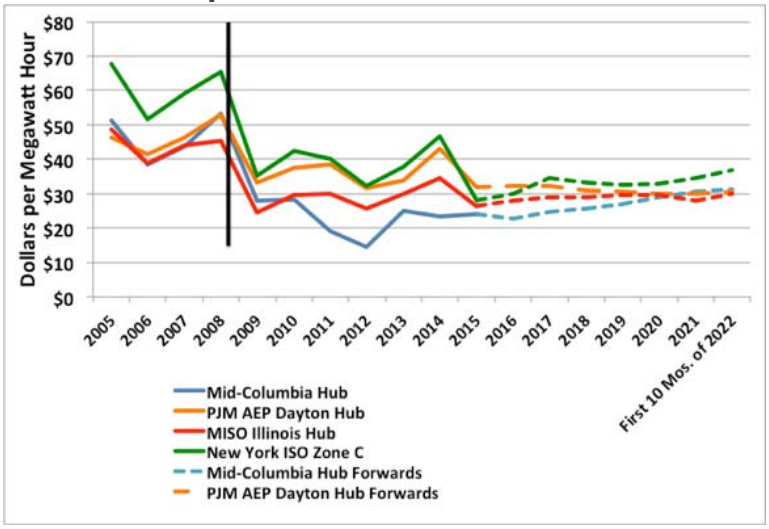
Low Gas Prices Lead to Lower Energy Prices in Competitive Wholesale Markets



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More Gas-Fired Capacity is On the Way

- 16 GW of new gas-fired capacity under construction in PJM. Another 2.7 GW is in advanced development stage, according to SNL Financial. This means that it has met two of the following: necessary permits obtained, financing obtained, EPC contract signed, PPA signed, and turbines secured.
- 3.1 GW of gas-fired capacity under construction in ERCOT, with another 7.8 GW in advanced development.
- 1.7 GW of gas-fired capacity under construction in MISO.

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Solar and Wind Pose Serious Threats to Financial Viability of Coal Plants

- Solar and wind installation costs and power purchase agreement (PPA) prices have been declining dramatically in recent years.
- With no fuel costs, utility-scale solar and wind facilities are dispatched ahead of coal plants – displaces energy from coal.
- Solar generation acts to keep energy market prices low during periods of peak demands. Wind generation puts pressure on market prices in both peak and off-peak hours.
- Distributed rooftop solar photovoltaic resources reduce loads on the electric grid and, therefore, reduce the need for generation from coal (and natural gas) plants.

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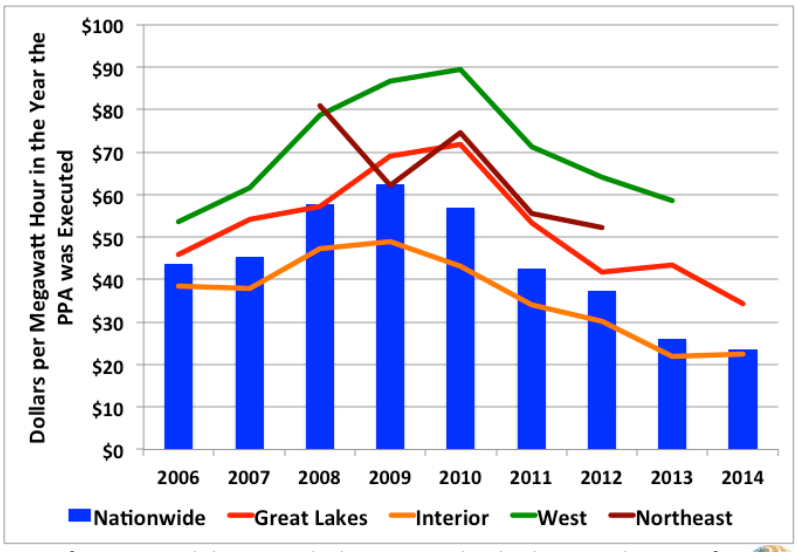
Declining Wind PPA Prices in Recent Years



[Lawrence Berkeley National Lab – 2014 Wind Technologies Market Report]

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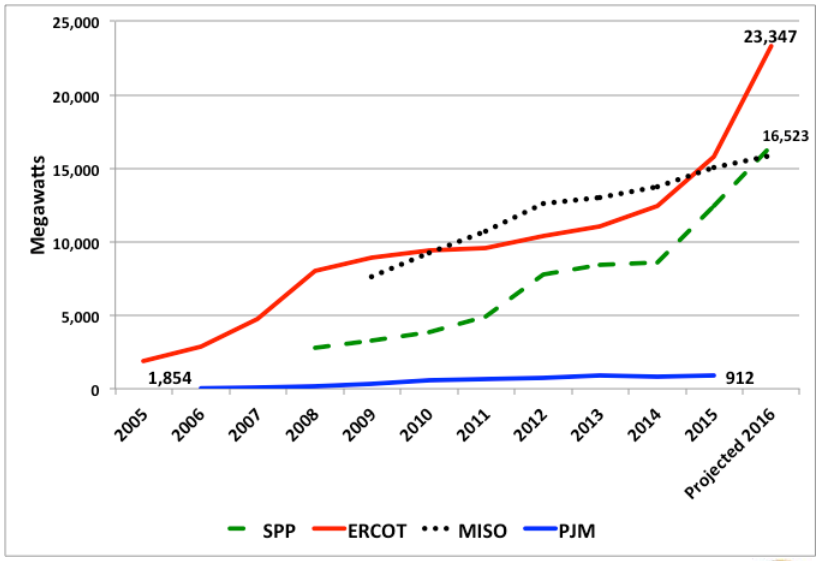
Dramatic Increases in Wind Capacity, Except in PJM



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Wind Highlights

- Wind provided 32% of the energy in MISO's North region in the 7 month period October 2015 through April 2016, with a high of over 42% of the energy in April 2016.
- 48.32% of the system load in SPP was served by wind at 2 am on April 5th.
- 48.28% of the load in ERCOT was served by wind on March 23rd, and 45.14% on February 18th.
- Wind capacity factors are improving. The average capacity factor for 15,029 MW of wind in MISO was 40.9% in February 2016.

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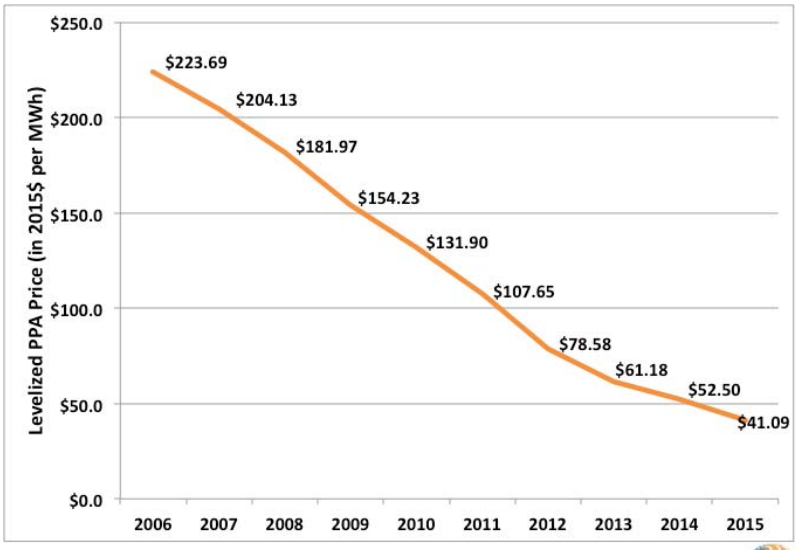
Solar PPA Prices Dropping Like They're Hot



[LBNL – ***Utility-Scale Solar 2015: An Empirical Analysis of Project Cost, Performance and Pricing Trends in the United States*****]**

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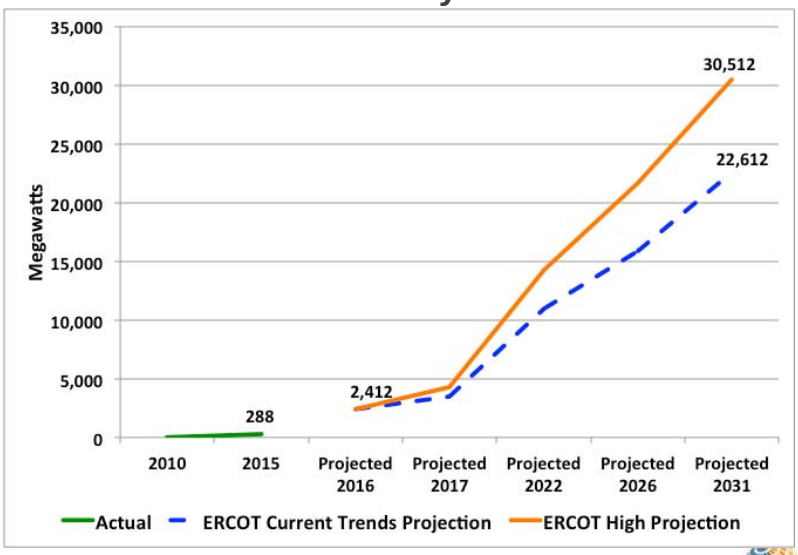
Solar Coming in ERCOT
"As Far as the Eye Can See"



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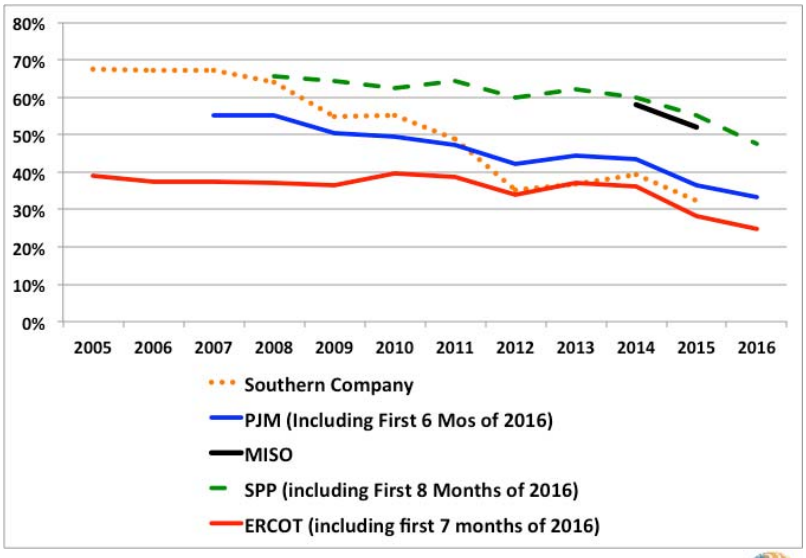
Coal's Declining Market Share



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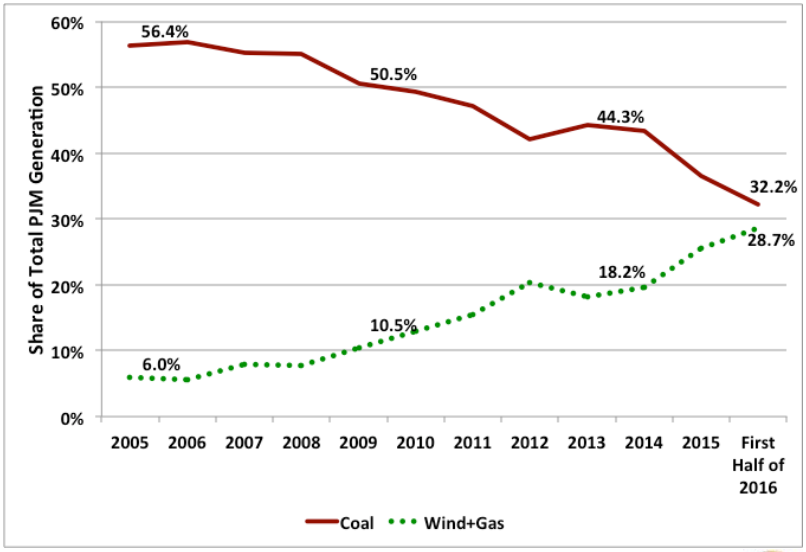
Gas and Wind Displacing Coal in PJM



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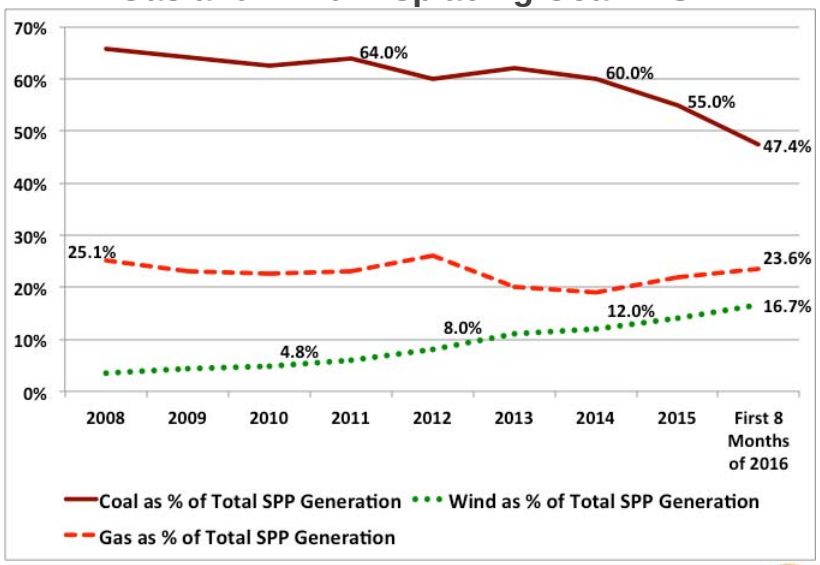
Gas and Wind Displacing Coal in SPP



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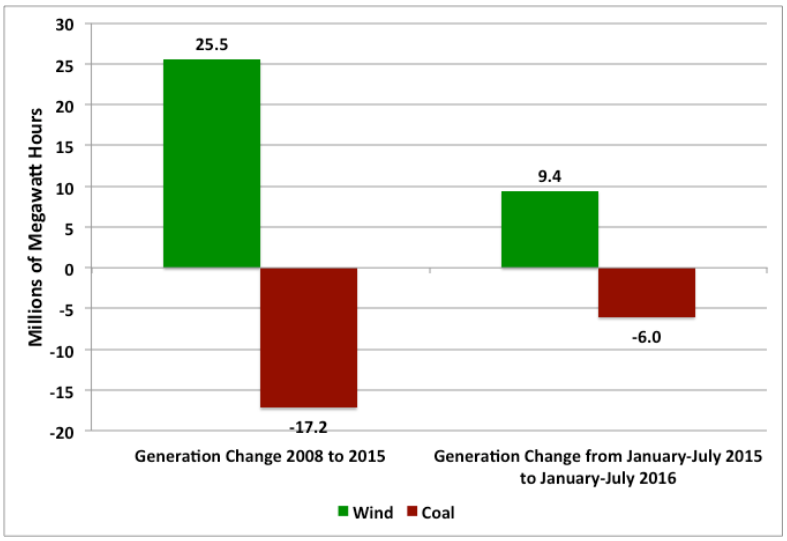
Wind Replacing Coal-Fired Generation in ERCOT



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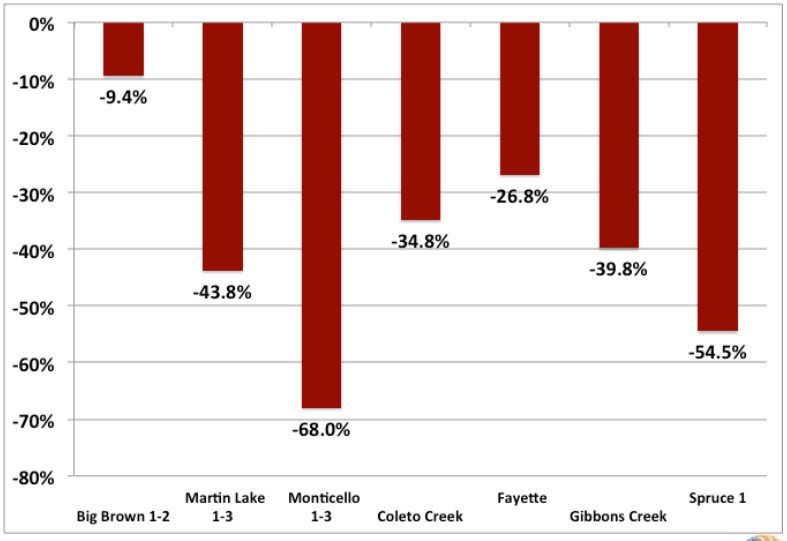
Declines in Generation at Texas Coal-Fired Generators Between 2008 and 2015



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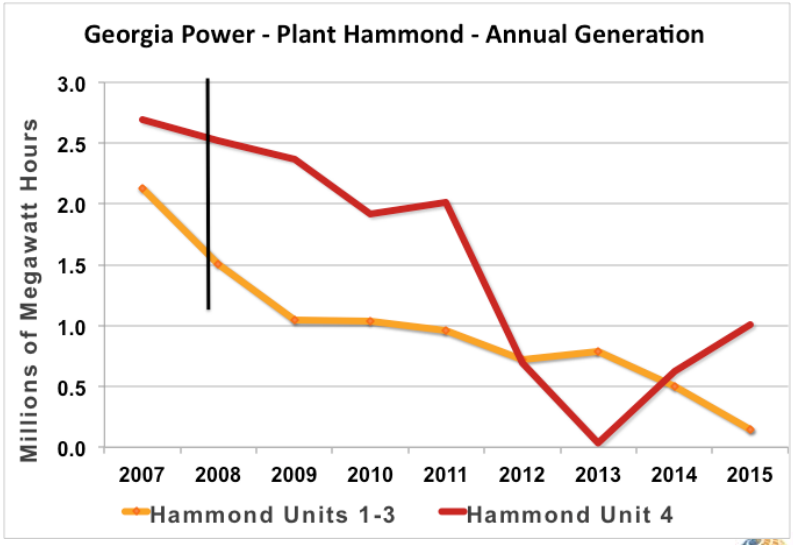
Declining Generation at Southern Company's Plant Hammond



Note – While Hammond's generation was declining Georgia Power spent hundreds of millions of dollars adding a scrubber

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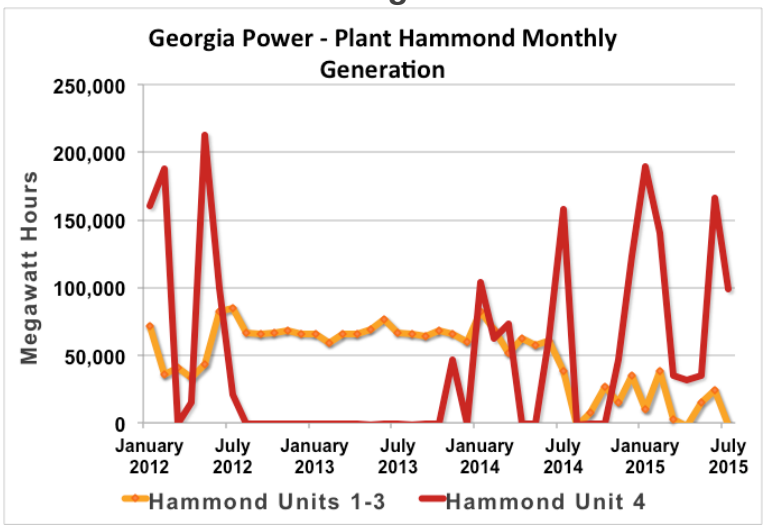
Previously Base Load Coal Plants Have Become Peaking Units



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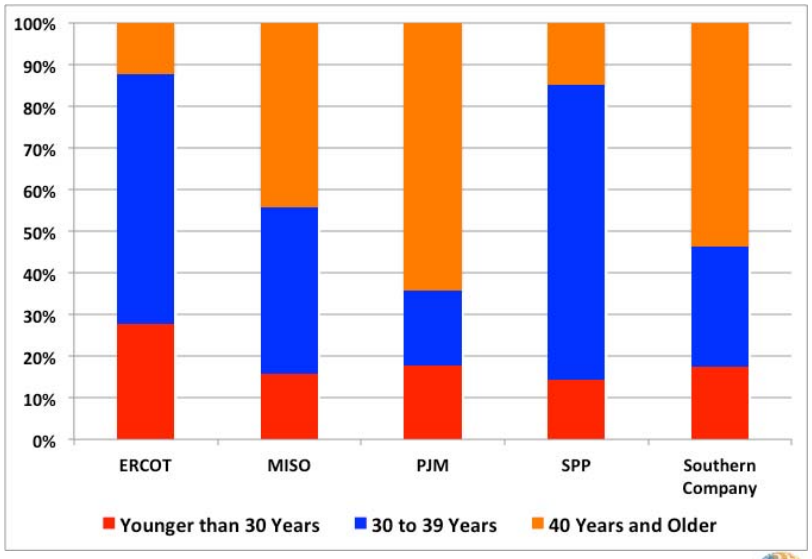
Aging U.S. Coal Fleets (as % of total capacity)



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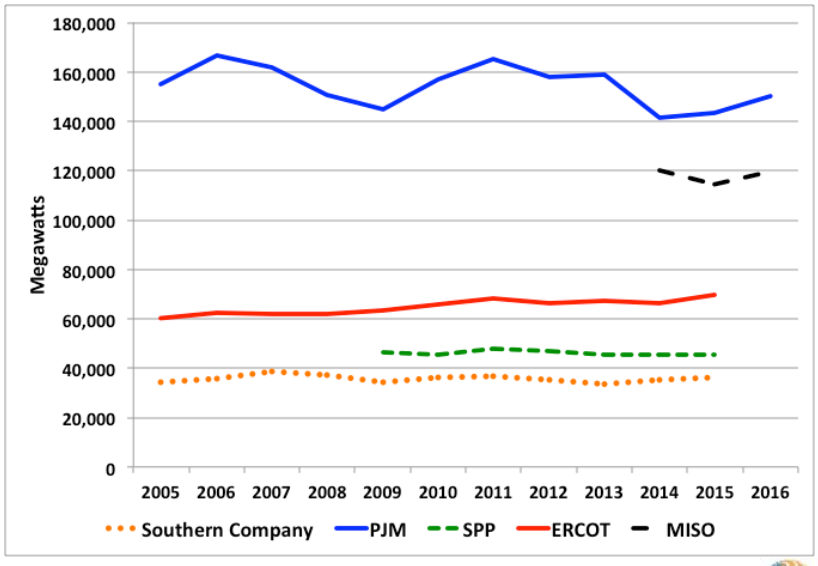
Little-to-No Growth in Peak Demands



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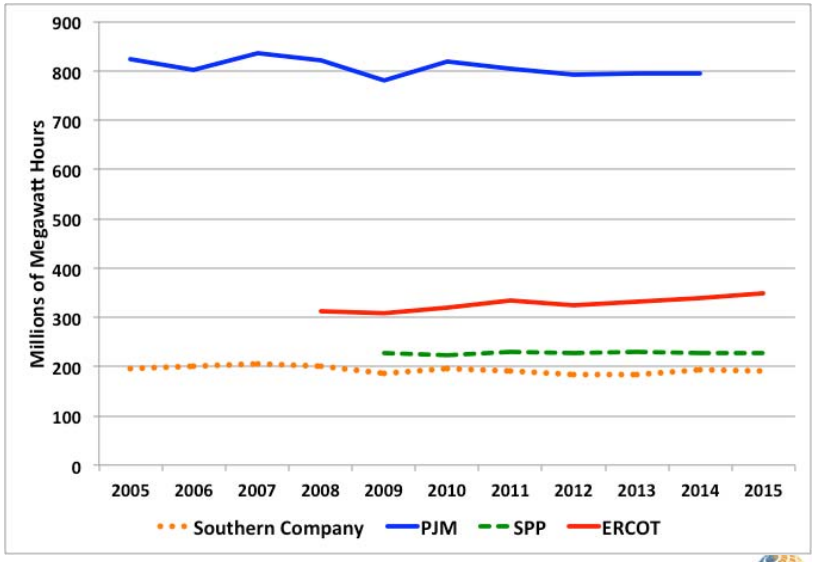
Little-to-No Growth in Energy Sales



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Why Are the Loads Flat or Relatively Flat?

- Impact of formal energy efficiency investments and increased interest from consumers in saving energy.
- Increased generation from distributed “rooftop” solar PV.
- GDP growth has outpaced increases in electricity consumption as a result of strategies by industrials and large utilities to better manage their power use and load + changing residential consumption habits.
- All of these likely to continue to dampen future growth.
- Recovery from Great Recession.

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Result – Coal Plants Are Caught in Death Spiral (Or At Least Near-Death Experience)

- Many units generating much less power than before and/or not operating as base load generators.
- Plus, owners getting less for each MWh of power their plants generate.
- This means significantly lower revenues from power sales.
- But production costs at many plants are increasing. Capex, some expensive, also necessary.
- Generating at high cost and selling at low cost is never good!
- Coal is in serious trouble even without the EPA!

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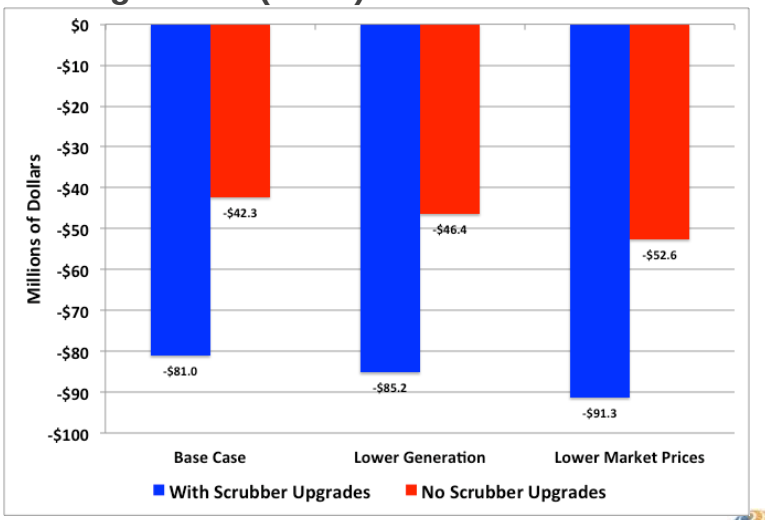
Example of a Failing Plant – IEEFA's Estimated Average Annual Pre-Tax Losses for Big Brown (in TX) for the Years 2017-2024



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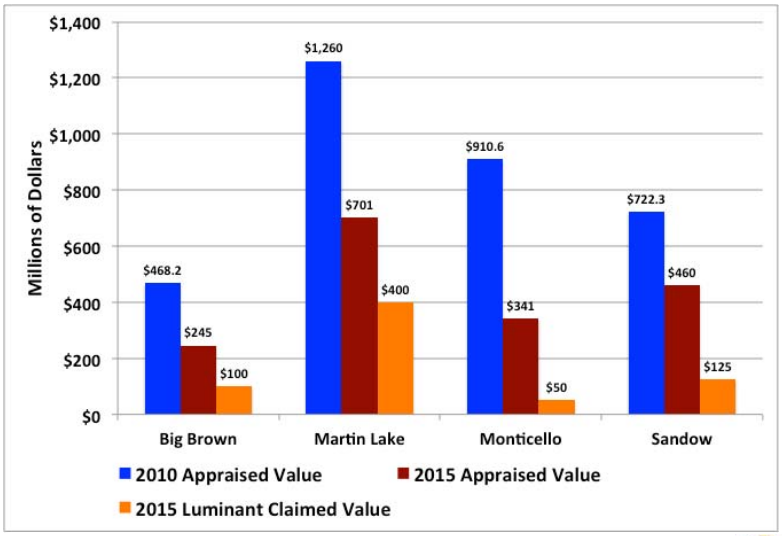
Decline in Tax Values of Luminant's Coal-Fired Generators in Texas



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For More Information

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