Clean Power Plan in Texas
Implications for Renewables and the Electricity Market

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ERCOT market impacts estimated in this presentation are illustrative only and are not intended to be interpreted as a projection. These results incorporate several simplifying assumptions that were adopted for the purposes of this presentation but that do not necessarily reflect the presenter’s view on the most likely market or regulatory outcomes. For example, several charts incorporate a natural gas price assumption that exceeds the current forward curve in order to better illustrate a qualitative point.

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The EPA’s Clean Power Plan will require Texas to achieve mass reductions of 4% by 2022 and 18% by 2030 from covered units compared to 2012.

Raises many policy questions on how Texas can best meet that challenge:
- State-mandated (i.e. non-market) efficiency and renewables?
- Rate-based or mass-based?
- Interstate trading?
- Harvest renewable potential for export?
- How to allocate CO₂ allowances under mass-based?

Each option has pros and cons, with very different implications for reliability, economic efficiency, customer costs, and asset values.

Texas may need to design its own implementation approach to maintain consistency with efficient dispatch within the energy-only market and avoid “leakage”.
Scaling the CO₂ Reduction Challenge in Texas

**Reductions**
- Texas: 4% by 2022 and 18% by 2030 compared to 2012
- Compare to 3% by 2022 and 21% by 2030 US total

**CO₂ Already Trending Down in US**
- Low gas prices, renewables growth, and coal retirements have already reduced US CO₂ output by 15% between 2005 and 2014
- Same factors somewhat affect Texas but offset by load growth; overall CO₂ output increased 2% over 2005 to 2014

**Texas Emissions Under CPP**
EPA’s Translation of Rate to Mass Standard

**Notes:** *Assuming mass-based approach with new units covered, including all early action and renewable allocations.*
# Range of State Implementation Plan Options

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<th>Design Element</th>
<th>Primary Options</th>
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| **Compliance Standard**         | - **Mass-Based** (FIP, Trade-Ready) – CO₂ allowances required for all emissions  
                                 | - **Subcategory Rate-Based** (FIP, Trade-Ready) – Gas CCs and fossil steam meet different rates  
                                 | - **State Average or Multi-State Average Rate-Based** – All covered units meet the same rate |
| **Covering New CCs and Existing CTs** | - FIP excludes New CCs or existing CTs, posing a leakage risk unless states expand coverage  
                                 | - Mass-based FIP has an option for covering new CCs through New Source Complement |
| **Mass-based CO₂ Allowance Allocations** | - To existing generators (e.g., based on historical CO₂ output or projected allowable output)  
                                 | - To load serving entities  
                                 | - Set-aside and allocation for policy objectives (e.g. renewables, avoid coal retirement)  
                                 | - Auction-based |
| **Trading and Addressing Seams** | - Adopt a trade-ready compliance option for trading to other states with similar plan  
                                 | - Create a new multi-state coordination group (e.g., average rate approach or mass-based)  
                                 | - Join an existing CO₂ market (California or RGGI)  
                                 | - Apply a “CO₂ price adder” on imported power (similar to California) if at a leakage risk (e.g., from mass-based to rate-based state) |
| **Renewables Incentives (similar for EE)** | - **Rate-based**: new units eligible under CPP can earn Emission Rate Credits (ERCs)  
                                 | - **Mass-based**: all renewables earn additional revenue through higher power prices, plus allowance bonus opportunities for early action  
                                 | - **Expanded RPS**: additional revenue stream for meeting state RPS requirement can be available either just for new renewables or all |
Evaluating Economic and Market Impacts

Impacts for Texas
- Texas will need to evaluate the economic and market impacts of each plan option
- View in light of policy objectives

CPP SIM
- Following slides describe market impacts from a few policy options in ERCOT
- Illustrative results from a simplified implementation of our CPP SIM model (not a full projection)
Mass-Based CO₂ and Energy Prices

CO₂ Prices
- Cost of coal to gas switching is a major factor in the carbon price (so CO₂ price increases with gas price)
- If gas prices stay very low, CO₂ and energy impacts from CPP may be modest (ERCOT estimated zero CO₂ price in 2022)
- CO₂ price increases may also induce dispatch switching to non-covered CTs and CCs
- Expanded EE and renewables would depress CO₂ prices

Energy Prices
- Wholesale energy prices will increase under mass-based (approximately $0.5-$0.8/MWh per $1/ton CO₂ price)
- Retail rates will not necessarily increase by the same amount, since the value of CO₂ allowances could be rebated to customers

Notes: Assumptions: No interstate trading or cooperation, new CCs covered, CTs not covered. ERCOT CO2 budget at 80% of state (compared to 90% in ERCOT’s simulations).
Rate-Based Approach Is Different

Wholesale prices would be higher under mass-based than rate-based:

- **Mass-based:**
  - Fossil generators must pay for every ton of carbon produced, increasing dispatch costs and wholesale prices
  - They or consumers could be compensated through allowance auction revenues

- **Rate-based:**
  - Fossil units only have to buy enough Emission Reduction Credits (ERCs) to reduce their emissions rate to the standard
  - If CCs are below the rate, they can earn revenue from creating ERCs (reducing their energy offer price!)

### Coal and Gas Dispatch Price

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<th>Mass-Based</th>
<th>State Rate-Based</th>
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<tr>
<td></td>
<td>$18/ton CO₂</td>
<td>$12/MWh ERC</td>
</tr>
<tr>
<td>Fossil Fuel Unit Production Cost ($/MWh)</td>
<td>$60</td>
<td>$50</td>
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**Notes:** Illustrative calculation that assumes coal-to gas switching is the marginal CO₂ abatement opportunity, resulting in equal coal and gas dispatch prices. Shows 2022 compliance with a mass based (including new units) and State rate based standards, with $6/mmbtu gas.
State Rate-Based ERC and Energy Prices

Emissions Reduction Credit (ERC) Prices
- Also largely driven by gas prices (also level of EE and renewables growth)
- The ERC price remains essentially the same because a similar to ensures coal to gas switching
- However since the 2030 standard is quite a bit tighter a similar ERC price implies a much higher carbon price

Energy Prices
- At 2022 rates, energy price doesn’t increase as much above BAU due to two offsetting effects:
  - Coal offer prices increase
  - Gas CC offer prices decrease (because they earn ERC revenues when generating)
- But at the tighter 2030 rate standard gas CCs must purchase ERCs not sell (and so compete with coal for the limited supply created from EE and renewables)
CO₂ Output Varies by Standard Type

Notes: Assumes $5/mmbtu gas in 2022 and $5.70/mmbtu gas in 2030; these prices exceed the forward curve at $3.3/mmbtu by 2022 but better illustrate certain effects. Also assumes that new NGCC’s will be covered under a mass based standard, which included the new source complement, and that generators serving ERCOT load receive 80% of Texas’ allowances.
New Wind Economics

Notes: Assumes $5/mmbtu gas in 2022 and $5.70/mmbtu gas in 2030, that new gas CC’s will be covered under a mass based standard, which included the new source complement, and that generators serving ERCOT load receive 80% of Texas’ allowances. Only wind generators built after 2012 are eligible to generate ERCs under rate-based standards. Net revenues exclude any value from RECs or the Production Tax Credit.
Allowance/ERC Markets and Allocations

CO₂ Allowances

- Under a mass standard, CO₂ allowances are worth approximately $2.5 billion/yr at $14/ton CO₂ in 2022
- Large sum of value, with allocation options as varied as the interests:
  - Auction-based (revenues going to state)
  - EE and green energy support
  - Retail price offsets
  - Offset state budget
  - Allocate to fossil gen (e.g. FIP)

ERCs and Gas-Shift ERCs

- Not allocated, but substantial potential revenue source for renewable or EE funding
Takeaways for Renewable Power

- **State policy** decisions on CPP compliance that would enhance opportunities for renewable power include:
  - Minimal energy efficiency efforts; expanded state RPS
  - Covering all fossil types including new CCs and existing CTs
  - CO₂ allocations to fund renewables

- **Market implications** of CPP greatly depend on the compliance option:
  - Higher energy prices under mass-based (for both new and existing); allowance value to be allocated
  - But rate-based options create ERC markets which provide a new revenue stream for new renewable resources
  - Gas price is a big driver for value to renewables (both through the energy price but also indirectly as drivers of CO₂ allowances or ERC prices)

- **Linking** to national CO₂ and ERC markets could also create an avenue for exporting Texas renewable potential (but only if other states need the allowances/credits more than Texas)
Dr. Kathleen Spees is a Principal at The Brattle Group with expertise in designing and analyzing wholesale electric markets and carbon policies. Dr. Spees has worked with RTOs including PJM, ISO-NE, ERCOT, MISO, AESO, IESO, NYISO and others in the U.S. and internationally to improve their market designs for capacity investments, scarcity and surplus event pricing, ancillary services, wind integration, and market seams. She has worked with U.S. and international regulators to design and evaluate policy alternatives for achieving resource adequacy, storage integration, carbon reduction, and other policy goals.

For private clients, Dr. Spees provides strategic guidance, expert testimony, and analytical support in the context of regulatory proceedings, business decisions, investment due diligence, and litigation. Her work spans matters of carbon policy, environmental regulations, demand response, virtual trading, FTRs, ancillary services, coal retirements, merchant transmission, renewables integration, hedging, and storage.

Kathleen earned a B.S. in Mechanical Engineering and Physics from Iowa State University. She earned an M.S. in Electrical and Computer Engineering and a Ph.D. in Engineering and Public Policy from Carnegie Mellon University.

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