



EPA Clean Power Plan and Impact on Texas and the Country

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United Nations 21st Conference of the Parties

- United Nations Meeting on Climate Change
- 195 Nations
- 185 Nations Have Submitted Pledges to Reduce Greenhouse Gas Emissions or to Reduce Carbon Intensity (including China and India)
- Seeking to Reduce Global Warming to 2 Degrees Celsius
- Will an Agreement Be Reached? If So, Contribution to Encouraging Carbon Capture, Use, and Storage?



US Supreme Court Rules on EPA Tailoring Rule on GHG Permitting Regulations

- *Utility Air Regulatory Group v. EPA*, No. 12-1146 (June 23, 2014)
 - Invalidated EPA Tailoring Rule: PSD and Title V programs only triggered by emissions of conventional pollutants (sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead) above 100- to 250-ton-per-year thresholds specified in the CAA, not by GHG emissions
- Supreme Court Allowed Regulation of GHG Emissions by EPA
 - If EPA is regulating an emissions source anyway because it emits conventional pollutants above threshold levels under the PSD program,
 - Then EPA may also require these “anyway” sources to implement BACT to control their non-de minimis GHG emissions as well.
 - What constitutes a de minimis level of emissions, and what would constitute BACT, were left to EPA to define, which has set it at 75,000 tons/year



What is the Clean Power Plan?

- EPA Clean Power Plan (CPP) designed to Regulate Greenhouse Gases, Largely CO₂, from Electric Generating Plants
- Largely affects coal, not natural gas plants, in terms of setting emissions limits lower than coal plants can meet without controls, such as CCUS



Building Blocks

- States can develop plans to reduce greenhouse gas emissions from power plants across electricity grid
- Three Building Blocks
 - Increase efficiency of coal plants
 - Increase capacity use of natural gas plants (emit about 50% less CO₂ than coal plants on average)
 - Greater use of renewable energy, particularly solar and wind
 - Energy efficiency was a fourth building block, but it was removed from the final rule (see later slide on its role)



What Is EPA's Authority and Challenges to That Authority?

- Section 111(d) of the federal Clean Air Act, amended by Congress and signed by George Bush in 1990.
- Arguments against rule:
 - Not allowed under 111(d)
 - Since EPA has regulated emissions under 112, can't regulate under 111(d) under CAA language
 - Can't regulate "outside the fence line" of the power plant
- Litigation filed by 20 plus states, at least 15 industry groups and one labor union



What Will States Do?

- States required to submit under the CAA a State Implementation Plan, or EPA will issue a Federal Implementation Plan.
- State options
 - Submit plan and don't challenge rule
 - Submit plan and challenge rule
 - Refuse to submit plan and challenge rule
- Texas will challenge rule, only question is whether it will submit a plan to EPA
- Twenty-four states filed suit to challenge rule
- A number of other states will support the rule
- States are forming multi-state programs to manage CPP obligations—studies show far less expensive to comply across multiple states



What Will Industry Do?

- A number of companies and industry groups will or have challenged rule
- Others will support the rule
 - Natural gas electric generation companies, e.g., Calpine
 - Solar and wind companies and related manufacturers
 - Technology firms, e.g., Apple, Microsoft, etc.
- Like the states, it will be a divided group of businesses and industries



Potential Impact on Texas

- Based on Electric Reliability Council of Texas or ERCOT study
 - ERCOT manages the grid that services about 80% of Texas
- Analysis of EPA's Proposed Rule
 - Result in 9000 MWs of coal plant shutting down
 - Market lead to 9000 MWs of solar by 2029
 - CPP lead to 13,000 MWs of solar



ERCOT Analysis of Impact from Final EPA Rule

- ERCOT estimates
 - 4000 MW of coal fired generation will be closed
 - Note: over 4500 MW of combined cycle natural gas plants already permitted
 - 13,000 MW of solar will be installed based on market demand; up 44% from estimate less than a year ago
 - Note: Solar pricing approaching combined cycle, natural gas power price
 - An additional 300-500 MW of solar with CPP
 - An additional 3,660 to 8,400 MW of Wind generation
 - Note: Wind projects now less than combined cycle, natural gas power
 - An additional 1,900 to 2,200 MW of gas generation
 - Note: Plenty of opportunity and low price for combined cycle, natural gas at low price



ERCOT Analysis of Impact from Final EPA Rule

- Electricity prices
 - Without energy efficiency, increase in prices of between 8-18% by 2030
 - With energy efficiency, increase in prices by 5% by 2030
 - Report notes this does not include potential additional expense for
 - Building or upgrading transmission lines
 - Natural gas infrastructure (pipelines)
 - Ancillary services procurement, or
 - Reliability-must-run contracts



Energy Efficiency and Natural Gas Prices

- Price increase with energy efficiency 5% versus 8-18% without it
- Estimates \$31 billion spend on energy efficiency by 2030, or around \$2.4 billion per year through 2030
- Assumes natural gas prices will increase to over \$6 MMBTU (rise in part because of increased demand for natural gas because of CPP)

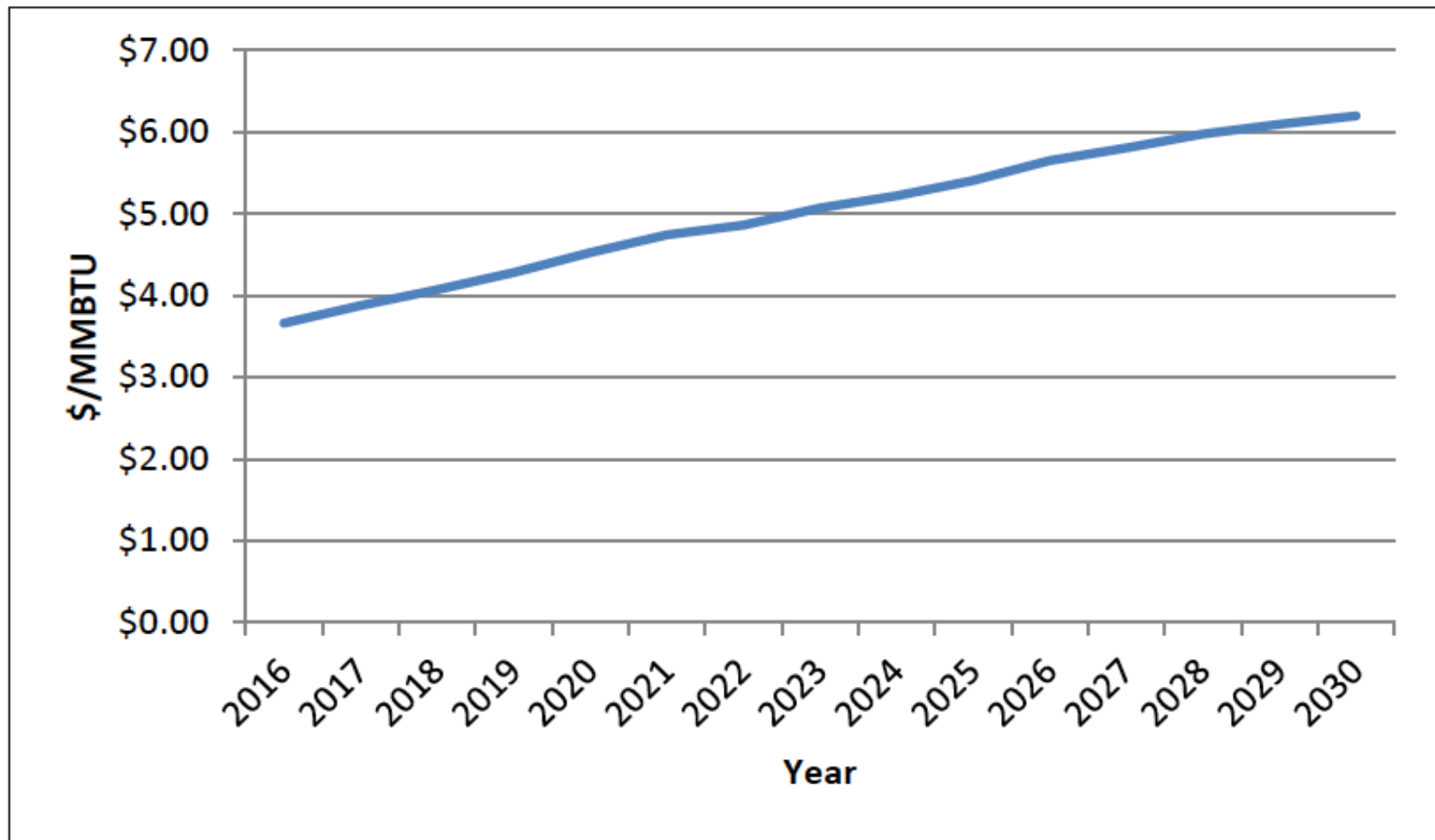


Figure 1: Natural Gas Price Assumptions



Breakdown of Generation by 2030

Table 5: 2030 Annual Generation by Fuel

Fuel Type	Baseline	CO₂ Limit	CO₂ Price	CO₂ Price & Regional Haze
Natural Gas (%)	43	51	50	50
Coal (%)	27	16	14	15
Wind (%)	14	16	20	20
Solar (%)	7	7	7	7
Nuclear (%)	9	9	9	9
Other (%)	<1	<1	<1	<1



New Source Performance Standard for Electricity Generating Plants

- Clean Air Act requires a New Source Performance Standard (NSPS) be in place before EPA enacts a standard for existing sources (CAA § 111(d)(1)(A)(ii))
- EPA released a final NSPS for greenhouse gas emissions from new and modified fossil-fuel-fired power plants at the same time as it released the CPP
 - Requires the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements)
 - For new steam generating units (e.g., coal or pet coke power plants), EPA determined the BSER to be an efficient new supercritical pulverized coal (SCPC) utility boiler with partial carbon capture and sequestration (CCS) technology, resulting in a performance standard of 1400 lbs CO₂/MWh.
 - For new baseload stationary combustion turbines (e.g., natural-gas power plants), EPA determined the BSER to be an efficient natural gas combined-cycle (NGCC) plant, resulting in a performance standard of 1000-1030 lbs CO₂/MWh.



Overall View—Environmental and Energy Regulation in a Time of Immense Technology Disruption

- Disruptive Technologies in Electricity Generation and Use
 - Low cost natural gas and high efficient, rapid ramp up combined cycle, natural gas plants
 - Low cost wind
 - Low cost solar
 - Low cost LED lighting
 - Energy efficiency management, Internet of Things
 - Energy storage—batteries (price has to come down)
- Result: Lower Emissions at Low Prices
- Cheap, Cleaner Energy



Declining Solar Price vs. Potential Price Increase of Natural Gas

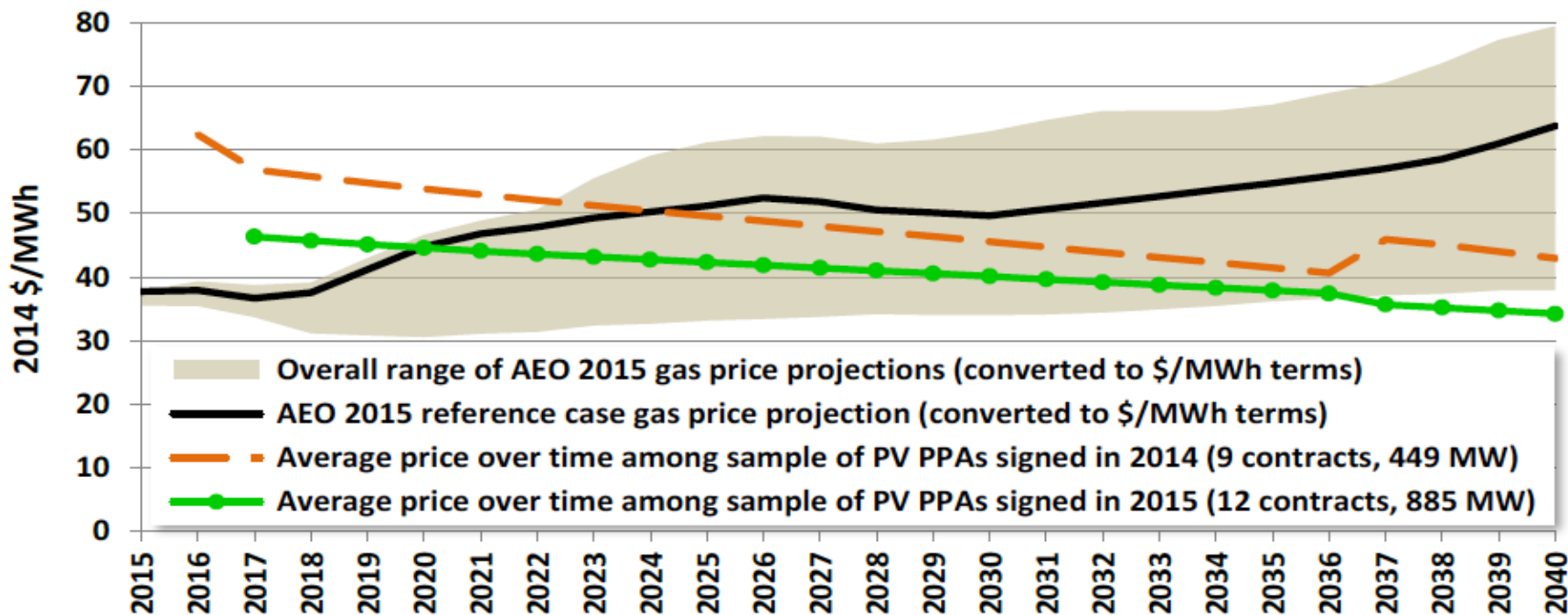
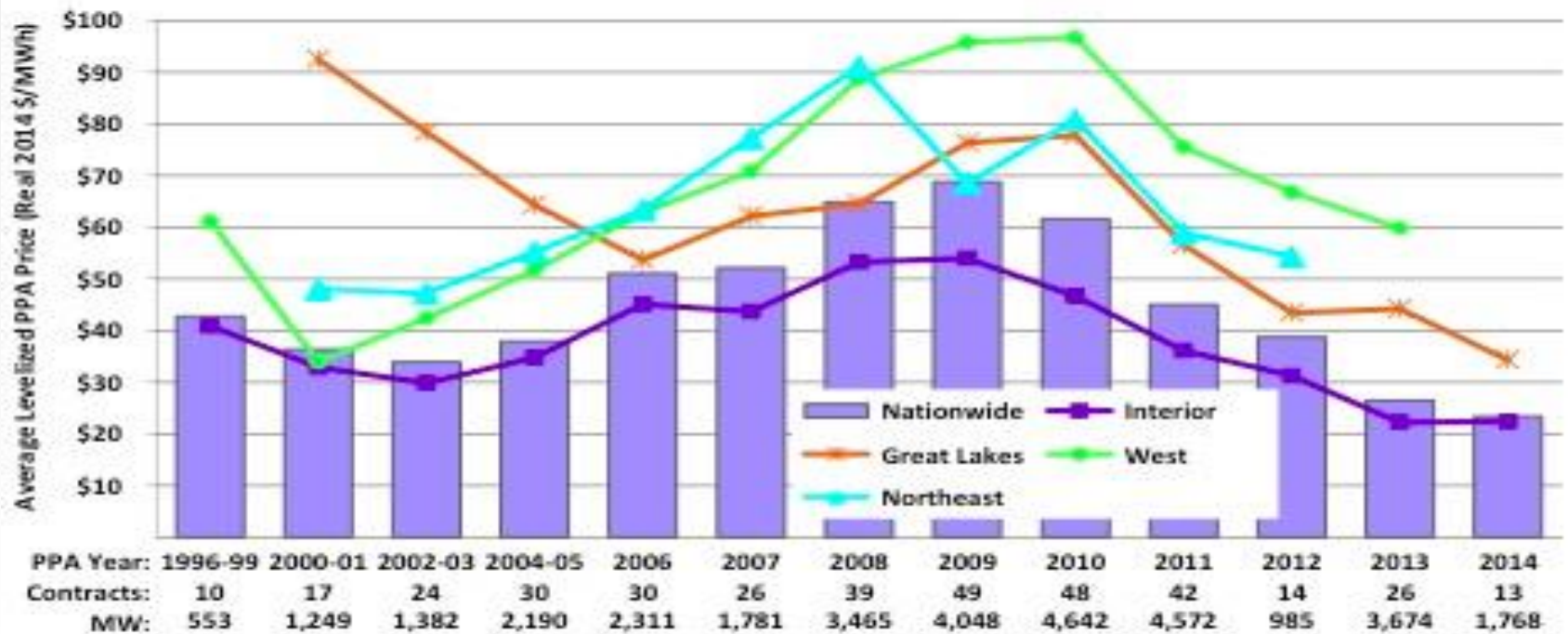


Figure 18. Average PV PPA Prices and Natural Gas Fuel Cost Projections Over Time



Declining Wind Prices





Electricity Generation in Texas in 2030 with Clean Energy Plan and Energy Efficiency Investment

- According to ERCOT, by 2030 with Energy Efficiency Investment
 - About 20-22% of electricity will be generated by renewable energy, wind and solar
 - About 60-69% of electricity will be generated by fossil fuels
 - Coal generation will drop significantly; natural gas generation will increase
- Carbon Reduction Goals as Expressed by Climate Science Will Not Be Achieved
- What Will Federal and State Government Do in 2030 or in Advance of 2030?



What's Left for Energy/Environmental Technological Disruption?

- Carbon Capture, Use, and Storage
- To achieve climate goals, CCUS is critical
- Regardless of political/ideological positions, this is the clear reality based on predictions by ERCOT, the International Energy Agency, and US Energy Information Administration of sources of electricity generation being largely from fossil fuels in 2030 and 2040



Market Capitalization for Peabody and Arch vs. DOW Since 2011





What Will Happen to Natural Gas Electricity Generation over the Next 20 Years?

- Will the Result Be Similar to Coal?
- Universities and Other Entities Considering Disinvestment in all Fossil Fuel Companies
- Sierra Club Advancing Anti-Fracking and Anti-Natural Gas Agenda
- De-carbonization Being Called for in Paris at COP 21 by 2050 or Earlier
- EPA Methane Rules for Oil and Gas Exploration and Production Operations
- Coal, However, Had Another Fossil Fuel to Take Its Place; Natural Gas Does Not
- Will Renewable Energy and Energy Storage Allow Replacement of Natural Gas?



Need a Realistic Energy/Environmental Regulatory Structure and Investment for CCUS for Natural Gas

- Government Financing of Basic Research into CCUS
- Industry Investment in Research into CCUS Technologies
- Private Investment in Commercialization of CCUS Technologies
- Will Need Multiple Means of Using CO₂
 - For enhanced oil recovery
 - For other purposes: Examples include food and brewing/soft drink industry
 - Producing products from CO₂: Examples include fuels, chemicals, sodium bicarbonate, etc.
- Government Incentives: Tax Credits, Carbon Credits, and Other Regulatory/Financial Mechanisms



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