EPA's Clean Power Plan and Interstate Trading Options

PJM Perspective

Council of State Governments

October 27, 2015

M. Gary Helm
Lead Market Strategist
### Key Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member companies</td>
<td>940+</td>
</tr>
<tr>
<td>Millions of people served</td>
<td>61</td>
</tr>
<tr>
<td>Peak load in megawatts</td>
<td>165,492</td>
</tr>
<tr>
<td>MW of generating capacity</td>
<td>183,604</td>
</tr>
<tr>
<td>Miles of transmission lines</td>
<td>62,556</td>
</tr>
<tr>
<td>2014 GWh of annual energy</td>
<td>797,461</td>
</tr>
<tr>
<td>Generation sources</td>
<td>1,376</td>
</tr>
<tr>
<td>Square miles of territory</td>
<td>243,417</td>
</tr>
<tr>
<td>States served</td>
<td>13 + DC</td>
</tr>
</tbody>
</table>

- 27% of generation in Eastern Interconnection
- 28% of load in Eastern Interconnection
- 20% of transmission assets in Eastern Interconnection

---

As of 09/2015

21% of U.S. GDP produced in PJM
Increasing Productivity of Unconventional Gas Reserves

Rig Productivity (mcf/rig/day)

Marcellus
Utica
Eagle Ford
Haynesville
Bakken
Niobrara
Permian

Annual average natural gas prices, 2008–25

$3 gas

Real 2013 $/MMBtu


© 2015 HS

Jan-07 Jul-07 Jan-08 Jul-08 Jan-09 Jul-09 Jan-10 Jul-10 Jan-11 Jul-11 Jan-12 Jul-12 Jan-13 Jul-13 Jan-14 Jul-14 Jan-15
Declining Electricity Demand Growth

- 2013 Load Forecast
- 2014 Load Forecast
- 2015 Load Forecast

Without EKPC 2011-2014
Evolving Resource Mix

The graph illustrates the evolving resource mix from 2007/8 to 2018/19 across various sectors:

- **Coal** shows a steady trend with a slight decline in the later years.
- **Gas** remains consistent with minor fluctuations.
- **Nuclear** exhibits stability with minor changes over time.
- **Demand Response** and **Solar & Wind** demonstrate growth trends, with demand response showing an increasing trend and solar & wind a more缓慢的 growth.

The graph includes a line indicating **Pre Transition Auction Capacity**, which remains relatively flat throughout the years.

**Note:** The data and graph are from PJM's report.
Falling Emission Rates

PJM Average Emissions (lbs/MWh)

- **Carbon Dioxide**
- **Sulfur Dioxides**
- **Nitrogen Oxides**

- **2005**
- **2006**
- **2007**
- **2008**
- **2009**
- **2010**
- **2011**
- **2012**
- **2013**
- **2014**
- **2015**

- **CO₂**
- **SO₂ and NOₓ**
Economic Analysis of Proposed Rule: Regional and State Compliance Vary

**CO₂ ($/Ton)**

- **Coal Generation as % 2012 State Load (198% to 0%)**
- **$15.42 Regional CO₂ Price**
- **$3.50 Regional CO₂ Price**
- **$0.0 Regional CO₂ Price**

- **WV**: Renewables and EE @ 14% of 2012 Load
- **IN**: Renewables and EE @ 7% of 2012 Load
- **KY**: Renewables and EE @ 7% of 2012 Load
- **PA**: Renewables and EE @ 7% of 2012 Load
- **OH**: Renewables and EE @ 7% of 2012 Load
- **IL**: Renewables and EE @ 7% of 2012 Load + NGCC Entry reduced by 11.7 GW
- **NC**: Renewables and EE @ 7% of 2012 Load
- **MD**: Renewables and EE @ 7% of 2012 Load
- **VA**: Renewables and EE @ 7% of 2012 Load
- **DE**: Renewables and EE @ 7% of 2012 Load
- **NJ**: Renewables and EE @ 7% of 2012 Load

PJM©2015
Generation Investment Location Doesn’t Always Match the Emissions (Tons) Displacement Location

Note: Data based on OPSI 2a (Achieve State RPS and EPA EE targets) versus PJM 4 (Lower Growth in Renewables and EE) Scenario in 2020

Note: Results from Draft Rule
Assume 3,300 MW of new generation added each year (based on most recent 10 year average)

Retirements are assumed to be evenly distributed 2020-2029

Generation Requirement

6 GW Retirement Scenario

16 GW Retirement Scenario

32 GW Retirement Scenario

Reliability Analysis of Proposed Rule: Resource Adequacy
## Reliability Analysis of Proposed Rule: Potential Thermal Violations

<table>
<thead>
<tr>
<th>Transmission Line</th>
<th>Ckt ID</th>
<th>kV Level</th>
<th>Tx Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mickleton - Monroe</td>
<td>1</td>
<td>230</td>
<td>AEC</td>
</tr>
<tr>
<td>Mickleton - Monroe</td>
<td>2</td>
<td>230</td>
<td>AEC</td>
</tr>
<tr>
<td>Bagley - Raphael Road</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Bagley - Raphael Road</td>
<td>2</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Conastone - Northwest '311'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Conastone - Northwest '326'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Graceton - Bagley</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Raphael Road - Northeast '317'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Raphael Road - Northeast '339'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Sandy Springs '14' - High Ridge '16'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Sandy Springs '34' - High Ridge '16'</td>
<td>1</td>
<td>230</td>
<td>BGE</td>
</tr>
<tr>
<td>Stuart - Spurlock</td>
<td>1</td>
<td>345</td>
<td>Dayton/EKPC</td>
</tr>
<tr>
<td>Brunswick - Carson</td>
<td>1</td>
<td>500</td>
<td>DOM</td>
</tr>
<tr>
<td>Rawlings - Carson</td>
<td>1</td>
<td>500</td>
<td>DOM</td>
</tr>
<tr>
<td>Milford - Cool Springs</td>
<td>1</td>
<td>230</td>
<td>DPL</td>
</tr>
<tr>
<td>Red Lion - Cedar Creek</td>
<td>1</td>
<td>230</td>
<td>DPL</td>
</tr>
<tr>
<td>Steele - Milford</td>
<td>1</td>
<td>230</td>
<td>DPL</td>
</tr>
<tr>
<td>Nottingham - Nottingham Reactor</td>
<td>1</td>
<td>230</td>
<td>PECO</td>
</tr>
<tr>
<td>Nottingham Reactor - Peach Bottom</td>
<td>1</td>
<td>230</td>
<td>PECO</td>
</tr>
<tr>
<td>Peach Bottom - Conastone</td>
<td>1</td>
<td>500</td>
<td>PECO/BGE</td>
</tr>
<tr>
<td>Frackville - Siegfried</td>
<td>1</td>
<td>230</td>
<td>PPL</td>
</tr>
<tr>
<td>Milton - Sunbury</td>
<td>1</td>
<td>230</td>
<td>PPL</td>
</tr>
<tr>
<td>Montour - Milton</td>
<td>1</td>
<td>230</td>
<td>PPL</td>
</tr>
<tr>
<td>Otter Creek - Conastone</td>
<td>1</td>
<td>230</td>
<td>PPL/BGE</td>
</tr>
<tr>
<td>Safe Harbor - Graceton</td>
<td>1</td>
<td>230</td>
<td>PPL/BGE</td>
</tr>
</tbody>
</table>
Economic Dispatch

MW
(Thousands)

140
130
120
110
100
90
80

24 4 8 Noon 16 20 24
Midnight Operating day (24 hours) Midnight

$120 $100 $65 $50 $35 $25 $20 $15 $10

Combustion Turbine
Renewables
Combined Cycle
Coal
Nuclear

PJMC©2015
Reliability Assurance Needed

- Interim compliance period (2022-2029)
- Trading
- States consider reliability issues as part of plan submission
- Process for a state to revise its plan for reliability
- Reliability Safety Valve
  - State must get EPA approval
  - 90 days (emissions excluded from CPP)
  - Extensions possible (emissions included)
Clean Power Plan Mass-Based Targets Interim Compliance Period (2022-2029)

*T2012 Net baseline removes emissions from retiring resources.
Map of 2030 mass and rate compliance gap across states

- **Red**: Incremental efforts (above IHS reference) required under both rate and mass
- **Light Red**: Incremental efforts (above IHS reference) required under mass
- **Orange**: Incremental efforts (above IHS reference) required under rate
- **Green**: No incremental efforts required

Source: IHS

© 2015 IHS
• Submission of comments on the proposed federal rule

• Update rate and mass-based security constrained economic dispatch analysis
  – Seeking state and stakeholder feedback for compliance scenarios
  – Updating model assumptions for fuels, transmission system and resource portfolio
EPA’s Clean Power Plan and Interstate Trading Options

Jonas Monast, Director, Climate & Energy
Sarah Adair, Senior Policy Associate
Nicholas Institute for Environmental Policy Solutions

October 27, 2015

Association of Air Pollution Control Agencies
Council of State Governments
Key Considerations for Trading

1. Electrons do not stop at state borders
   • Flexibility to manage grid
2. Cost
   • Wider markets tend to lower overall cost
3. Growth
   • Access to markets for additional allowances
4. Reliability
   • Potential benefits of geographic diversity
Mass Based Trading

State plan creates # of allowances in each compliance period = total emissions budget

1 allowance = 1 (short) ton of emissions

Establish tracking system & method of getting allowances into market

To comply: Affected units measure their emissions in each compliance period

Must surrender 1 allowance for every ton emitted
Mass-Based Model Rule

- **Budget?**
  - EPA-defined *existing units only* interim and final budgets
- **What trades?**
  - 1 allowance = 1 short ton
- **Allowances Accepted for Compliance?**
  - Issued by a state (or EPA) with a similar, approved, trading ready plan
- **Tracking?**
  - EPA Allowance Tracking and Compliance System
- **Allowance Allocation?**
  - Most allowances allocated to EGUs based on historic generation 2010-2012
  - Three set-asides for Clean Energy Incentive Program, Output Based Allocation to NGCC,* Renewable Energy*
  *part of leakage demonstration*
Rate Based Trading

Measure:
lbs of CO$_2$ & output (MWh)

Lbs/MWh = unadjusted rate

Below standard $\rightarrow$ Earn ERCs
Above standard $\rightarrow$ owe ERCs

Duke
Nicholas Institute for Environmental Policy Solutions
Celebrating 10 Years
Rate-Based Model Rule

- **Rate?**
  - EPA-defined **subcategory-specific** interim step and final rates
- **What trades?**
  - 1 ERC = 1 MWh with zero emissions
- **ERCs Accepted for Compliance?**
  - Issued by any state with a similar EPA approved plan
- **Tracking?**
  - EPA Allowance Tracking and Compliance System
- **ERC Issuance?**
  - By the State (or EPA) to:
    1. Affected units that beat their rate
    2. All existing gas units (Gas-Shift ERCs to be used by steam)
    3. Nuclear, Renewables & Energy Efficiency with third party verification
Key Decisions for States

- **Trade?**
  - Trading Ready? Multi-state plan?

- **Rate or mass?**
  - **Rate:**
    - Administration of ERC issuance process
  - **Mass:**
    - Budget: existing sources only OR existing + new?
      - If existing only, leakage demonstration?
    - Allowance allocation/auction
Thank you
Trading Options in State Plan Pathways

All Plan Types

- **Intra-state Trading Only**
  - Only trading option for state-defined rates
  - Allowable in all plan types

- **Multi-State Plan with Defined Trading Partners and Multi-State Goal**
  - Required for interstate trading with blended rate
  - Allowable in all plan types except state-defined rates

- **“Trading Ready” Plan with Single State Goal**
  - New relative to proposed rule
  - Allowed for all types of mass based plans and subcategorized-rates
Why Trading Ready?

Intra-state Trading Only

• “Go it alone” forgoes access to interstate markets

Multi-State Plan with Defined Trading Partners and Multi-State Goal

• Requires formal negotiation with other states
• Requirement to update all state plans if states come and go

“Trading Ready” Plan with Single State Goal

• Access interstate markets without multistate agreements
Trading-Ready State Plan Pathways

What is “Trading Ready”? Allows EGUs and others to trade compliance instruments with the same definition and a common or linked tracking system with entities in other states without a formal multistate agreement.

<table>
<thead>
<tr>
<th>Mass</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowance representing 1 (short) ton of CO₂ emissions (model rule)</td>
<td>Emission Rate Credit (ERC) representing 1 MWh of zero carbon generation or avoided emissions</td>
</tr>
</tbody>
</table>

*Mass can trade with mass and rate with rate.*
Trading Ready State Plan Requirements

Trading-Ready Plans must:
• Use mass or subcategorized rate
• Submit as trading-ready
  – Indicate allowances/ERCs accepted from other jurisdictions
• Use linked or common tracking system
  – Can use EPA’s Allowance Tracking & Compliance System (ATCS)

State flexibility:
• Can specify trading partners, turn trading on or off by updating plan
  • Name states from which allowances/ERCs would be accepted
  • Co-develop tracking system or link tracking system with certain states
• No plan modification if other states move in and out of trading ready
EPA is encouraging early action in 2020-2021
Interim compliance period pushed back 2 years to 2022
Three interim steps
Two year compliance periods for final goal
Mass-Based Plans and Leakage

Mass-based plans need to demonstrate they have addressed risk of leakage to new sources in state plan

3 options available to states

1. Cover new sources
2. Use an allocation method that counteracts leakage
3. Other methods demonstrated by state to prevent leakage
Output-based Allocation Set-Aside to Address Leakage

\[
\text{Allowance to existing NGCC unit} = \text{Net Generation over 50\% CF} \times 1030 \text{ lbs/MWh-net}
\]

There is a lagged accounting method

- NGCC units earn output-based allowances in one compliance period (for example 2022-2024) by operating above 50\% CF over entire period
- Submits the confirmed generation to state (EPA)
- State (EPA) awards the allowances in the next compliance period
- If exceed allocation, distribute pro-rata basis
- Unused allowances distributed to affected EGUs
RE Set-Aside to Address Leakage

• 5% allowances in model rule
• In-state: utility-scale wind, solar (any), geothermal and utility-scale hydro constructed after Jan 1, 2013
• Sources apply to EPA/state with MWh projection
• Allocation year prior to generation
• True-up mechanism
• All allowances allocated, allowances per MWh depends on total
  – cannot simultaneously generate ERCs
• Set-aside increases with retirements in model rule
The GS-ERC Emission Factor represents how much lower an individual NGCC’s emission rate is compared against the fossil steam standard.
The Clean Power Plan
Final Rule and Interstate Trading

Matt Larson
Wilkinson Barker Knauer LLP
October 27, 2015
The EPA believes that it is reasonable to anticipate that a virtually nationwide emissions trading market for compliance will emerge, and that ERCs will be effectively available to any affected EGU wherever located, as long as its state plan authorizes emissions trading among affected EGUs.

- EPA, Clean Power Plan, August 3, 2015
Key issues with Carbon Trading

• Congruency between state currencies and architecture
• Rate-based goals versus mass-based goals
• The notion of “headroom”
• Political economy issues
• The need for state legislation to authorize trading
• The want for state legislation to authorize trading
• Federal model trading rule and federal plan
The Notion of Headroom

<table>
<thead>
<tr>
<th>Region</th>
<th>Coal-Fired EGU Rate</th>
<th>NGCC Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern</td>
<td>1305 lbs CO₂/MWh</td>
<td>771 lbs CO₂/MWh</td>
</tr>
<tr>
<td>Western</td>
<td>360 lbs CO₂/MWh</td>
<td>690 lbs CO₂/MWh</td>
</tr>
<tr>
<td>Texas</td>
<td>237 lbs CO₂/MWh</td>
<td>697 lbs CO₂/MWh</td>
</tr>
</tbody>
</table>
Political economy issues

• Different types of utilities
• Redistribution of allowances or ERCs
• The parallels with telecom universal service
• Similarities with favoritism in spectrum markets
State measures and trading

• This is a specific type of plan approach under the Final Rule
• Trading enacted as a state measure can avoid CAA enforcement regime
• However, this requires state legislation
QUESTIONS

White Papers are available at:
http://www.wbklaw.com/News/Articles_Publications

Ray Gifford
Greg Sopkin
Matt Larson
Wilkinson Barker Knauer, LLP
1755 Blake Street
Suite 470
Denver, CO 80202
Phone 303.626.2350