Virginia State Corporation Commission and
Virginia State Bar
34th National Regulatory Conference

May 20, 2016
Paul M. Sotkiewicz, Ph.D.
Senior Economic Policy Advisor
PJM Interconnection, LLC
PJM as Part of the Eastern Interconnection

Key Statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member companies</td>
<td>960+</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>171,648</td>
</tr>
<tr>
<td>Miles of transmission lines</td>
<td>72,075</td>
</tr>
<tr>
<td>2014 GWh of annual energy</td>
<td>792,580</td>
</tr>
<tr>
<td>Generation sources</td>
<td>1,304</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

21% of U.S. GDP produced in PJM
Where Have We Been with Reliability, Markets, and Environmental Policy?
Responsiveness of Capacity Market

Megawatt

80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0

Coal
Gas
Nuclear

Pre Transition Auction Capacity

Demand Response
Solar & Wind

Delivery Year

Changing Energy Market Trends

Declining Emission Rates

PJM System Average Emissions

CO₂ (lbs/MWh)

SO₂ and NOₓ (lbs/MWh)

Carbon Dioxide
Sulfur Dioxide

PJM System Average Emissions

2015 – 4th Quarter

Oct Nov Dec
Main Driver: Natural Gas

Rig Productivity
(mcf/rig/day)
A Peak into the Future of Markets, Reliability, and Environmental Policy
Declining Electricity Demand Growth
Queued Interconnection Requests

December 31, 2015

- Natural Gas, 58,948 MW
- Nuclear, 1,663 MW
- Other, 163 MW
- Solar, 2,203 MW, Nameplate Capacity, 3,769 MW
- Wind, 2,352 MW, Nameplate Capacity, 14,914 MW
- Biomass, 45 MW
- Wood, 66 MW
- Coal, 1,863 MW
- Methane, 97 MW
- Hydro, 209 MW
- Storage, 0 MW, Nameplate Capacity, 866 MW
*DC does not have a compliance obligation. The portion of Tennessee in PJM does not have any sources covered by the proposed rule. The portion of Michigan in PJM has a single covered source (Covert Generating Station) and was not studied for state-by-state compliance.
Emissions Reductions from RE & EE: Proposed CPP Analysis

Energy Displacement due to Wind Resources

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2025</th>
<th>2029</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>1.3%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>68.7%</td>
<td>53.8%</td>
<td>51.6%</td>
</tr>
<tr>
<td>Coal</td>
<td>31.3%</td>
<td>44.9%</td>
<td>45.9%</td>
</tr>
</tbody>
</table>

Energy Displacement due to Energy Efficiency

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2025</th>
<th>2029</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>5.2%</td>
<td>3.1%</td>
<td>4.0%</td>
</tr>
<tr>
<td>NGCC</td>
<td>60.0%</td>
<td>66.9%</td>
<td>70.2%</td>
</tr>
<tr>
<td>Coal</td>
<td>34.8%</td>
<td>30.1%</td>
<td>25.8%</td>
</tr>
</tbody>
</table>

OPSI 2b.1 and OPSI 2a used to calculate displacement percentage

OPSI 2b.2 and OPSI 2a used to calculate displacement percentage
Detailed Reference Model and Reference Model Sensitivity Results: Final CPP Analysis
Emissions and target emissions are for existing sources only covered by the Clean Power Plan regulation for existing sources.
Solar Renewable Energy Credits

Weighted Average Price for PJM Region

Low Gas RPS
- Utility Scale Solar Renewable Energy Credits
- Solar Renewable Energy Credits Price ($/SREC)

Reference RPS
- Utility Scale Solar Renewable Energy Credits
- Solar Renewable Energy Credits Price ($/SREC)

No credit multipliers are assumed; therefore, Solar Renewable Energy Credits = Generation.
No credit multipliers are assumed; therefore, Renewable Energy Credits = Generation.
PJM CPP Reference Model and Sensitivities

Transmission Expansion Advisory Committee

April 07, 2016
What it is
• Simultaneous clearing of energy, capacity, REC and SREC markets that provides a robust modeling representation of potential system futures driven by policy, regulatory and market drivers

How should it be used?
• To convey dynamics of various stimuli on the economic viability of existing and future generation
• Only for comparison with policy cases

What isn’t it
• An economic forecast of expected future outcomes
• A representation of all the considerations resource owners may make in investing in new assets or retiring existing assets
## Key Assumptions

### Reference Model
Assumes Production and Investment Tax Credit[^1]

### Sensitivities

<table>
<thead>
<tr>
<th>Sensitivities</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Portfolio Standard (RPS)</strong></td>
<td>Assumes Production and Investment Tax Credit and enforces RPS through state Alternative Compliance Payments</td>
</tr>
<tr>
<td><strong>Lower Gas</strong></td>
<td>Assumes Production and Investment Tax Credit</td>
</tr>
<tr>
<td><strong>Lower Gas + RPS</strong></td>
<td>Assumes Production and Investment Tax Credit and enforces RPS through state Alternative Compliance Payments</td>
</tr>
</tbody>
</table>

### Key Inputs

<table>
<thead>
<tr>
<th>Key Inputs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Natural Gas Price ($2016)</td>
<td>$5.14/mmbtu (avg. 2016-2037)</td>
</tr>
<tr>
<td>Lower Gas Natural Gas Price ($2016)</td>
<td>$3.43/mmbtu (avg. 2016-2037)</td>
</tr>
<tr>
<td>Inflation</td>
<td>2.25%</td>
</tr>
<tr>
<td>Effective Tax Rate</td>
<td>40%</td>
</tr>
<tr>
<td>Weighted Average Cost of Capital</td>
<td>8%</td>
</tr>
<tr>
<td>Study Horizon</td>
<td>2018 to 2037</td>
</tr>
</tbody>
</table>

[^1]: Renewable Energy Certificates (REC) are assumed tradeable throughout the footprint. Solar RECs must be produced within the state.
Intermediate and Baseload Resource

- Low avoidable costs (once built) and high capacity prices enable natural gas combined cycles to enter the market despite depressed energy market prices.
- Lower gas prices will lead to greater dependence on the capacity market for cost recovery by coal and nuclear resources.
- Coal resources appear to be at greater risks than nuclear since lower natural gas prices mean not only lower margins in the energy market but also reduced run hours.
Intermittent Resources

- Wind and solar can continue to grow in a low gas price environment provided RPS is in place and alternative compliance penalties remain high.
- Solar can take advantage of resource retirements more effectively than wind due to higher capacity value (38% vs. 13%).

Emissions
Sustained lower gas prices will result in CO₂ reductions through retirements and new combined cycle entry.
How is PJM Performing the CPP Analysis

April 31
Phase 1: Long-Term Analysis
20-year Economic Entry/Exit

April 31 - May 15
Phase 2 & 3: Short-Term Analysis
Solve hourly chronological Energy Market model with full transmission constraints, emissions and reserve and energy constraints
More detailed reliability evaluation as needed

May 31 - June 15
Final Compliance Assessment Report

Q3 Continued reliability and economic sensitivity analysis
Q3/4 PJM & MISO coordinated analysis
Detailed Reference Model and Reference Model Sensitivity Results
Reference Model and Reference Model Sensitivities
PJM Capacity and Energy Market Prices ($2018)

- **Capacity Market**
  - Reference
  - Low Gas
  - Reference with RPS
  - Low Gas with RPS

- **Energy Market**
  - Cost evolution from 2018 to 2030 for different scenarios.
Levelized Energy & Capacity Market Prices ($2018) vs. Change in Generating Capacity

$/MWh

Reference | Low Gas | Reference with RPS | Low Gas with RPS

MW

Reference | Low Gas | Reference with RPS | Low Gas with RPS

Sources: PJM, EIA, SEIA, NREL

AEP 20180215

www.pjm.com
Solar Renewable Energy Credits
Weighted Average Price for PJM Region

Low Gas RPS
- Utility Scale Solar Renewable Energy Credits
- Solar Renewable Energy Credits Price ($/SREC)

Reference RPS
- Utility Scale Solar Renewable Energy Credits
- Solar Renewable Energy Credits Price ($/SREC)

No credit multipliers are assumed; therefore, Solar Renewable Energy Credits = Generation.
No credit multipliers are assumed; therefore, Renewable Energy Credits = Generation.
PJM Region CO₂ Emissions for Existing Sources vs. Clean Power Plan Emissions Targets

Emissions and target emissions are for existing sources only covered by the Clean Power Plan regulation for existing sources.
Data Sources
### Clean Power Plan Analysis
#### 2014 Versus 2016 Analysis

<table>
<thead>
<tr>
<th></th>
<th>2014 Analysis</th>
<th>2016 Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simulation Tool</strong></td>
<td>ABB Promod IV</td>
<td>Plexos by Energy Exemplar</td>
</tr>
<tr>
<td><strong>Energy Market</strong></td>
<td>Chronological simulation of discrete years (SCED)</td>
<td>Chronological and load duration curve based simulation</td>
</tr>
<tr>
<td><strong>Entry/Exit</strong></td>
<td>None</td>
<td>20-year optimized economic entry/exit based on simulated energy and capacity market revenues</td>
</tr>
<tr>
<td></td>
<td>(Unit at-risk analysis performed in post-processing)</td>
<td></td>
</tr>
<tr>
<td><strong>Capacity Market</strong></td>
<td>None</td>
<td>20-year clearing BRA for RTO within simulation</td>
</tr>
<tr>
<td><strong>Reserves</strong></td>
<td>RTO operating reserves</td>
<td>RTO operating reserves</td>
</tr>
<tr>
<td><strong>Renewable Portfolio Standard (RPS)</strong></td>
<td>Scenario based (RPS targets achieved)</td>
<td>Market optimization based on Renewable Energy Credit clearing prices (REC and SREC), energy and capacity market results</td>
</tr>
<tr>
<td><strong>GHG Emissions</strong></td>
<td>Dispatch to price (Manually iterate on emissions price)</td>
<td>Single-Step optimization for annual or multi-year constraints</td>
</tr>
<tr>
<td><strong>SO₂ and NOₓ</strong></td>
<td>ABB forecasts</td>
<td>ABB forecasts</td>
</tr>
<tr>
<td><strong>Combined Cycle and Combustion turbine siting</strong></td>
<td>Queue units with an Interconnection Service (ISA) or Facilities Study Agreement (FSA)</td>
<td>Units with permits added automatically. Remaining queue projects enter when economic (FSA/ISA preference)</td>
</tr>
</tbody>
</table>

**Evolved analytical approach to evaluate compliance impacts over a wider range of state and multi-state compliance scenarios**
### Modeling Assumptions

<table>
<thead>
<tr>
<th></th>
<th>Combined Cycle</th>
<th>Combustion Turbine</th>
<th>Nuclear</th>
<th>Coal</th>
<th>Solar</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overnight Capital Costs</strong></td>
<td>Brattle 2014 PJM Costs of New Entry study</td>
<td>Brattle 2014 PJM Costs of New Entry study</td>
<td>EPA v5.13</td>
<td>N/A</td>
<td>NREL ATB 2015 - 2018 Technology year</td>
<td>NREL ATB 2015 - 2018 Technology year</td>
</tr>
<tr>
<td><strong>Technical Life</strong></td>
<td>30</td>
<td>30</td>
<td>40</td>
<td>N/A</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Depreciation</strong></td>
<td>MACRS 20-year</td>
<td>MACRS 15-year</td>
<td>MACRS 15-year</td>
<td>N/A</td>
<td>MACRS 5-year</td>
<td>MACRS 5-year</td>
</tr>
<tr>
<td><strong>Heat Rate (Btu/KWh)</strong></td>
<td>6,800[^1]</td>
<td>10,300[^1]</td>
<td>10,452</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capacity Factor</strong></td>
<td></td>
<td></td>
<td>Dispatchable within Model</td>
<td>NREL 2006 hourly shapes</td>
<td>NREL 2006 hourly shapes</td>
<td></td>
</tr>
<tr>
<td><strong>Fuel Forecast</strong></td>
<td></td>
<td></td>
<td>ABB Fall 2015 Fuel Forecast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Locational Costs Adders</strong></td>
<td>Brattle 2014 PJM Costs of New Entry study</td>
<td>Brattle 2014 PJM Costs of New Entry study</td>
<td>EIA energy market module NERC sub-regions</td>
<td>EIA energy market module NERC sub-regions</td>
<td>EIA energy market module NERC sub-regions</td>
<td></td>
</tr>
</tbody>
</table>

[^1]: Varies by PJM Locational Deliverability Region (GE 7FA technology)
Common Questions
**Common Questions**

- **Why is PJM performing analysis of the Clean Power Plan?**
  - The Organization of PJM States Inc. (OPSI) requested PJM to perform analysis, and PJM worked with the states and stakeholders to define the scope and timeline for the analysis. [http://pjm.com/~media/committees-groups/committees/teac/20160211/20160211-pjms-modeling-approach-to-the-final-cpp-emissions-guidelines.ashx](http://pjm.com/~media/committees-groups/committees/teac/20160211/20160211-pjms-modeling-approach-to-the-final-cpp-emissions-guidelines.ashx)

- **How does PJM treat expected unit technical life?**
  - PJM’s modeling reflects only market based entry/exit with the exception of announced retirements.

- **Does PJM model any minimum or maximum limits for resources?**
  - No, resources enter based on energy market revenues, capacity market revenues, solar and non-solar Renewable Energy Credits, and applicable Federal Tax Incentives.

- **How are Fixed Resource Requirement (FRR) resources treated in the capacity market simulation?**
  - All resources within the PJM footprint participate in the capacity market based on their unforced capacity. FRR resources are assumed to be price-takers, but can retire as a function of cost-recovery.
• **Is PJM doing resource planning?**
  – Absolutely not. The resource locations are all based on queue sites that are advanced in the interconnection queue study process. Wind and solar locations were added based on NREL sites nearest to the PJM transmission system.
  – The model is simply selecting resources based on when they become available given the various market prices.

• **What is the impact of not representing transmission in the 20-year model?**
  – In the short-run (< 5 years) some resources benefit significantly from the presence of transmission congestion, just as transmission congestion represents a limitation for other resources.
  – In the long-run, through PJM's baseline and market efficiency processes transmission congestion should be mitigated, such that resources across the interconnected system compete based on fundamental operating characteristics.

• **How does PJM represent the external world?** PJM uses the same external world representation used in PJM's Day-Ahead Market intended to replicate flow impacts on significant transmission constraints. However, in the model, external resources are not bid into the market.
Common Questions

• **How are retirement and entry decisions made within the model?**
  – Plexos performs a single step optimization of new entry and retirements for a 20-year horizon.
  – Within the 20-years the resource must have a positive net present value given capacity and energy market revenues, and for renewables, revenues from the renewable energy credit trading market.
  – Market revenues must exceed levelized capital payments, annual avoidable costs and production costs including cost of capital.

• **Does PJM model any confidential data?**
  – PJM’s model is based on publically available data with the exception of vendor supplied fuel and emissions forecasts. The model was tuned in coordination with various market operations and system planning departments, consequently not all data or assumptions will be provided publicly.
Primary Data Sources

- Federal and State Energy Policy and Incentives:
  [http://programs.dsireusa.org/system/program/](http://programs.dsireusa.org/system/program/)
- EPA Generating Unit and Financial Assumptions:
  [https://www.epa.gov/airmarkets/power-sector-modeling-platform-v513](https://www.epa.gov/airmarkets/power-sector-modeling-platform-v513)
- Natural Gas Combined Cycle and Combustion Turbine Financial Assumptions:
- Solar and Wind Financial Assumptions:
- Solar Hourly Shapes:
- Wind Hourly Shapes:
- Variable Resource Requirement Curve and RPM Planning Parameters:
I. Role of states in CPP compliance
   a. EPA promulgates guidelines
   b. States craft state-specific plans to account for each state’s particular energy mix
   c. EPA gave states large flexibility
      i. Rate-based
         1. Dual rate
         2. Blended rate
      ii. Mass based
         1. Must include “leakage” provision
         2. Including new sources is presumptively approvable
      iii. State measures
   d. Trading among states available for either rate or mass plans, but rate states may not trade with mass states
      i. Large and transparent markets will reduce compliance costs

II. Virginia’s plan development
   a. Public hearings
   b. Stakeholder process
   c. DEQ drafting at Governor’s direction
   d. State Air board approval
   e. Submission to EPA

III. Compliance for Virginia is not difficult
   a. Due to pre-existing commitments by utilities for reasons entirely unrelated to carbon pollution, most of the work is already done
   b. Virginia is already 80% of the way to compliance under final rule
   c. 2016 Integrated Resource Plans – strengths and weaknesses

IV. Policy considerations for Virginia’s plan
   a. Virginia’s plan must reduce carbon emissions
      i. Under certain rate-based plans, Virginia could technically comply with the CPP while allowing total carbon emissions to rise
   b. Virginia’s plan must make compliance as low-cost as possible – when done properly, Virginia can reduce its carbon pollution and simultaneously lower average ratepayer bills
i. Access to the largest and most transparent trading market
ii. Concentrate on renewables and efficiency programs
   1. Lowest hanging fruit
   2. Cheapest zero-carbon options
   3. Source of high-quality, well-paying jobs that cannot be outsourced
   4. Greater access to efficiency programs and distributed generation such as rooftop solar can reduce customers’ bills

V. Concluding thoughts
1. Preliminary Assessment of Ratepayer Impacts of “Final” Clean Power Plan (“CPP”)
   a. CPP compliance cost now appears much lower than originally forecasted
      i. Decline in natural gas prices
      ii. Moderation in final CPP compliance goals and dates
      iii. Coal retirements/conversions due to MATS and Regional Haze
      iv. Regional compliance solutions
   b. Mass based compliance goals generally appear to be easier to meet than Rate based goals
   c. Over-compliance provides opportunities for ratepayer savings in some instances

2. Ratepayer Input to State CPP Compliance Plan Development Process
   a. Ratepayer/State Regulator input to design of State compliance plan is essential to ensure lowest reasonable cost compliance solution
   b. Need for evidentiary based proceedings to develop information necessary to inform development of optimal statewide compliance plan
      i. Develop forecasted costs needed for modeling of compliance alternatives
      ii. Baseline forecasts of carbon emissions for state generating resources
      iii. Cost allocation issues

---

1 Mr. Norwood regularly performs consulting services for the Virginia Office of Attorney General’s Division of Consumer Counsel as an expert on electric utility matters. All views expressed by Mr. Norwood at the 2016 National Regulatory Conference are those solely of Mr. Norwood’s, and are not to be construed as the views of the Virginia Office of Attorney General.
3. Regulatory Policies for CPP Implementation
   a. Policies for evaluation of CPP impacts on major utility investments for demand-side and supply-side resources through integrated resource planning process
   b. Policies for allocation of CPP compliance costs and revenues
      i. Allocation between different state jurisdictions
      ii. Allocation between different utilities/electric service territories within the same state
      iii. Allocation between retail and wholesale rate classes
      iv. Allocation between retail rate classes
   c. Need for Re-evaluation of Major Utility Investments in light of final CPP
      i. Billions of dollars have already been invested on projects justified based on pre-CPP carbon compliance cost estimates that are now outdated and over-stated
      ii. While CPP details are not final, enough is known to re-evaluate major projects to avoid additional unjustified investments

4. Conclusions
Supreme Court stay of EPA’s Clean Power Plan:

- Supreme Court issued a stay of EPA’s CPP on Feb 9.
- Governor McAuliffe announced on Feb 10 that Virginia would stay on course and continue to develop the elements for a Virginia plan to reduce carbon emissions:
  o “Over the last several months my administration has been working with a diverse group of Virginia stakeholders that includes members of the environmental, business, and energy communities to develop a strong, viable path forward to comply with the Clean Power Plan. As this court case moves forward, we will stay on course and continue to develop the elements for a Virginia plan to reduce carbon emissions and stimulate our clean energy economy.”

- Virginia is part of a coalition of 25 states, cities and counties that is intervening to defend the CPP against legal challenge.
- The stay will remain in effect through the review of the CPP by the Court of Appeals for the District of Columbia Circuit (D.C. Circuit) and until the Supreme Court decides the matter, in the event that the losing side decides to appeal to the Supreme Court. This legal process could run into the middle of 2018.
- Will EPA “finalize” CPP Model Rule, Federal Plan, and CEIP this summer?
- Budget Bill General Assembly 2016 Session Item 369 relating to Air Program:
  o “Funding provided in this item is contingent upon no amount contained herein being used to prepare or submit to the Environmental Protection Agency (EPA) a state implementation plan, or other document with respect to the Environmental Protection Agency's “Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units,” 80 Fed. Reg. 64,662 (October 23, 2015), unless the stay issued by the United States Supreme Court is released pending disposition of the applicants' petitions for review in the United States Court of Appeals for the District of Columbia Circuit and disposition of the applicants' petition for a writ of certiorari, if such writ is sought.”


- Setup a dedicated web page in order to convey both federal and state information about the CPP to the public.
- Informal public comment periods to gather written comment from the public (proposed and final emission guidelines/CPP).
- DEQ met with the public to informally discuss EPA's carbon reduction plan at a series of listening sessions around the Commonwealth.
- Approximately 400 persons attended the listening sessions, and over 3000 written comments were received.
- DEQ also met, on an ongoing basis, with interested stakeholders, including affected utilities, the business community, and environmental organizations.
- In addition to receiving general input from the public, DEQ also sought to identify and gather input from vulnerable and overburdened communities.
- Virginia DEQ coordinates with EPA and other states on plan development.
- Virginia DEQ participates in meetings, trainings, workshops, other events in support of the development of the Commonwealth’s plan held by multiple entities, including but not limited to EPA, Nicolas Institute (Duke University), Georgetown Climate Center, Harvard Law School/Harvard Environmental Policy Initiative, and other organizations.
- Established a diverse 14 member stakeholders group (environmental organizations, electric power sector, industry, clean energy trade organizations, local government, community organizations) to advise and assist the Commonwealth to develop elements that could be included in the state compliance plan:
  - Stakeholders group met on November 12, 2015, December 15, 2015, February 12, 2016, February 18, and March 11, 2016
  - A report summarizing the stakeholder group's activities has been released to the public and along with all other Stakeholder group materials is available on DEQ’s CPP dedicated webpage: www.deq.virginia.gov/Programs/Air/GreenhouseGasPlan.aspx
  - Future discussions on recent CPP modeling results?
  - Other states plan to duplicate Virginia’s stakeholder process

- Virginia DEQ is continuing to get smarter and more informed about the key issues that will impact compliance and policy decisions.
- We will abide, of course, the General Assembly’s mandate not to prepare or submit a plan during the pendency of the CPP stay, but will position ourselves as best possible to develop a state plan once the stay is lifted.
INTRODUCTION

A stakeholder group (see Attachment A) was established by the Department of Environmental Quality (DEQ) on October 23, 2015. The purpose of this group was to discuss possible alternatives and compliance paths that the Commonwealth of Virginia may consider to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule. Members were invited due to the impact that this rule may have on their interests or on those whom they represent.

DEQ coordinated and facilitated the discussions of this group in an effort to find common ground and elements that could be included in the state compliance plan for the CPP. Meetings of the stakeholder group were held at the DEQ central office building, 629 East Main Street, Richmond, Virginia on the following dates:

- November 12, 2015, from 1:30 to 3:30 p.m.
- December 15, 2015, from 9:00 a.m. to 3:00 p.m.
- February 12, 2016, from 9:00 a.m. to 3:00 p.m.
- February 19, 2016, from 9:00 a.m. to 3:00 p.m.
- March 11, 2016, from 9:00 a.m. to 3:00 p.m.

At the time of this report, no further meetings have been planned; however, at a later date DEQ will evaluate whether additional meetings are needed, particularly after several utility integrated resource plans (IRPs) and studies become available in May 2016.

Meeting minutes are found in Attachment B. A prioritized list of issues developed by the group, and summaries of meeting notes taken by facilitating staff are included as Attachment C and Attachment D.
PROCEDURES

This group is a public body under the Freedom of Information Act (FOIA), and must comply with FOIA requirements for conducting state business in the open and the availability of public records. Members were advised of FOIA requirements, including the need for members to circulate information to the group via staff. Lists of documents provided by members to the group are found in the meeting minutes (see Appendix B).

The group was polled from time to time by the facilitator in order to determine if consensus existed on a particular issue, or to better define specific areas of agreement or disagreement. "Consensus" was considered to have been achieved when the group voted unanimously in favor of a specific subject. "General agreement" was the result of the group voting primarily in favor of a subject, with some members expressing reservations or outstanding questions that prevented them reaching consensus. "No consensus" was reached if there were any negative votes, or a mixture of positive/negative/unsure votes.

SPECIFIC DISCUSSION ISSUES

DEQ sought input on the following specific questions.

- Question 1: What are the benefits and issues of each approach (source performance standards plan or state measures plan) and what is the preferred path?
- Question 2: What general mechanism should be used to implement the preferred compliance plan (mass-based versus rate-based)?
- Question 3: What specific mechanisms should be included in the compliance plan?
- Question 4: What other issues should be addressed and how?

RECOMMENDATIONS/UNRESOLVED ISSUES

Below is a summary of the results of the work of the group. The first is a list of recommended elements of the plan on which the panel developed consensus (complete agreement) or general agreement (some reservations or uncertainty). The second is a list of the issues on which the panel failed to develop consensus or general agreement. Finally, other issues that were identified and discussed that did not necessarily fall into a plan recommendation are summarized. Attachments B through D provide further details on the group’s discussions.
**Recommended Plan Elements**

Question 1: The group came to consensus that a source performance standards plan was preferred over a state measures plan.

Question 3: There was general agreement that Virginia should wait until additional studies are released (anticipated in May 2016) before making a decision about mass vs. rate (e.g., release of IRPs from Dominion and American Electric Power, the PJM Regional Transmission Organization study, etc.). Although the group did not come to consensus as to whether the compliance plan should be mass- or rate-based (see Question 2 discussion below), there was consensus/general agreement on specific mechanisms for either approach.

A mass-based plan should contain or consider the following:

- Program should be trading-ready (**consensus**).
- Must address leakage (i.e., shifting generation to new plants).
- Allowance allocation should be based on historical generation or emissions.
- Allow early retired units to keep allowances through their useful life to ensure coverage for rate payers.
- Include trading, banking and borrowing of allowances.
- Provide some set aside of allowances.
- Recognize the importance of renewables in the allowance allocation method, e.g., performance-based allocation system that updates annually and is technology neutral.
- Predicting future load growth is difficult.
- Look into ways to address uncertainty.

A rate-based plan should contain or consider the following:

- Program should be trading-ready (**consensus**).
- A reliability safety valve (**consensus**).
- A national registry for generating verifiable allowances and credits (**consensus**).
- Price transparency.
- Include EPA model rule safety valve language.
- Include biomass and combined heat and power; include all types of renewable and low-emission sources.
Unresolved Issues

Question 2: The group did not come to consensus as to what general mechanism should be used to implement the preferred compliance plan:

<table>
<thead>
<tr>
<th>option</th>
<th>support</th>
<th>oppose</th>
<th>neutral/unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate</td>
<td>4 members</td>
<td>7 members</td>
<td>1 member</td>
</tr>
<tr>
<td>mass - existing only</td>
<td>3 members</td>
<td>3 members</td>
<td>5 members</td>
</tr>
<tr>
<td>mass with new source component</td>
<td>5 members</td>
<td>5 members</td>
<td>1 member</td>
</tr>
</tbody>
</table>

Advantages and disadvantages identified by group members for both approaches are summarized below.

<table>
<thead>
<tr>
<th>MASS-BASED APPROACH, PROS AND CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>existing only</strong></td>
</tr>
<tr>
<td><strong>pros</strong></td>
</tr>
<tr>
<td>Allowances are a known commodity--most clear approach to ensure transparent/efficient markets.</td>
</tr>
<tr>
<td>More market transparency.</td>
</tr>
<tr>
<td>More interstate trading.</td>
</tr>
<tr>
<td>Low costs; leads to economic development/jobs.</td>
</tr>
<tr>
<td>Environmental certainty due to cap.</td>
</tr>
<tr>
<td>All technologies can participate.</td>
</tr>
<tr>
<td>Economic development of renewable and energy efficiencies due to cap.</td>
</tr>
<tr>
<td>Leakage can be addressed via allowance allocation method.</td>
</tr>
<tr>
<td>Compliance easier--already familiar with compliance requirements due to previous programs.</td>
</tr>
</tbody>
</table>

4
RATE-BASED APPROACH, PROS AND CONS

<table>
<thead>
<tr>
<th>pros</th>
<th>cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>No cap: new sources can be built.</td>
<td>Reduced market transparency: some emission reduction credits (ERCs) won't get to market.</td>
</tr>
<tr>
<td>Good for states with a diverse electricity generation portfolio.</td>
<td>Potential for limited market.</td>
</tr>
<tr>
<td>Credits can come from energy efficiency and renewables.</td>
<td>Compliance mechanism not as well understood.</td>
</tr>
<tr>
<td>No concerns about leakage.</td>
<td>Disadvantages resources needed for reliability and fuel diversity.</td>
</tr>
<tr>
<td>Combined-cycle units generate ERCs.</td>
<td>Doesn't recognize benefits of existing zero-carbon assets.</td>
</tr>
<tr>
<td>Lower cost.</td>
<td>ERCs may not be fungible.</td>
</tr>
<tr>
<td>Provides flexibility for economic development.</td>
<td>ERCs are generated after production.</td>
</tr>
<tr>
<td></td>
<td>Validation of ERCs can be cumbersome for regulators; ERCs subject to legal challenge.</td>
</tr>
<tr>
<td></td>
<td>&quot;Buyer beware&quot; - potential for litigation costs under ERC creation</td>
</tr>
</tbody>
</table>

Question 4: In regard to what other issues should be addressed, members mentioned permitting requirements, new technologies and the rate at which they are appearing and becoming available, and considering recycling as a form of energy efficiency. The role of biomass and waste-to-energy was addressed. The group also discussed whether or not Virginia should join the Regional Greenhouse Gas Initiative (RGGI); no consensus was reached. Additionally, the following issues were identified by group members:

1. Don't lock into current technology for long-term solutions.

2. In most states, energy efficiency is the least-cost method of delivering energy. The cost/need to build new sources and transmission for load growth can be mitigated by increasing demand.

3. Don't confuse grid modernization cost exclusively with the CPP.

4. Health benefits should be an overarching concern and inform all decisions.

5. The Clean Energy Incentive Program (CEIP)—given that it is not yet in its final form—is likely a positive program in which Virginia should consider participating. No consensus was reached, but general agreement was met for the following:

- Virginia should probably join the program.
- Expand the program to include renewables and energy efficiency measures to ensure least cost projects.
- Start the program earlier if possible.
6. The following general areas of agreement were put forth by group members as important factors to address in any plan regardless of what compliance option is chosen:

- Clearly define and address leakage.
- Encourage regulatory certainty.
- Encourage a well-functioning market (transparency/liquidity/efficiency); avoid creating market distortions.
- Minimize impacts/costs to consumers.
- Encourage diverse power sources.
- Avoid impeding economic development.
- Consider a low-carbon future.
- Use all available tools to get to low cost.
- Level the playing field among like units.
- Use performance to assess technologies.

Attachments
ATTACHMENT A

VIRGINIA CLEAN POWER PLAN FOR GREENHOUSE GASES
STAKEHOLDER GROUP MEMBERS

AEE   Malcolm Woolf, Senior Vice President, Policy and Government Affairs, Advanced Energy Economy

AEP   John Hendricks, Director of Air Quality Services, American Electric Power

Alpha Natural Resources   Donald Ratliff, President of Commonwealth Connections

Birchwood   Will Poleway, Birchwood Power Partners, L.P.

Power Plant Management Services   Kris Gaus, EHS Manager

Covanta   Michael Van Brunt, Director of Sustainability

Dominion   Lenny Dupuis, Manager of Environmental Policy

Doswell/LS Power   Scott Carver, LS Power Development, LLC

NRDC   Walton Shepherd, Energy Staff Attorney, Natural Resources Defense Counsel

ODEC   Laura Rose, Environmental Health and Safety Coordinator, Old Dominion Electric Cooperative

Tenaska   Greg Kunkel

VACO   John Morrill, Energy Manager, Arlington Initiative to Rethink Energy

VMA   Irene Kowalczyk, Director Global Energy, WestRock

We Act   Dr. Jalonne White-Newsome, Environmental Justice Federal Policy Analyst, We Act for Environmental Justice [participated October 2015 - January 2016]
The baseline meeting minutes follow. Attachments are not included; complete minutes with attachments are available from the DEQ Greenhouse Gas Web Page at http://deq.virginia.gov/Programs/Air/GreenhouseGasPlan.aspx.
COMMONWEALTH OF VIRGINIA
CLEAN POWER PLAN FOR GREENHOUSE GASES

STAKEHOLDER GROUP MEETING MINUTES

SECOND FLOOR CONFERENCE ROOM
629 EAST MAIN STREET, RICHMOND, VIRGINIA
NOVEMBER 12, 2015

Members Present:
Malcolm Wootl, Advanced Energy Economy
John Hendricks, AEP
Donald Retlif, Alpha Natural Resources
Julie Caiafra for Will Poleway, Birchwood
Kris Gaus, Cogentrix
Michael Van Brunt, Covanta
Lenny Dupuis, Dominion
Scott Curver, Doswell/LS Power
Walton Shepherd, NRDC
James Wright, ODEC
Greg Kunkel, Tenaska
John Morris, VACO
Irene Kowalczyk, VMA
Dr. Jolonne White-White, We Act

Department of Environmental Quality:
David K. Paylor, Director
Ann M. Regn, Office of Public Information
Michael G. Dowd, Air Division
Karen Sabasteanski, Regulatory Affairs

The meeting began at approximately 1:35 p.m.

Meeting Purpose: This stakeholders group has been established to advise and assist the Commonwealth on elements that could be included in the state compliance plan to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule for the control of greenhouse gases. The purpose of this meeting is for DEQ to coordinate and facilitate discussions of this group in an effort to find common ground and elements that could be recommended to the Administration for consideration in the state compliance plan for the Commonwealth.

Welcome and Introductions: Mr. Paylor made a number of introductory remarks. The group's purpose is primarily advisory to the Administration. Every effort will be made to achieve consensus with the understanding that there are many options and choices. However, even if consensus is reached, the content of the final plan is nevertheless the Governor's prerogative. After today, alternates should not attend as continuity of discussion is important.

Ms. Regn welcomed the group. Members introduced themselves individually. Ms. Regn then provided general guidelines for discussions (see Attachment A).

FOIA Requirements: Ms. Berndt discussed Virginia Freedom of Information Act (FOIA) requirements as they pertain to this group's meetings (see Attachment B).
Clean Power Plan Overview: Mr. Dowd provided a broad overview of CPP basics. EPA’s final plan requirements, how EPA addressed Virginia’s comments, Virginia’s goals, compliance options, a timeline, details on plan and plan components, and questions for the group to consider as it moves ahead (see Attachment A).

Work Plan/Group Discussion: The group discussed initial reactions to Question 1 (see Attachment B): What are the benefits and issues of each plan and what is the preferred path? Some needs for additional information to be provided by DEQ and group members were identified.

Next Steps/Future Meetings: Ms. Regn wrapped up the meeting. Future meetings are scheduled for December 15, 2015, January 22, 2016, February 12, 2016, and March 11, 2016.

The meeting adjourned at approximately 3:35 p.m.

Attachments

SIPv111-DIGGISTAKEHOLDERSMEETING111215
COMMONWEALTH OF VIRGINIA
CLEAN POWER PLAN FOR GREENHOUSE GASES

STAKEHOLDER GROUP MEETING MINUTES
SECOND FLOOR CONFERENCE ROOM
629 EAST MAIN STREET, RICHMOND, VIRGINIA
DECEMBER 15, 2015

Members Present:
Malcolm Woof, Advanced Energy Economy
John Hendricks, AEP
Donald Retliff, Alpha Natural Resources
Will Poleway, Birchwood
Kris Gaus, Power Plant Management Services
Michael Van Brunt, Covanta
Lenny Dupuis, Dominion
Scott Carver, Doswell/LS Power
Walton Shepherd, NRDC
Laura Rose, ODEC
Greg Kunkel, Tenaska
John Morrell, VACO
Irene Kowalczyk, WestRock/VMA
Dr. Jalone White-Newsome, We Act

Department of Environmental Quality:
David K. Paylor, Director
Ann M. Regn, Office of Public Information
Mary E. Major, Regulatory Affairs
Michael G. Dowd, Air Division
Thomas R. Ballou, Air Division
Karen Sabasteanski, Regulatory Affairs

The meeting began at approximately 9:00 a.m.

Meeting Purpose: This stakeholder group has been established to advise and assist the Commonwealth on elements that could be included in the state compliance plan to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule for the control of greenhouse gases. The purpose of this meeting is for DEQ to coordinate and facilitate discussions of this group in an effort to find common ground and elements that could be recommended to the Administration for consideration in the state compliance plan for the Commonwealth.

Welcome and Introductions: Mr. Paylor welcomed the group and made a number of introductory remarks. The group needs to understand the impacts of the Clean Power Plan throughout the Commonwealth. He reiterated that alternates should not attend as continuity of discussion is important, and that all materials should be disseminated to the group through DEQ staff.

Ms. Regn welcomed the group. Members introduced themselves individually. Ms. Regn then reviewed the agenda, provided a brief summary of the previous meeting, and reviewed the questions for group discussion, general guidelines for discussions, and the main factors to be considered. She also reviewed the discussion and consensus
process, and provided a brief description of what the final report will contain (see Attachment A).

Mr. Ballou then reviewed baseline data requested by the group at the previous meeting. He described the affected electric generating utilities (EGUs) covered under the 2012 baseline, including changes made to affected sources in Virginia that occurred after 2012. He also provided emission and rate trends for both carbon dioxide (CO₂) and for criteria pollutants (nitrogen dioxide and sulfur dioxide) for the 2000 through 2014 period (see Attachment A).

**Work Plan/Group Discussion:** The need to consider how health benefits tie into general environmental benefits, particularly with respect to communities and the potential for “hotspots” was raised. The group discussed initial reactions to Question 1 (see Attachment A): What are the benefits and issues of each type of plan and what is the preferred path? The first factor considered by the group was whether the plan should be an emissions performance standard plan, or a state measures plan, details of which were provided by Mr. Dowd. The group discussed the costs and benefits of either approach, and came to consensus that the emission standards approach was preferred.

Given the emissions standard approach as a starting point, the group then began to consider Question 2; whether a mass-based or rate-based program is preferable. The group discussed, in considerable detail, the pros and cons of the mass-based approach, with some overlap with respect to rate; there was also detailed discussion as to whether or not a new source complement should be considered should the program be mass-based. Attachment B is a brief summary of the primary discussion topics.

No formal consensus was reached on any issue, although the group generally agreed that the Clean Energy Incentive Program (CEIP)—given that it is not yet in its final form—was likely a positive program in which Virginia should consider participating.

When the group reconvenes in January, the likely topics of discussion will be:

- Continue discussion of issues with a mass-based program, including whether a new source complement should be included.
- Go into the rate-based program in greater detail.
- Discuss source-specific issues with respect to local impacts.
- Continue to consider available modeling tools. (Mr. Shepherd provided some examples of modeling outputs; see Attachment C.)

In advance of the January meeting:

- Mr. Ballou will provide source-specific data.
- Mr. Shepherd will provide more information on how the mass-based goals were developed.
- Mr. Wooll will review the Advanced Energy Economy State Tool for Electricity Emissions Reduction (STEER) modeling tool in a more Virginia-specific context.
- DEQ staff will review Information Handling Services (IHS) modeling for any applicability to Virginia.
- DEQ staff will report on any additional modeling information from PJM/Nicholas Institute as available.

Next Steps/Future Meetings: Ms. Regn wrapped up the meeting. Future meetings are scheduled for January 22, 2016, February 12, 2016, and March 11, 2016.

The meeting adjourned at approximately 2:30 p.m.

Attachments

SIP\11-D\IGH\STAKEHOLDERS\MEETING2\121515
COMMONWEALTH OF VIRGINIA
CLEAN POWER PLAN FOR GREENHOUSE GASES

STAKEHOLDER GROUP MEETING
SECOND FLOOR CONFERENCE ROOM
629 EAST MAIN STREET, RICHMOND, VIRGINIA
FEBRUARY 12, 2016

Members Present:
Malcolm Woolf, Advanced Energy Economy
John Hendricks, AEP
Walton Shepherd, NRDC
Will Poleway, Birchwood
Kris Gaus, Power Plant Management
Services
Lenny Dupuis, Dominion
Irene Kowalczyzk, WestRock/VMA
Laura Rose, ODEC
Greg Kunkel, Tenaska
John Morrill, VACO
Michael Van Brunt, Covanta

Members Absent:
Scott Carver, Doswell/LS Power
Donald Ratliff, Alpha Natural Resources

Department of Environmental Quality:
David K. Paylor, Director
Ann M. Regn, Office of Public Information
Michael G. Dowd, Air Division
Karen Sabastianski, Regulatory Affairs
Mary E. Major, Regulatory Affairs

The meeting began at approximately 9:40 a.m.

Meeting Purpose: This stakeholders group has been established to advise and assist the Commonwealth on elements that could be included in the state compliance plan to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule for the control of greenhouse gases. The purpose of this meeting is for DEQ to coordinate and facilitate discussions of this group in an effort to find common ground and elements that could be recommended to the Administration for consideration in the state compliance plan for the Commonwealth.

Welcome and Introductions: Mr. Paylor welcomed the group and made a number of introductory remarks. Although the Supreme Court has stayed the federal emissions guidelines on which the plan will be based, the guidelines have not been struck, so the group will continue to consider the pros and cons of elements of a potential plan, and determine what would be the best plan for Virginia.

Ms. Regn welcomed the group. Members introduced themselves individually. Ms. Regn then reviewed the agenda, provided a brief summary of the previous meeting, the questions for group discussion, general guidelines for discussions, and the main factors to be considered. She also reviewed the discussion and consensus process (see
Attachment A). The focus of today's meeting was Question 2: What general mechanism should be used to implement the preferred compliance plan?

Members were then asked to individually state the pros and cons of the two primary compliance options: (i) a mass-based program (either limited to existing sources, or including existing and new sources), and (ii) a rate-based program. Although the group did not reach consensus on any specific recommendations, the following general areas of agreement were put forth as important factors in any plan regardless of what compliance option is chosen:

- Regulatory certainty
- A well-functioning market (transparency/liquidity/efficiency)
- Minimize impacts/costs to consumers
- Encourage diverse power sources
- Avoid impeding economic development
- Consider a low-carbon future
- Use all available tools to get to low cost
- Level the playing field among like units
- Use performance to assess technologies
- Avoid creating market distortions

Mr. Woolf provided the group with a copy of Modeling a low-cost approach to Clean Power Plan Compliance for Virginia, and Mr. Shepherd provided a copy of a white paper on Guidance Principles for Clean Power Plan Modeling (see Attachment B). The group also discussed several modeling options previously sent to the group by Ms. Kowalczyk.

Ms. Regn polled the group and found the members supported compliance approaches as follows:

<table>
<thead>
<tr>
<th>option</th>
<th>support</th>
<th>oppose</th>
<th>neutral/unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate</td>
<td>4 members</td>
<td>4 members</td>
<td>3 members</td>
</tr>
<tr>
<td>mass - existing only</td>
<td>2 members</td>
<td>3 members</td>
<td>6 members</td>
</tr>
<tr>
<td>mass with new source component</td>
<td>3 members</td>
<td>6 members</td>
<td>2 members</td>
</tr>
</tbody>
</table>

In advance of the next meeting, the group was asked to consider the following elements, assuming a neutral stance on which approach to take, but providing detail on what each type of approach should contain:

- What are the important operational details for each plan type
- How to handle allocation of allowances
- Steps that could be taken beyond the EPA plan

The meeting adjourned at approximately 2:15 p.m.
COMMONWEALTH OF VIRGINIA
CLEAN POWER PLAN FOR GREENHOUSE GASES

STAKEHOLDER GROUP MEETING
SECOND FLOOR CONFERENCE ROOM
629 EAST MAIN STREET, RICHMOND, VIRGINIA
FEBRUARY 19, 2016

Members Present:
Malcolm Wooff, Advanced Energy Economy
John Hendricks, AEP
Lenny Dupuis, Dominion
Will Poleway, Birchwood
Irene Kowalczyk, WestRock/VMA
Michael Van Brunt, Covanta

Scott Carver, Doswell/LS Power
Walton Shepherd, NRDC
Laura Rose, ODEC
Greg Kunkel, Tenaska
John Morrill, VACO

Members Absent:
Donald Rattliff, Alpha Natural Resources
Kris Gaus, Power Plant Management Services

Department of Environmental Quality:
David K. Paylor, Director
Ann M. Regn, Office of Public Information
Mary M. Major, Regulatory Affairs

Michael G. Dowd, Air Division
Karen Sabasteanski, Regulatory Affairs

The meeting began at approximately 9:05 a.m.

Meeting Purpose: This stakeholders group has been established to advise and assist the Commonwealth on elements that could be included in the state compliance plan to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule for the control of greenhouse gases. The purpose of this meeting is for DEQ to coordinate and facilitate discussions of this group in an effort to find common ground and elements that could be recommended to the Administration for consideration in the state compliance plan for the Commonwealth.

Welcome and Introductions: Mr. Paylor welcomed the group and made a number of introductory remarks. He reminded the group that the goal is a detailed understanding of issues and concerns related to the CPP, and that today's emphasis would be on organizing and synthesizing information for the administration in order that the final plan be the best for Virginia.

Ms. Regn welcomed the group. Members introduced themselves individually. Ms. Regn then reviewed the agenda, provided a recap of the previous meeting, and stated that the current meeting's primary task was to address Question 3: What specific
mechanisms should be included in the compliance plan? The group was reminded of
the factors to be considered. The current status of the members' stance on each
compliance option was reiterated. (See Attachment 1.)

The group, which was organized according to members' general stance on each
compliance option, was then asked to consider the advantages and disadvantages of
each approach, including compliance, costs, benefits, and impacts. Displays
summarizing the pros and cons of (i) mass-based, existing sources, (ii) mass-based
with new source compliment, and (iii) rate-based were presented, and members were
asked to rate each issue according to importance in order to focus on priorities. Issues
where there was uncertainty or outstanding questions were also flagged. Once the
group had prioritized the pros and cons for each compliance option, members then
individually discussed why those choices were made.

The group then discussed what should be the prescribed elements of a mass-based
compliance plan, for both existing-only and with a new source compliment. Members
were asked to consider what they would prefer to see in a mass-based program
regardless of whether or not they favor mass or rate, in order that the best possible
mass-based plan can be developed.

Although the group did not reach consensus on any specific items, several areas of
general areas of general agreement were identified:

- A trading ready program is likely something that everyone would want to see
- Leakage ought to be clearly defined and addressed
- It is difficult to predict future load requirements
- It is difficult to predict the benefits associated with new technology
- Need to look into ways to address uncertainty
- Given that the program is not yet finalized, CEIP will probably be a good option
for Virginia

Ms. Regn polled the group and found the members supported compliance approaches
as follows:

<table>
<thead>
<tr>
<th>option</th>
<th>support</th>
<th>oppose</th>
<th>neutral/unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate</td>
<td>4 members</td>
<td>7 members*</td>
<td>1 members</td>
</tr>
<tr>
<td>mass - existing only</td>
<td>3 members</td>
<td>3 members</td>
<td>5 members</td>
</tr>
<tr>
<td>mass with new source</td>
<td>5 members</td>
<td>5 members</td>
<td>1 member</td>
</tr>
<tr>
<td>source component</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Although Mr. Geus did not attend, his handout indicated that Spruance Genco would be opposed to rate;
see below.

The group also agreed that for the forthcoming discussion of rate, a dual approach
would be discussed but not a blended approach.
Although Mr. Gaus was unable to attend, he provided the group with a paper briefly summarizing issues specific to Spruance Genco (see Attachment B). Mr. Woolf also provided the group with *A Performance-Based Approach to Allowance Allocation for Clean Power Plan Compliance* (see Attachment C).

The following items were identified for discussion at the March 11, 2016 meeting:

- The prescribed elements of a dual-approach rate-based compliance plan
- How to treat biomass, waste-to-energy, etc.
- Define least cost: to whom, and what elements should be considered
- Whether the plan should go beyond the EPA plan--are there other ways to achieve emissions reductions at a reasonable cost
- CEIP
- Other cost mitigation measures

Ms. Regn reminded members that all materials and group communications must be sent through Ms. Sabasteanski.

Mr. Paylor noted that the final meeting of the group is scheduled for March 11, 2016; after this meeting, DEQ will evaluate where we are and then make a determination as to how to proceed. He also suggested the possibility of the group meeting again once several utility IRPs and a PJM study become available in May.

The meeting adjourned at approximately 3:00 p.m.
COMMONWEALTH OF VIRGINIA
CLEAN POWER PLAN FOR GREENHOUSE GASES

STAKEHOLDER GROUP MEETING
SECOND FLOOR CONFERENCE ROOM
629 EAST MAIN STREET, RICHMOND, VIRGINIA
MARCH 11, 2016

Members Present:
Malcolm Wooff, Advanced Energy Economy
John Hendricks, AEP
Michael Van Brunt, Covanta
Will Poleway, Birchwood
Kris Gaus, Power Plant Management Services
Lenny Dupuis, Dominion

Scott Carver, Doswell/LS Power
Walton Shepherd, NRDC
Laura Rose, ODEC
Greg Kunkel, Tenaska
John Morrill, VACO
Irene Kowalczyk, WestRock/VMA

Members Absent:
Donald Ratliff, Alpha Natural Resources

Department of Environmental Quality:
David K. Paylor, Director
Ann M. Regn, Office of Public Information

Michael G. Dowd, Air Division
Karen Sabasteanski, Regulatory Affairs
Mary E. Major, Regulatory Affairs

The meeting began at approximately 9.05 a.m.

Meeting Purpose: This stakeholders group has been established to advise and assist the Commonwealth on elements that could be included in the state compliance plan to meet the final U.S. Environmental Protection Agency (EPA) Clean Power Plan (CPP) rule for the control of greenhouse gases. The purpose of this meeting is for DEQ to coordinate and facilitate discussions of this group in an effort to find common ground and elements that could be recommended to the Administration for consideration in the state compliance plan for the Commonwealth.

Welcome and Introductions: Mr. Paylor welcomed the group and made a number of introductory remarks. These meetings have been very helpful to us. Although this meeting is the last one scheduled, it is clear that there is more to learn. The collaborative process will continue; we will provide a schedule once we have reported to the Administration and we have a clearer framework on which to proceed. We also expect that a number of forthcoming studies will be useful in informing future activities.

Ms. Regn welcomed the group. Members introduced themselves individually. Ms. Regn then reviewed the agenda, provided a recap of the previous meeting, and stated
that the current meeting's primary task was to finish addressing Question 3 (What specific mechanisms should be included in the compliance plan?) with respect to a rate-based program, and to address Question 4: What other issues should be addressed and how? (See Attachment A.)

The group then discussed what should be the prescribed elements of a rate-based compliance plan. Members were asked to consider what they would prefer to see in a rate-based program regardless of whether or not they favor mass or rate, in order that the best possible rate-based plan can be developed.

The group reached consensus on the following specific items:

- A trading-ready program is preferred.
- A national registry for generating verifiable allowances and credits—whether standalone or as a marketplace—is important.

The following areas of general agreement were identified:

- A reliability safety valve is important.
- Price transparency is important.

The group then discussed potential ways of treating biomass, waste-to-energy and other sources under each compliance approach. There was some interest in how waste heat recovery from low quality steam could become economically attractive.

The Clean Energy Incentive Plan (CEIP) was then discussed. Although the members generally agree that the CEIP is a positive program in which the state should participate, and given that the program is not yet final, there was some discussion about when and how to participate, and how to best address impacts to low income communities. Mr. Shepherd added that the group representative for environmental justice had provided a document, Environmental Justice State Guidance, and asked that it be sent to the group (see Attachment B).

There was a discussion of other measures to reduce CO₂ emissions—that is, the group was given the opportunity to discuss any other ideas or concerns that had not otherwise been addressed throughout the stakeholder process. Although not necessarily part of the immediate CPP, members mentioned permitting requirements, new technologies and the rate at which they are appearing and become available, and considering recycling as a form of energy efficiency. The group also discussed whether or not Virginia should join the Regional Greenhouse Gas Initiative (RGGI); no consensus was reached.

Finally, the group initiated a discussion on cost: what least cost/cost mitigation measures should be considered. The group talked more about the concept of leakage as it affects cost, and who pays for transmission costs and stranded assets.
Prior to the meeting, Mr. Morrill provided the group with two ACEEE white papers (*Best practices in developing state lead-by-example programs and considerations for Clean Power Plan Compliance and Energy Efficiency and the Clean Power Plan: Steps to Success*), and an AJW document (*Simplifying energy efficiency for states: utilizing and incentivizing energy efficiency-related greenhouse gas reductions under the Clean Power Plan's mass-based approach*). (See Attachments C, D and E.)

Mr. Paylor and Ms. Regn then wrapped up the meeting. Mr. Paylor reiterated that the discussion will continue once we have developed a structure for moving forward.

The meeting adjourned at approximately 3:00 p.m.
ISSUES PRIORITIZED AND WEIGHTED BY THE GROUP

At the fourth meeting, which was held on February 19, 2016, the group was organized according to members' general stance on each compliance option, and was then asked to consider the advantages and disadvantages of each approach, including compliance, costs, benefits, and impacts. Displays summarizing the pros and cons of (i) mass-based, existing sources, (ii) mass-based with new source compliment, and (iii) rate-based were presented, and members were asked to rate each issue according to importance in order to focus on priorities. Issues where there was uncertainty or outstanding questions were also flagged. Once the group had prioritized the pros and cons for each compliance option, members then individually discussed why those choices were made.

- A red mark indicates opposition.
- A green mark indicates agreement.
- A yellow mark indicates uncertainty/outstanding issues to be addressed.
Mass-based (with new sources) approach Worksheet

Pros/Advantages
1. Leakage is addressed
2. Allowances are a known commodity (i.e., come from VA) - most clear approach to ensure transparent and efficient markets.
3. Equally open access to markets
4. Allowance allocation process for M-B easier
5. Cost to state would be lower; especially if funding is involved.
6. Load growth is built-in to the cap
7. Multiple demonstrated successful M-B trading platforms
8. Market liquidity
9. More control for regulators
10. More transparency
11. More experience in implementing M-B programs
12. More interstate trading
13. Greater environmental certainty
14. Each reduction is recognized
15. More flexibility in recognizing reductions in green house gases
16. Compliance is straightforward
17. Low cost, leads to economic development/jobs
18. Compliance process already established under EPA through CAMD

Cons:

a. Finite amount of allowances tent to pit companies against
b. More open access to markets under R-B
c. Including new source component reduces flexibility
d. No direct incentive for renewable development or EE

e. More expensive; cost increases under M-B.
f. R-B discriminates against coal facilities but one really need to consider reliability issue
g. New source complement will impact coal and gas-fired plants; not efficient
h. How to deal with load growth and incentives for certain technologies
i. M-B limits growth especially if the new source complement is included
j. Very difficult to generate allowances for green house gases
k. Less incentive for renewable (R-B generate ERCs)
l. Surrounding states have a bigger cap
m. Costs could be higher

n. Not sure how solar projects will be handled;

o. Con: Greater risk especially if auction is used to distribute allowances-that will increase cost to customers
p. Con: price volatility is greater under M-B than it would be under R-B
### Mass-based (no new, future) approach Worksheet

**Pros/Advantages**
1. Allowances are a known commodity (i.e., come from VA) – most clear approach to ensure transparent and efficient markets.
2. Equally open access to markets
3. Allowance allocation process for M-B easier
4. Cost to state would be lower; especially if funding is involved.
5. Load growth is built-in to the cap.
6. Multiple demonstrated successful M-B trading platforms
7. Market liquidity
8. More control for regulators
9. More transparency
10. More experience in implementing M-B programs
11. More interstate trading
12. Greater environmental certainty
13. Each reduction is recognized
14. More flexibility in recognizing reductions in green house gases
15. Compliance is straight forward
16. Low cost, leads to economic development/jobs
17. Compliance process already established under EPA through CAMD

**Cons:**

- a. Finite amount of allowances tent to pit companies against
- b. More open access to markets under R-B
- c. Including new source component reduces flexibility
- d. No direct incentive for renewable development or EE
- e. More expensive; cost increases under M-B.
- f. R-B discriminates against coal facilities but one really need to consider reliability issue
- g. New source complement will impact coal and gas-fired plants; not efficient
- h. How to deal with load growth and incentives for certain technologies
- i. M-B limits growth especially if the new source complement is included
- j. Very difficult to generate allowances for green house gases
- k. Less incentive for renewable (R-B generate ERCs)
- l. Surrounding states have a bigger cap
- m. Costs could be higher if future sources not included
- n. Not sure how solar projects will be handled;
- o. Cons: Greater risk especially if auction is used to distribute allowances—that will increase cost to customers
- p. Cons: price volatility is greater under M-B than it would be under R-B
Rate-based Worksheet

Pros/Advantages

1. Not subject to cap
2. Not worried about leakage
3. Not dependant on EPA
4. Can take advantage of low emitting combined-cycle units to generate ERCs
5. Easier to track compliance costs
6. Requires a "lighter lift" to meet compliance requirements, i.e. lower generation cost, perhaps higher administrative cost but unclear at this time
7. Better at addressing inequalities between combined-cycle facilities
8. No cap. New sources can be built. Very important if new generation is required to replace nuclear facilities.
9. No need to address leakage; more equitable treatment of existing and new sources
10. More flexibility as to how to treat new sources as they come online
11. Lower cost/more flexibility
12. NO CAP
13. For states with a diverse portfolio, R-B better
14. Perhaps the ERC will be more credible; APX is developing a registry
15. More flexibility for economic growth
16. Finite number of allowances
17. Transparency; one can verify the development and the validation of ERCs
18. ERC can come from efficiency and renewables

Disadvantages/Cons

a. Potential for a limited market (not big enough) if can't trade with M-B states
b. Bigger expense for regulatory agency; very complex program to develop
c. Could need more ERCs for compliance than are generated
d. Market mechanism not as well demonstrated
e. Less real-time certification of ERC
f. ERCs are generated after production; can be cumbersome
g. No cap under R-B; greenhouse gas emission can increase
h. Some ERCs won't make it to market; i.e., peer-to-peer ERC transactions
i. Complex market for ERCs; can't accurately predict how markets will work leading to potential unintended consequences
j. Not all ERCs are fungible
k. Validation will be cumbersome for regulator; subject to case decision and litigation
l. Buyer of ERC has liability
m. Don't see new renewables/efficiencies being realized under R-B approach. Process leaves stranded assets
n. Doesn't recognize benefits of existing low/zero carbon assets
o. Disadvantages resources need for reliability and fuel diversity
FACILITATOR NOTES

Staff took notes on flip charts during each meeting. Summaries of these notes follow.

Note that flip charts were not used during the first group meeting on November 12, 2015.
Clean Power Plan Meeting 12/13/2015 Flip chart summary.

- Identifies issues to be revisited

**Consensus Achieved: Emission Standard Approach**

**Other Issues to be addressed at a later time:**

- Don't lock into 2012 technology for 2030 solutions
- Ensure motivation for state to move toward energy efficiency
- 40% of Dominion capacity is currently supplied by nuclear energy. Those facilities are up for re-licensing in 2030; if not renewed, the replacement of that generation capacity will be very difficult to achieve instate.
- How can we ensure that the modeling that is being conducted but not yet completed can be incorporated into the process?
- Health issues for communities near sources and low-income communities; new permitted sources will need to meet NSPS and BACT
- Need to include health costs and a method to quantify reductions at the source
- Need to assess the role of biomass in the program even though EPA doesn't include them in the program VA has several biomass facilities
- Are new units included in the program or does it only apply to existing units
- Need to develop an approach that utilizes all resources
- Need to have sufficient time to include modeling information that will be available sometime in 2016.
- Need to define an approach that provides the lowest cost to consumer with maximum flexibility for the sources.
- More in-depth discussion of the CEIP participation in future meetings

**General Discussion of Mass vs Rate-based approach.**

Will VA be "flush" with CO2 emissions?

Many states are leaning toward mass-based; however, states with nuclear tend to lean for rate-based

REGGIE states leaning toward mass-based

The EPA FIP will be a massed-based.

To the best of our knowledge, Regional Transmission Organizations (RTO’s) like PJM don’t have a preference.

For coal units, the mass-based approach would allow for them to compete as the rate-based approach set a limit they can’t meet. In addition, it will be very difficult for them to generate Emission Reduction Credits (ERCs). The point was made that the coal units could purchase credits if they are
unable to achieve the rate. That point was countered with the argument that the ERC market carries too many uncertainties. It becomes extremely difficult for sources that don't have a large energy portfolio.

Mass-based approach utilizes a cap.

Discussion of ERC vs Allowance

ERC = emission rate credit and are generated in the future...are created base upon a units past operation.

NGCC units have a rate limit of ?????/ coal units have a rate limit of 1.3 lbs/MWh (megawatt per hour)

Units that emit above the rate must buy ERCs; units that operate below the rate limit generate ERCs that can then be sold or utilized within the company system.

Significant uncertainty in the actual value of an ERC.

Significant concern that there may not be sufficient ERC for compliance demonstration.

Two types of ERCs: Gas-shifting ERCs that can only be used by coal units within own system will need to be validated; how will that be accomplished? Gas-shifting ERCs may have a different value than "regular" ERCs. "Regular" ERCs can be generated by renewable or zero emitting energy generation such as solar, wind, or nuclear power generation or energy efficiency.

Rate based approach provides many opportunities (motivation) for energy efficiency and generation of ERCs.

Rate-based approach could allow for the complete development of NGCC in the PIIM system

Allowances: EPA sets an emissions cap in tons of emissions; One allowance = one ton of emissions. allowances are distributed up front so a source knows exactly how many tons they are allocated.

Emissions are measured at the stack

If the unit emits more emissions than it is allocated, it must buy additional allowances. If it operates below its allocation level, it generates extra allowances that can be sold or traded.

Market is very stable; everyone know exactly how many allowances there are upfront as opposed to ERCs that are determined after a period of operation. One is unsure just how many ERCs might be generated within a specific time period. There is some comfort in utilizing allowances as the industry has previous experience with them under NOX SIP Call and CAIR programs. Others argue that the comfort of the "old ways" doesn't lend itself to push for new markets, energy efficiency, etc.

There will be some sort of market response to the generation of ERCs; a registry will probably be developed. This registry could be used for either a mass based or rate-based program. There will need to be some mechanism to determine the lowest cost allowance or the value of the ERC.
New sources under the allowance approach will have a new source set aside. How big, how its
distributed are details yet to be determined.

For "zero" emitting sources there is the possibility of flooding the ERC market.

**Some perceived "pros" of the mass-based approach (allowances)**

Already have experience with that approach

Will have certainty regarding the cost of allowances even though they may raise or fall in price
depending on market forces

Large market size for allowances, very robust market

**Market issues of ERCs**

Question: Is there something inherently unstable about the ERC and the potential ERC market?

Markets will develop prior to the mandated compliance date; the first interim period for compliance is 3
years. There will be some knowledge of the renewable energy development market. In VA the supply
of ERCs will be contingent on the operation of NGCC and one will be able to estimate that operation.

Models are also being developed that will estimate the ERC market

**Discussion of Including new sources**

Benefits: easy to do, levels the playing field, locks in environmental benefits. If not included it creates a
special class of sources not subject to the same program restrictions of existing sources- could cause
distortions in the dispatch of power generation

Cons: if new units included under a mass approach it could restrict growth as that approach sets a cap
on all emissions, including the set aside for new units. Some suggest that the EPA growth factors and
not sufficient. Some existing models suggest a very large demand for new power in VA that will need to
come from NGCC units. Including new units under a defined cap make the possibility of meeting that
demand very problematic.

Bigger discussion includes the issue of leakage between existing sources and new units.

Requirements under 111(b) provide "less stringent" compliance requirements for new sources
compared to the requirements for existing sources under 111(d); however, all new sources will need to
meet BACT so how much leakage will there really be?

**No consensus for either mass based approach vs rate based**

**No consensus for including new units in a mass-based approach.**
Clean Power Plan Meeting 02/12/2015 Flip Chart Summary

Abbreviations:

- Mass-Based: M-B
- Rate-Based: R-B

Discussion of Pro/Con of Mass-Based (M-B) Program

Comments from NRDC Rep:

- Pro: Allowances under M-B are a known commodity (i.e., come from VA) – most clear approach to ensure transparent and efficient markets.
- Pro: Equally open access to markets.
- Pro: Allowance allocation process for M-B easier than issuing emission reduction credits (ERCs) for R-B.
- Pro: Cost to state would be lower than for a R-B program; especially if trading is involved
- Load growth built-in to the cap.
- Pro: Market liquidity.

Comments from ODEC Rep.

- Con: Finite amount of allowances tend to pit companies against each other - ODEC prefers R-B approach.
- Con: More open access to markets under R-B.
- Con: Including new source component reduces flexibility per unit operation.
- Con: No direct incentives for renewable development (RE) or energy efficiency (EE); R-B approach provides more incentives for RE and EE driving cost of down.
- Con: More expensive; cost increases under M-B.

Comments from AEE Rep:

- STEER Report demonstrates several least cost compliance options for VA (M-B and R-B)
- Both M-B and R-B will work if the playing field is level.
- EPA’s proposed allocation approach to affected EGU’s on the basis of historical generation leads to market failure (i.e., discounts emission reduction measures beyond the fenceline (e.g., RE/EE) and distorts utility choices for compliance). A performance based allocation approach, based on previous year’s performance fosters a technology neutral competition between all eligible emission reduction measures, both inside and outside of the fence line of affected EGU’s.
- New source complement should be included as it addresses the leakage issue.

Comments from Birchwood Rep.

- M-B approach preferred; at mercy of ERC markets under R-B.
- Concern about how ERC market will work e.g., transparency, liquidity, size, etc.
- R-B discriminates against certain technologies including coal facilities, which lead to a less diverse electric power generation mix and potential reliability issues.
- M-B approach would create a more level playing field than a R-B approach.
- EPA has suggested the Birchwood wouldn't be able to operate under a R-B approach.
- New source complement will impact coal and gas-fired plants; not efficient.

Comments from Covanta Rep:
- **Pro:** Multiple demonstrated successful M-B trading platforms.
- **Pro:** M-B provides more control for regulators.
- **Pro:** State of PA is leaning toward M-B; bigger trading platform.
- **Pro:** M-B provides more market transparency and certainty.
- **Pro:** More experience in implementing M-B programs
- **Pro:** More interstate trading.
- **Pro:** M-B provides greatest environmental certainty.
- **Pro:** Each emission reduction is recognized.
- **Pro:** More flexibility in recognizing reductions in CO₂ emissions.
- **Con:** How to deal with load growth and incentives for certain technologies.

Comments from AFP Rep:
- M-B preferred.
- Currently conducting IRP studies; state should wait until studies are completed; need to be submitted by 5/1/2016.

Comments from VACO Rep:
- Counties are first responders.
- Tend to look long term.
- Prefer M-B because the intent of the rule is to reduce CO₂ emissions.
- Assumptions on load growth are always proved to be too high.
- **Pro:** Compliance is straightforward; market will determine the cost of compliance.
- Must be aware of the difference between cost, i.e. the customer’s bill which includes both the rate and usage.
- **Pro:** RGGI program (a M-B program) has been great for the state in terms of achieving CO₂ reductions and stimulating economic growth/jobs/ etc.
- **Pro:** Low cost, leads to economic development.

Comments from Dominion Rep:
- Also conducting IRP studies.
- R-B appears to be best for VA.
- M-B limits growth especially if the new source complement is included.
The new source complement needs to be significant if nuclear facilities are not relicensed and that capacity needs to be replaced.

The required generation to replace nuclear will be built elsewhere.

M-B experience has been with programs addressing pollutants that the sources could retro-fit for reductions. Very difficult to generate allowances for greenhouse gases.

Con: Less incentive for renewable. Under a R-B program they generate ERCs for renewable energy more tangible benefits.

R-B complements a more diverse generation profile; provides more flexibility.

R-B provides the potential to generate and sell ERCs.

Con: Under the M-B program, surrounding states have a bigger cap.

Comments from Tenaska Rep:

Prefer R-B.

Next preference is M-B if structured correctly.

Last preference is M-B including new source complement particularly if new sources are treated differently from existing sources.

Program should not disrupt existing market; old and new sources need to be treated the same.

Cons: Under M-B energy costs could be higher.

Con: Under M-B not sure how solar projects will be handled; under R-B they generate ERCs.

Comments from Comextrix Rep:

Only kind of facility in state.

Current steam contracts do not allow for pass-through-costs. This applies with either M-B or R-B.

Pro: Facility would receive a certain number of allowances under M-B.

Pro: Compliance process already established under EPA through CAMD.

Comments from WestRock/VMA Rep:

Rates will increase under either M-B or R-B program; estimated to be 1.5 Billion per year.

Determination of compliance approach should be data driven.

Certain studies suggest that R-B will be lower cost than M-B.

Con: Greater risk under M-B especially if auction is used to distribute allowances that will increase cost to customers.

The diverse generation mix in VA suggests that the generation of ERCs is possible thus lowering costs to customers.

Full trading is necessary for low costs; need to develop method to trade between M-B and R-B programs even though EPA closed the door on that in the final rule.

Need to review modeling studies and reports.
**Discussion of Areas of Agreement**

- Need regulatory certainty
- Support diverse energy generation
- Need transparency in market/liquidity and efficiency
- Low cost for consumer now and in the future
- Don’t impede growth
- Need to consider low-carbon future
- Use tech-neutral approach
- Need to consider cost for both electricity and gas when look at “low cost for consumer”
- Need level playing field for like-kind generators
- Need equal treatment under the law/regulation
- Don’t create market distortions
- Need big market; robust participation
- Need to consider nuclear re-licensing issue

**Discussion of Pro/Con of Rate-Based (R-B) Program**

**Comments from WestRock VMA Rep:**
- **Pro:** Not subject to cap.
- **Pro:** Not worried about leakage.
- **Pro:** Can take advantage of VA’s low emitting combined-cycle units to generate ERCs.
- **Pro:** Easier to track compliance e.g., you can see where every ERC comes from.
- **Pro:** Requires a “lighter lift” to meet compliance requirements, i.e., lower generation cost, perhaps higher administrative cost but unclear at this time.
- **Con:** Potential for a limited market (not big enough) if can’t trade with M-B states.

**Comments from Cogentrix Rep:**
- **Con:** R-B means a much bigger expense for regulatory agency; very complex program to develop.
- **Con:** Could need more ERCs for compliance than are generated.

**Comments from Tenaska Rep:**
- **Globally,** the U.S. is producing electricity at a very low cost of generation.
- **VMA explained** that there was concern that other commodities/companies may move offshore to countries with lower electricity costs.
- **Con:** Market mechanism not as well demonstrated as that for M-B program.
- **Con:** Less real-time certification of ERC, not like with M-B approach.
- **Con:** ERCs are generated after production; could be cumbersome.
- **Pro:** R-B better at addressing inequalities between combined-cycle facilities.
Pro: No cap. New sources can be built. Very important if new generation is required to replace nuclear facilities.

No need to address leakage; more equitable treatment of existing and new sources.

Comments from Dominion Rep:

- Pro: R-B provides more flexibility as to how to treat new sources as they come online.
- Timeline for Nuclear Re-Licensing: 4 units between 2032 – 2038.
- Concerned about 2030 and beyond; currently there is lot of regulatory and legal uncertainty.
- Pro: Lower cost and more flexibility.
- Very complex program, administration may be problematic, however, PMJ has developed and offered their Generation Attribute Tracking System (GATS) as a trading platform for ERCs... ERCs could be issued monthly and GATS also addresses energy efficiency.

Comments from VACO Rep:

- DOE has issued grants to develop methods for easier interstate trading.
- Con: No cap under R-B; CO₂ emission can increase. This is contrary to the intent of the program.
- VA doesn’t operate in a vacuum but is part of a large region. Other states can supply additional power if needed.
- Environmental regulation has spurred innovation and market solutions.
- Renewable energy and efficiency measures could replace current nuclear portion of generation (40%).
- Supports M-B approach.

Comments from AEP Rep:

- Pro: No Cap.
- Con: ERC market is uncertain.

Comments from Covanta Rep:

- Pro: For states with a diverse portfolio, R-B better.
- Pro vs Con discussion depends on purpose of discussion: If the issue is compliance, the R-B becomes favorable; however, if purpose is to lower CO₂, then M-B becomes more favorable.
- Con: Some ERCs won’t make it to market i.e., peer-to-peer ERC transactions.
- Con: Complex market for ERCs; can’t predict how markets will work leading to potential unintended consequences.
- Con: Not all ERCs are fungible.
- Con: EMV for ERCs will be cumbersome for regulator; and are subject to case decision and litigation.
- Buyer of ERC has liability.
- Pro: Perhaps the ERC will be more credible; APX is developing a registry.
EPA system set up "buyer beware" scenario; a third party registry could alleviate many problems of verifying ERCs.

Comments from Birchwood Rep:
- Don’t agree that R-B is cheaper.
- Cap not necessarily restrictive for future load growth.

Comments from AEE Rep:
- Not convinced that it is easier to track ERCs or that R-B is the least cost compliance approach.
- Both R-B and M-B approaches need registry—especially M-B.
- M-B needs an allocation approach that ensures entities that invest in low or no carbon solutions directly benefit from such investments.

Comments from ODEC Rep:
- ODEC modeling suggests the R-B approach best for VA; current models include mixed trading for both M-B and R-B between states.
- DEQ needs to slow the process to allow current studies and analysis to be completed.
- Pro: R-B allows for more flexibility for economic growth.
- Pro/Con: Finite number of allowances.
- Current experience under RGGI suggests that states constantly run-up against the cap limit, this suggests that the price volatility is greater under M-B than it would under R-B.
- Pro: Transparency; one can verify the development and the validation of ERCs.
- Pro: An ERC registry, i.e. third party validation would be very cost effective and minimize the cost to the state.

Comments from NRDC Rep:
- Pro: ERCs can come from energy efficiency, renewables, other sources and reward least-cost sources.
- Con: 600-800 MW of new NGCC plants expected to be built in VA: Existing gas plants cannot compete, which leads to leakage. R-B is a stranded asset plan. Favors M-B approach.
Clean Power Plan Meeting 02/19/2015 Flip Chart Summary

Abbreviations:
- M·B (Mass-Based)
- R·B (Rate-Based)

Prioritizing Pros/Cons of Mass-Based (M·B) with New Sources

*Results based upon red/green/yellow dots

Pros:
- Load growth is built into the cap
- Greater environmental certainty
- Equally open access to markets
- Leakage is addressed

Cons:
- Limits growth especially if the new source complement is included
- Finite amount of allowances tend to pit companies against each other
- Price volatility is greater under M·B than under R·B
- Surrounding states have bigger cap
- Load growth only for instate sources not importing energy; energy imports should be minimized
- No direct incentives for renewable development (RE) or energy efficiency (EE)

Discussion:
- Reliability is important; if you develop a goal the market will respond. Example: LED lights are significant in creating energy efficiency
- Can’t accurately predict what load growth will be:
  - New technologies will have impact; can’t predict what that will be
  - Reduced cost for renewable
  - Reduced cost for energy efficiencies
- How do the other “cap” states (RGGI) deal with caps
- Cost of carbon is very low now relative to cost of electricity
- Possibility of a hybrid plan:
  - Use cap approach until something significant occurs that would trigger allowing new sources
  - Issue of backsliding
- New source complement eliminates market distortions; without it you have leakage.
- EPA approach allowance allocation approach distorts markets
- Performance based output allowance allocation addresses leakage without market distortions
- RGGI states: average customer bill is cheaper than in VA even though the cost of electricity per kWh is higher.
- Consequence of high carbon price: Residents of California use less energy than anywhere else in the country—however, very difficult to compare region fluctuations in energy use between parts of the country.

Prioritizing Pros/Cons of Mass-Based (M-B) No New Sources

Pros:
- Allowance allocation easier—coal facilities can’t generate ERCs.
- Compliance easier—already familiar with compliance requirements due to previous programs.
- Environmental certainty due to cap.
- All technologies can participate.
- Economic development of renewable and energy efficiencies due to cap.
- Leakage can be addressed via allowance allocation method.

Cons:
- Increased energy costs without future new sources.
- Limits growth, especially if the new source complement is included.
- Finite amount of allowances tend to pit companies against each other.
- Increased cost if an auction is used to allocate allowances.

Discussion:
- Existing plants subject to additional costs that new sources (those online after 2022) don’t have.
- Risk of stranded assets.
- Need a level playing field:
  - Need to treat new and existing sources the same.
  - If not treated the same market distortions will occur.
- Cost of entry for a new combine-cycle is very high.
- SCC has traditionally made it difficult for energy efficiency to compete; SCC just responding to companies’ proposals.
- Let market determine lowest cost then the utility can take that to the SCC.
- Need an allocation system that provides a way for each utility to capture the benefits of prior activity-historic approach of allocating leads to higher costs.
- The big question is how will the state address leakage?
  - One way is through output based allocation.
- Carbon cost is reflected in cost of allowance-issue only with auction approach.
- To avoid additional costs, allocate to combine cycle first then existing coal and new sources compete on level playing field.
• Cost of carbon is relative to the stringency of the cap
• Less efficient units set price—they will have costs under both approaches

**Prioritizing Pros/Cons of Rate-Based (R-B)**

**Pros:**
• No cap: new sources can be built
• Good for utilities with a diverse portfolio
• Combined-cycle units generate ERCs
• Provides flexibility for economic development

**Cons:**
• Reduced market transparency: some ERCs won’t get to market
• Potential for limited market
• Compliance mechanism not as well understood
• Doesn’t recognize benefits of zero-carbon assets
• Additional resources needed for reliability and fuel diversity
• ERCs may not be fungible
• "Buyer beware" - potential for litigation costs under ERC creation—ERC created "after the fact" no certainty

**Discussion:**
• Pro/Cons of ERC development can lead to unintended consequences
• How will efficiency be rewarded:
  o State develops registry with EM&V
  o EGLUs looks to the registry for ERCs
  o Seller is held accountable if fraud is detected
• Is there a different value for different quality of ERCs?
  o Renewable ERCs have a direct measurement; very straightforward
  o Energy Efficiency ERCs need a verification procedure; the registry would take on this responsibility
  o There are ways to certify and verify ERCs
• ERCs comparable to carbon offsets
• Litigation cost associated with defending ERCs
• Costs for ERCs: verification costs; financing with ERCs becomes problematic as finance folks question true value
• Need to build generation into IRP for when renewable are not operating
Design Elements of a M-B Program

Must address leakage

Needs to be trading ready – need to trade with other states

Allocation base on historical generation or emissions

Early retired units keep allowances through useful life to ensure coverage for rate payers

There are never enough free allowances

Leakage can be addressed through allowance allocation

New combined cycle units need more allowances as they can’t rely upon historic operation (these are presumably the units that we want to operate more; i.e., cleaner, more efficient)

If new units are included, new source set aside could be short and create market distortions

Include combined heat, include all types of renewable and low emission sources i.e. **biomass (round wood considered carbon neutral)

Don’t distort wood market

Approach will have impact on all manufacturing

Need to include trading, banking and borrowing

Borrowing may not be necessary if means to convert between rate and mass

No shelf life for allowances

Avoid protracted allocation method

Auction best choice for allocating allowances in long term; insures transparency

Provide allowances to entities based on load then pass savings on to rate payers

Could use a consignment auction: 1st initial auction determines price; conduct auction then return revenue

Under auction scenario the rich get richer; small guys can’t compete

Historic approach can adversely impact some operators

Need to provide some set aside
Need to recognize the importance of renewable in allowance allocation method.

Concern that state just selects “winners” and “losers” if just allocation of allowances

Don’t include borrowing

Energy efficiency needs to be competitive with renewable energy generation.

Don’t use 3-year historical data; some operate under PPA so allocation would be based on contracts-too limiting

Market can be manipulated by holding allowances; need to place a limit on how much one can hold

Who can buy allowances-Goldman Sachs?

Provide market innovation

Align incentives to meet program goals: Don’t allocate base on historic data

* Performance-base allocation system that updates annually

* Tech neutral

2010-2012 not representative of historical operations

* indicates number of times comment mentioned
Clean Power Plan Meeting 03/11/2016 Flip Chart Summary

Abbreviations:

• M-B (Mass-Based)
• R-B (Rate-Based)
• * means issue mentioned several times

Key Elements of a Rate-Based (R-B) Program

• AEP: Awaiting IRP study (to be completed May 1)
• NRDC: GAS shift ERCs need to be clarified
• *Rules for the market operation must be able to aggregate various methods to capture ALL efficiencies
• *Registry is necessary
• VA needs to be involved in the development of the registry: Mr. Dowd affirmed that VA had been invited to participate in the development:
• State needs to continue to participate in capture of energy efficiencies beyond the registry
• For some particulate projects (combined heat and power for example) there should be no third party verification required provided that specific criteria is followed; keep it simple
• These issues are appropriate for M-B approach as well
• Allowance distribution needs to be verified; any beyond the fence measures verification needs to be similar for R-B approach
• SCC currently verifies energy efficiency for allowances; rule requires that that responsibility be under DEQ – could involve consultation with SCC.
• Verification is much easier under a metered approach; cost of verification related to complexity of the project
• Energy efficiency measures "what isn't there"; Easier to isolate and quantify consumption – approaches are available to do that
• Verify and Quantify
• Some projects have already demonstrated that they work and what the efficiencies are; need to be able to utilize those approaches without third party verification.
• Verification process needs to keep costs down; need to create the program in such a way that verification costs are minimal
• Verification costs are very project dependent
• Create standardized protocols to make reviews very straight forward

Registry Discussion

4 Requirements:
- Is the project eligible?
- Is it a real project, not just a paper exercise?
- Did they follow protocol?
- Need a market-clearing house to match buyers with sellers

- Need to ensure that what is entered into the registry conforms with interstate trading
- Difference between registry and clearinghouse: registry tracks all transactions, the clearinghouse would provide market price
- Clearinghouse becomes the market: Brokers will be involved with the market and match buyers with sellers
- Clearinghouse: private sector; registry: government over site
- *Registry needs to be trading ready with common currency
- Mandate that sources participate in clearinghouse, i.e. disclose price?
- Can't compel participation in clearinghouse, can mandate participation in registry
- Auction of allowances provides a reconciliation of market prices; provides a method to determine fair-market value of ERCS
- *Price must be transparent
- Problem becomes how to determine the price of ERCS with the state only responsible for verification that they are real
- State has more policy control under M-B plan because they determine who get allowances
- How does one make price transparent under R-B approach?
- *Big markets (multiple states participating) provides an easier method to discover price of ERCS

**Discussion of Carbon Policy**

- The key issues is how to ensure that emissions don't increase; R-B not the best approach to meet that goal
- Goal of CPP is to address EXISTING SOURCES; it is under §111d which addresses existing sources, new sources must meet BACT
- Is it important to VA to reduce carbon emissions?
- Can we create some sort of backstop if it is determined that carbon emission are increasing?
- Any backstop measure will kill market
- Should we include a review to address any unintended consequences?
- Review would not be good for sources that need certainty as they do long-term planning
- It's only a regulation; they get reviewed and changed all the time; this is not unique to VA and it is something we deal with all the time
- Certainty issue should be taken into consideration in any policy decisions

**Vote Regarding Inclusion of Backstop Provisions**
Yes (green) - 1  No (red) - 0  Unsure (yellow) - 3

Continued Discussion on Key elements of R-B Program:

- Need to include a reliability safety valve; be able to suspend program if costs become prohibitive for consumers, i.e. meets some 5 increase threshold
- "VA plan needs to follow EPA model rule so that it is trading ready"
- Needs to include biomass, nuclear, energy efficiencies
- Have unlimited banking
- Adopt multiple year averages
- Reliability safety valve will also impact market in a negative way; the provisions for catastrophic circumstances are addressed in model rule
- Need to develop method to contest ERs
- Need a method to include existing renewables
- "Must be trading ready"
- "Must be inclusive"
- Need to protect small players; R-B favors the big sources with a broad portfolio
- Under a R-B plan coal facilities would require some sort of set aside
- "Need to ensure that the market has ERs for facilities to use, get ERs into market"
- "Market liquidity"
- Need a rule that is trading ready; need consistency throughout region, need a big market to ensure price transparency. Most simple approach would be to follow EPA model rule
- Model rule might have unintended consequences
- "Can have a trading ready program that isn't the exact EPA model rule"
- "Need to include the EPA proposed language for emergencies"
- Markets change rapidly, need flexibility
- Will program include other types of zero-emitting sources?
- Need to create a MOU (or similar vehicle) to coordinate activities of SCC, DMME, DEQ
- "Need to include energy efficiencies"

Vote on 6 issues

1. Program needs to be trading ready: Yes (green) - 12  No (red) - 0  Unsure (yellow) - 0

2. Program required a registry: Yes (green) - 12  No (red) - 0  Unsure (yellow) - 0

3. Price transparency: Yes (green) - 10  No (red) - 0  Unsure (yellow) - 2

4. Include EPA model rule safety valve language: Yes (green) - 11  No (red) - 0  Unsure (yellow) - 1

5. Allow all renewables: Yes (green) - 11  No (red) - 1  Unsure (yellow) - 0
6. Need a form of protection for energy intensive industries: Yes (green) - 5 No (red) - 3 Unsure (yellow) - 4

Need additional discussion regarding role of clearinghouse

**Discussion of biomass/waste energy:**

- Not required under the EPA model rule; want them both to be included in the VA program
- Need to be included in either M-8 or R-8 program
- Need to have a preapproved list of which types of biomass would be included
- Allow flexibility for additional types to be included; CHP facilities, anaerobic digestion, agricultural byproducts
- Proposal addresses only new sources; doesn't address existing sources
- Value of existing renewable sources needs to be included
- EPA will be holding a meeting regarding biomass on April 7
- Co-firing of biomass needs to be included
- Pyrolysis – biochar, heat waste, waste water creating resource recovery all need to be included
- Don't utilize resources used by paper industry
- EPA doesn't include ERCs created behind the meter; distributed solar must be included
- Allowances provided to existing renewable increases costs to rate payers
- Renewables need to have a mechanism that includes the cost of the overall benefit of carbon reduction they provide
- Maintaining exiting renewable is cheaper than replacing with new

**Discussion of Clean energy Incentive Plan (CEIP):**

DEQ finds the concept very complex; looking for input from members

- Program provides an opportunity for efficiencies
  1. It targets most common definition of low income communities
  2. Early adoption credits can be used for future compliance
  3. Rural areas provide many opportunities
- Downside of not participating; could disrupt current market; a delay could impact whether sources implement reductions now
- CEIP picks winners and losers; need to expand the program
- There is no demonstration that it is the least cost for consumers
- Need to conduct assessments
- Many rural members of co-ops are below poverty level
- Need to clearly understand what the least cost components are
- Vulnerable communities – NRDC provided an environmental justice report
- Program need to be more robust
• *Program need to be started prior to 2021; earlier the program starts the lower the compliance costs
• If not all renewable set asides are used then allow them to be used energy efficiency and vice versa
• There is double counting in low income areas; can the program be expanded to include areas not considered low income?
• Can state propose to use credits differently?

Vote Regarding CEIP

Should VA include the program: Yes (green) - 9  No (red) - 0  Unsure (yellow) - 3

Expand to include more than wind and solar: Yes (green) - 8  No (red) - 0  Unsure (yellow) - 4

Should the program start earlier: Yes (green) - 9  No (red) - 0  Unsure (yellow) - 3

Discussion on why folks voted yellow under CEIP Vote:

• Not convinced that more incentives are required
• Projects in 2021 can generate ERCs, if started earlier it will be easier to meet state reduction goals
• **Need time to process implications for

Other Discussion points:

• Mechanism to convert ERCs to allowances not going to be addressed by EPA
• Need measures to streamline permitting
• Many opportunities; the cost of solar decreasing; renewable are cheaper
• Recycling is a form of energy efficiency; how can that be calculated
• ERCs must be available for non-utilities

Discussion on whether VA should join RGGI:

• NO: Cap hinders growth
• Changes would go beyond Clean Power Plan (CPP); biomass would be subject to RGGI, not CPP
• Power make-up very different than that of VA: North East (N.E.) is shutting down nuclear, gets much hydro from Canada
• Don’t want to give-up control of program
• Auction based; expensive to rate payers. If an auction is used, proceeds should be funneled back to rate-payers.
• Benefits: Carbon emission have decreased while rates have not gone up; Money generated used for economic development, State determines what happened to auction proceeds.
• Don’t need to join RGGI to trade with other states
• Residential bills in N.E. are 32% higher, industrial costs 45% higher
• Rates in N.E. have always been higher than VA...cost increase the further north one goes: this is not a function of RGGI
• Why is a carbon cap perceived to be a hindrance to economic development when it’s been proven in other states that it isn’t the case?
• The cap proposed for VA isn’t appropriate give the estimates for growth for VA

Vote Regarding RGGI
Should VA join RGGI: Yes (green) - 2  No (red) - 8  Unsure (yellow) - 2

Preliminary cost Discussion:
What are the drivers for costs:
• Modeling results will be helpful when available (estimate sometime in May)
• How efficient is the compliance instrument: Cost of compliance: ERCs or allowances
• Technology
• Cap; increase cost
• Include more units; increase cost
• Program consistent with other states; lower cost
• Stranded assets: increase cost
• New units must meet BACT, causes market distortions
• New units should be under cap to prevent market distortions
• Costs will always be higher for existing units
• Distortions due to leakage: however one can develop approached to deal with leakage
• If new units included then costs go down
• Need to include additional costs: transmission costs; increased pressure on gas pipeline increases costs, hook-up of renewable increases costs, current PJM study doesn’t include transmission costs
• A function market will decrease costs; it must have transparency, liquidity and flexibility then market will determine less cost options
• To reduce the cost, reduce demand
• Rate payers will pay for new construction and transmission anyway
- Existing low-carbon units need to be recognized in market place; cheaper to maintain an exiting renewable than to build a new one
- Benefit of zero carbon facilities must be taken into account
- Don't confuse transmission costs with CPP costs
- What

- How do the other "cap" states (RGGI) deal with caps
- Cost of carbon is very low now relative to cost of electricity
- Possibility of a hybrid plan:
  - Use cap approach until something significant occurs that would trigger allowing new sources
  - Issue of backsliding
- New source complement eliminates market distortions; without it you have leakage.
- EPA approach distorts markets
- Performance based output addressed leakage without market distortions
- RGGI states: average customer bill is cheaper than in VA even though the cost of electricity per Kw is higher. (Due to the high use of fuel oil?)
- Consequence of high carbon price: Residents of CA. Use less energy than anywhere else in the country—Very difficult to compare region fluctuations between parts of the country.

**Prioritizing Pros/Cons of Mass-Based (M-8) No New Sources**

**Pros:**
- Allowance allocation easier-coal facilities can't generate ERCs
- Compliance easier—already familiar with compliance requirements due to previous programs
- Environmental certainty due to cap
- All technologies can participate
- Economic development of renewable and energy efficiencies due to allocation cap.
- Leakage is addressed.

**Cons:**
- Increased energy costs without future new sources
- Limits growth especially if the new source complement is included
- Finite amount of allowances tend to pit companies against each other
- Increased cost if an auction is used to allocate allowances
- Potential for litigation costs under ERC creation—ERC created "after the fact" no certainty

**Discussion:**
- Existing plants subject to additional costs that new sources (those online after 2022) don't have
- Risk of stranded assets
- Need a level playing field
  - Need to treat new and existing sources the same
  - If not treated the same market distortions will occur
- Cost of entry for a new combine cycle is very high
- SCC has traditionally made it difficult for energy efficiency to compete: SCC just responding to companies' proposals
- Let market determine lowest cost then the utility can take that to the SCC
- Need an allocation system that provides a way for each utility to capture the benefits of prior activity-historic approach of allocating leads to higher costs
- The big question is how will the state address leakage
  - One way is through output based allocation
- Carbon cost is reflected in cost of allowance-issue only with auction approach
- To avoid additional costs allocate to combine cycle first then existing coal and new sources compete on level playing field
- Cost of carbon is relative to the stringency of the cap
- Less efficient units set price-they will have costs under both approaches

Prioritizing Pros/Cons of Rate-Based (R-B)

Pros:
- No cap; new sources can be built
- Good for utilities with diverse portfolio
- Combined-cycle units generate ERCs
- Provides flexibility for economic development

Cons:
- Some ERCs won't get to market
- Potential for limited market
- Mechanism not as well understood
- Doesn't recognize benefits of zero-carbon assets
- Additional resources needed for reliability and fuel diversity
- Are ERCs fungible
- "Buyer beware" increased costs due to litigation

Discussion:
- Pro/Cons of ERC development can lead to unintended consequences
- How will efficiency be rewarded:
  - State develops registry with verification
  - Third part looks to the registry for ERCs
- Seller is held accountable if fraud is detected
- Is there a different value for different quality of ERCs?
  - Renewable ERCs have a direct measurement; very straightforward
  - Energy Efficiency ERCs need a verification procedure; the registry would take responsibility
  - There are ways to certify and verify ERCs
- ERCs comparable to carbon offsets
- Cost associated to defending ERCs
- Costs for ERCs: verification costs; financing with ERCs becomes problematic as finance folks question true value
- Need to build generation into IRP for when renewable are not operating

**Design Elements of a M-B Program**

*****Must address leakage

*Needs to be trading ready - need to trade with other states

*****Allocation base on historical data;

***Early retired units keep allowances through useful life to ensure coverage for rate payers

There are never enough free allowances

Allowances can be addressed through allowance allocation

New combined cycle units need more allowances as they can't rely upon historic operation; (these are presumably the units that we want to operate more; i.e. cleaner, more efficient)

If new units are included new source set aside could be short and create market distortions

*Include combined heat, include all types i.e.* **biomass, *round wood (considered carbon neutral)**

Don't distort wood market

Approach will have impact on all manufacturing

**Need to include trading, ***banking and borrowing.

Borrowing not be necessary if means to convert between rate and mass

No shell life for allowances
Avoid protracted allocation method

**Auction best choice for allocating allowances in long term; insures transparency**

Provide allowances to entities based on load-then pass through to rate payers

Could use a consignment auction: 1st initial auction determines price; conduct auction then return revenue

Under auction scenario the rich get richer; small guys can't compete

Historic approach can adversely impact some operators

***Need to provide some set aside

*Need to recognize the importance of renewable in allowance allocation method

*Concern that state just selects "winners" and "losers" if just allocates allowances

Don't include borrowing

Energy efficiency needs to be competitive with renewable energy generation

Don't use 3-year historical data; some operate under PPA so allocation would be based on contracts-too limiting

Market can be manipulated by holding allowances; need to place a limit on how much one can hold

Can others buy-Goldman Sachs?

Provide market innovation

Align incentives to meet program goals: Don't allocate base on historic data

*Performance-base allocation system that updates annually

*Tech neutral

2010-2012 not representative of historical operations

* indicates number of times comment mentioned
State Implementation of EPA's Clean Power Plan
From a Multi-State Utility Perspective

John McManus
Vice President – Environmental Sciences
American Electric Power

National Regulatory Conference
College of William and Mary
Williamsburg, VA
May 20, 2016

I. State Plans for Clean Power Plan Compliance

a. A number of states in which AEP operates were actively developing state
   implementation plans prior to the issuance of the stay by the U.S. Supreme
   Court
      i. Stakeholder processes varied
      ii. Resistance in some states
      iii. Little sign of regional coordination at that point

b. Activity has slowed substantially as a result of the stay issued by the U.S.
   Supreme Court

c. Takeaways based on level of planning prior to issuance of the stay

II. Continuing Implications of Carbon Regulation for Integrated Resource
Planning

a. Incorporating potential carbon regulations into resource planning activities
   amid uncertainty over the Clean Power Plan

b. Resource planning includes consideration of strategically adding new
   renewable generation to a generation fleet that has seen significant coal
   retirements

III. AEP’s current perspectives on approach to carbon regulation

a. Rate versus mass compliance

b. Carbon trading between states

c. Issues that arise where a utility has fossil generation sited in one state dedicated to serving load in another state

IV. Concluding Thoughts