



ERCOT Analysis of the Clean Power Plan – Final Rule Update

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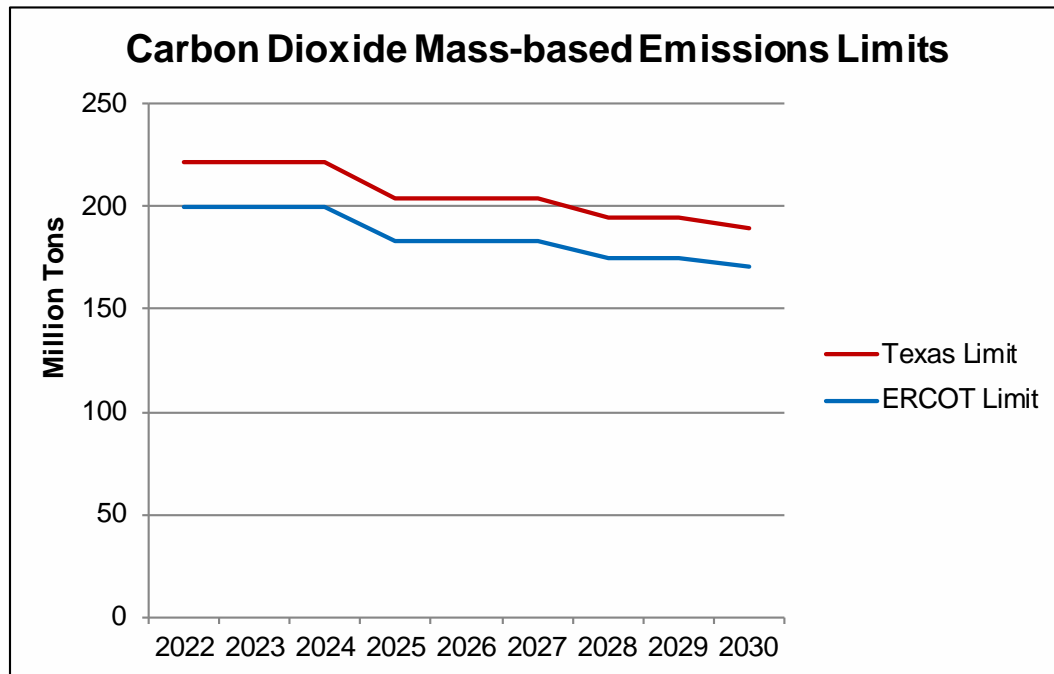


Background

- In December 2014, ERCOT evaluated the potential impacts of pending environmental regulations, including the proposed Clean Power Plan, on grid reliability
- On August 3, 2015, EPA released the Clean Power Plan final rule
 - The final rule made adjustments to magnitude and timing of the carbon dioxide (CO₂) emissions reductions for Texas
 - The requirements for Texas in the final rule are less stringent compared to the proposal
- ERCOT updated its analysis of the potential impacts of the Clean Power Plan for grid reliability based on the changes in the final rule

Clean Power Plan Requirements for Texas

- Sets limits on the amount of CO₂ that existing power plants can emit to the air
- Sets interim and final CO₂ emissions limits:
 - Three interim limits must be met on average between 2022-2024, 2025-2027, and 2028-2029
 - Final limit must be met from 2030 onwards
- States may choose to comply with either the rate (lb CO₂/MWh) or mass (tons CO₂) form of the limit



Simulation Methodology

- Used ERCOT stakeholder-vetted methodologies consistent with ERCOT's Long Term System Assessment (LTSA)
- Modeled four primary scenarios:

Scenario	Regulations Included in Scenario			CO ₂ Price (\$/ton)	
	CSAPR	CPP	Regional Haze	2022	2030
1. Baseline	✓			n/a	n/a
2. CO ₂ Limit	✓	✓		n/a	n/a
3. CO ₂ Price	✓	✓		\$1.00	\$22.50
4. CO ₂ Price & Regional Haze	✓	✓	✓	\$0.00	\$21.00

- Modeled the Clean Power Plan mass-based requirements for ERCOT as a limit and as an emissions fee
 - Scenario with emissions limit allows model to select the least-cost way to achieve compliance
 - Scenarios with emissions fees simulate a potential approach to achieve compliance, and allow an initial assessment of likely increases in wholesale power prices
- Modeled Regional Haze by adding costs of scrubber retrofits or upgrades for affected units
- Included an additional scenario to assess the impacts of energy efficiency

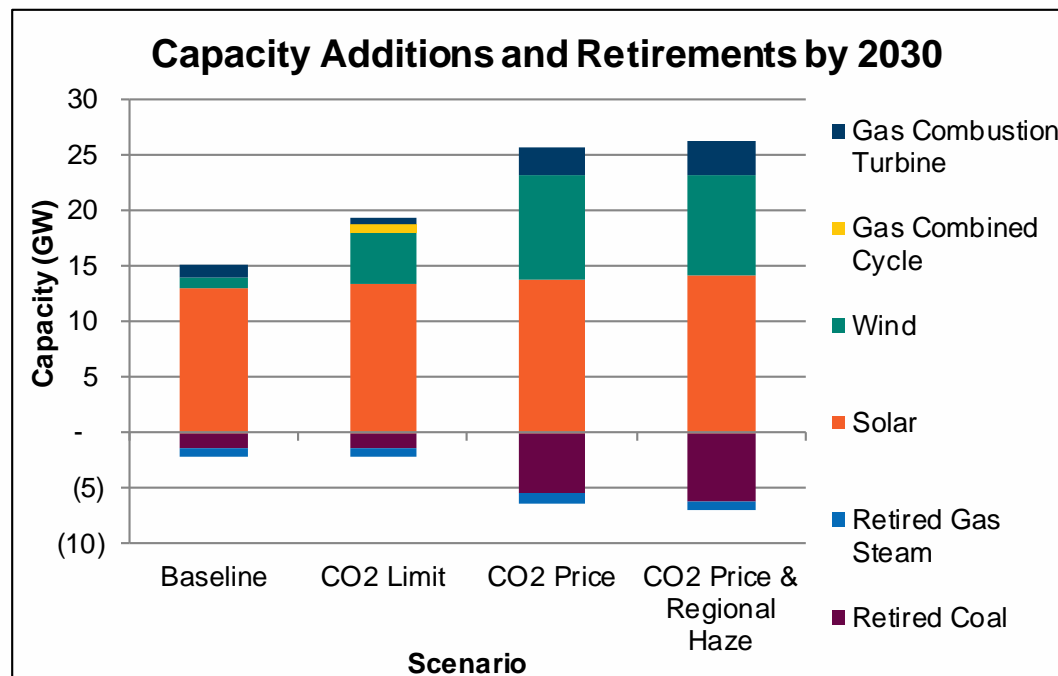
Grid Simulation Results

Coal Unit Retirements

- At least 4,000 MW of coal unit retirements due specifically to the Clean Power Plan
- Additional coal unit retirements when Regional Haze is considered, likely to occur before the Clean Power Plan compliance timelines

Renewable Energy Growth

- Up to 23,000 MW of solar and wind additions in scenarios with the Clean Power Plan, resulting in almost 44,000 MW total intermittent renewable capacity
- Increases compared to previous CPP study due to updated capital cost assumptions



Possible Grid Impacts

- Resource Adequacy: if future unit retirements occur without sufficient notice for the market to respond with new investment, there could be periods with reduced reserve margins and increased risk of system scarcity events.
- Transmission Reliability: the retirement of legacy units may result in localized transmission constraints that may affect transmission reliability and grid congestion.
 - Transmission improvements require four to five years for planning, routing approval, and construction.
 - Reliability-Must-Run contracts may not be an option if units are retired for environmental compliance reasons.
- Renewables Integration: while ERCOT has been very successful at integrating renewable generation, grid operations with the levels of renewables seen in future scenarios will be a challenge. At high levels of renewable penetration, any must-take requirements on renewable output to achieve environmental compliance goals could affect grid reliability.