Comments on Best Practices Report and Multi-state Analysis

NASUCA Stakeholder Meeting

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Agenda

10:00 - 10:15 Introductions

10:15 – 10:45 Discussion of Draft Multi-State Modeling Methodology Memo

- *Example combinations and issues to be examined*
- *Brief overview of CP3T*
- *Modeling methodology*

10:45 - 12:15 Discussion of Draft Best Practices in Planning for Clean Power Plan Compliance Memo

- *States have flexibility when it comes to compliance planning*
- *Planning for compliance will require electric system modeling*
- *The Clean Power Plan will result in system costs, but also system benefits*

12:15 - 12:45 Lunch

12:45 - 2:00 Q&A and discussion among NASUCA members

Synapse Energy Economics

- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 30 includes experts in energy and environmental economics and environmental compliance

Introductions

Clean Power Plan

What is the Clean Power Plan?

- EPA issued a proposed "Clean Power Plan" in June 2014. Issued under section 111(d) of the Clean Air Act, this proposed rule aims to cut carbon emissions by 30 percent below 2005 levels by 2030.
- The Clean Power Plan sets emission rate targets for each state for the years 2020-2030.
- Emission rate targets are constructed using "building blocks" – reduced emissions from coal heat rate improvements, natural gas combined cycle redispatch, generation from new and "at-risk" nuclear units, renewable generation, and energy efficiency.
- Generation and emissions used in the Clean Power Plan emission rate formula include existing coal, existing and under construction NGCC, existing oil and gas steam units, under construction and "at-risk" nuclear generation, energy efficiency, and renewables.

Methodology Memo: Multi-State Analysis

Evaluating multi-state compliance

- Synapse is using CP3T (Clean Power Plan Planning Tool) to evaluate examples of multi-state compliance
- State combinations for use in our analysis are:
  - "Northwest"— Idaho, Montana, Oregon, Utah, Washington, and Wyoming
  - "Southwest" — Arizona, New Mexico, and the Navajo and Fort Mojave tribes
  - "Iowa, Kentucky, and the Carolinas" — Iowa, Kentucky, North Carolina, and South Carolina
- Issues to examine include
  - Rate- versus mass-based compliance
  - Energy efficiency "Leakage"
  - Dissimilar RE technical potentials among cooperating states
  - Cooperating states that feature utilities crossing state boundaries
  - Dissimilar existing resources in cooperating states

Combinations vs. Scenarios

Combination: Grouping of states

Examples of combinations might be…

- California and Nevada
- PacifiCorp states
- Illinois and Missouri
- RGGI states
- "Northwest"— Idaho, Montana, Oregon, Utah, Washington, and Wyoming
- "Southwest" — Arizona, New Mexico, and the Navajo and Fort Mojave tribes
- "Iowa, Kentucky, and the Carolinas" — Iowa, Kentucky, North Carolina, and South Carolina

Scenario: Approach to compliance

Examples of scenarios might be…

- New NGCC construction
- High levels of energy efficiency
- Bundled or unbundled REC purchases (pairing with a state that has high renewable potential)

What does a multi-state combination look like?

"Solo compliance" means that a state will file its compliance plan singly with EPA.

"Trading" means that a state will participate in interstate trading mechanisms to share resources or other commodities with other states.

"Joint compliance" means that a state will join with one or more other states to file a single compliance plan with EPA.

Modeling methodology

1. Formulate compliance scenarios
   - Example A: Energy efficiency and renewable energy only
   - Example B: Increased generation from existing NG units and new NG units
   - Example C: Improvements in coal unit heat rates
2. Model states complying singly in all scenarios

3. Model states complying by trading with other states in all scenarios

4. Model states complying jointly in all scenarios

5. Compare and contrast results

Overview of Clean Power Plan Planning Tool (CP3T)

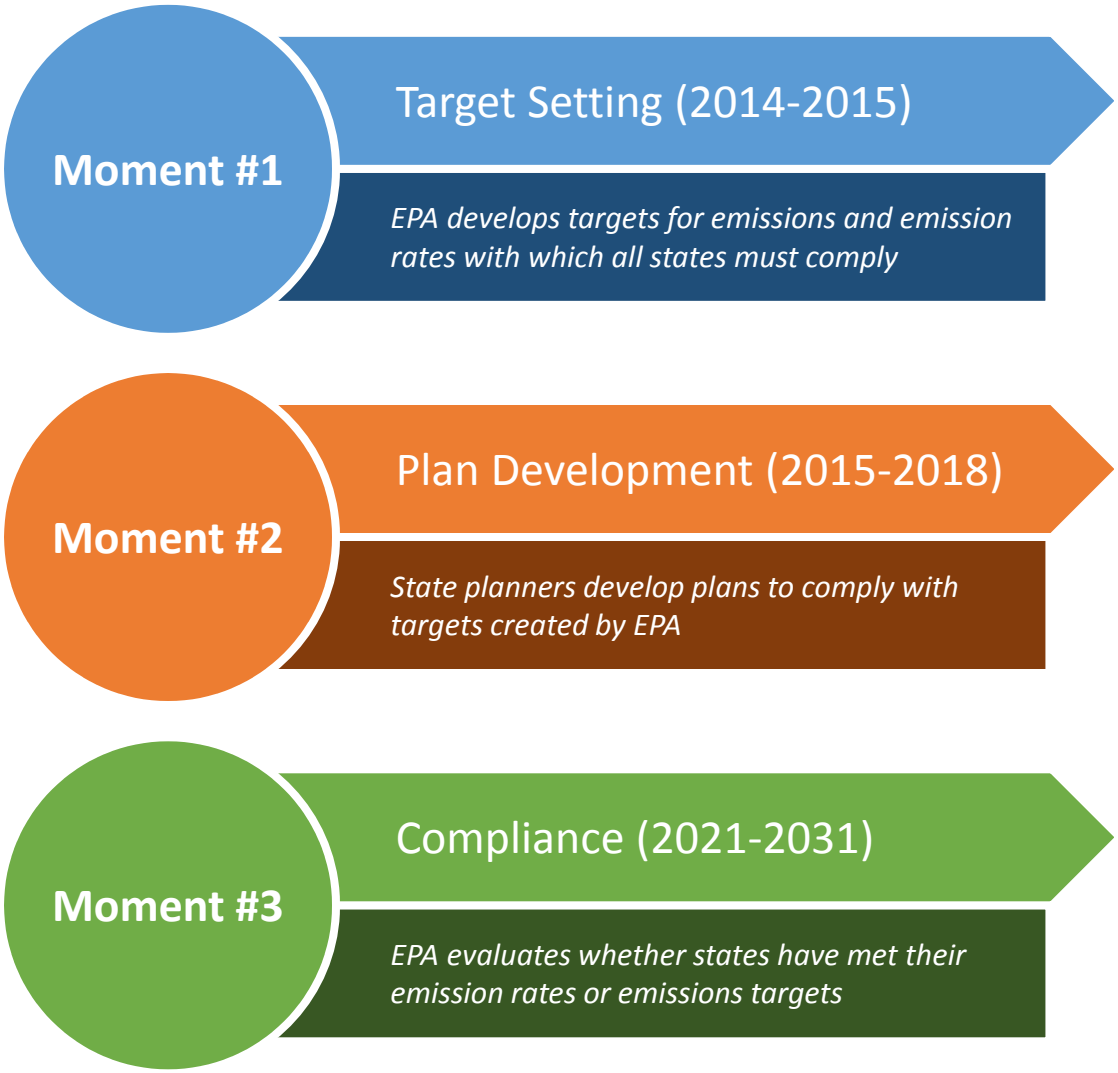
- Synapse has developed a user-friendly Excel-based spreadsheet tool based on the unit-specific data assembled by EPA to create their 111(d) building blocks.
- You can adjust fossil unit capacity factors, renewable energy and energy efficiency projections, unit retirements, and 111(b) unit additions for each state. You can compare the differences in generation, capacity, emissions, emission rates, and costs between their created scenarios and the EPA base case.
- Users may analyze a single state or a combination of states.
- CP3T is a free, open-source model released under a Creative Commons "share and adapt" license. This allows anyone to obtain a copy of CP3T and use it within the framework and caveats Synapse provides.
- CP3T is available at www.synapse-energy.com/cp3t or www.cp3t.com.

Draft Report: Best Practices in Clean Power Plan Planning

Clean Power Plan planning

- States have flexibility with building blocks.
- States may create compliance plans that involve other states.
- Planning for compliance will require system modeling to examine "least cost" plans.
- The Clean Power Plan will result in system costs, but also system benefits.

“Moments” in the Clean Power Plan



Steps for formulating a compliance plan

Step 1: Identify and engage key agencies and stakeholders

Step 2: Identify planning objectives and criteria for evaluating plans

Step 3: Assessing current and future system conditions

Step 4: Formulate a range of potential compliance plans

Step 5: Identify key uncertainties with compliance outcomes

What are the differences between existing Clean Air Act compliance planning and Clean Power Plan compliance planning?

Key agencies and stakeholders

- State environmental regulators
- State energy offices
- Public Utilities Commissions (PUCs)
- Regional transmission organizations (RTOs)/Independent System Operators (ISOs)
- Utilities
- Consumer advocates
- Other stakeholders

Criteria for strategies

1. All states must contain enforceable measures that reduce CO_2 emissions from affected sources.
2. Enforceable measures must be projected to achieve the equivalent or better than the 2030 emission targets set by EPA.
3. CO_2 emission performance from affected sources must be quantifiable and verifiable.
4. The state plan must include a process for:
   (a) state reporting of plan implementation at the level of the affected entity,
   (b) state-wide CO_2 emission performance outcomes, and
   (c) implementation of corrective measures if the initial measures fail to achieve the expected reductions.

Plan components

1. Identification of affected entities
2. Description of plan approach and geographic scope
3. Identification of state emission performance level (rate vs. mass)
4. Demonstration that the plan is projected to achieve the state's emission performance level
5. Milestones
6. Corrective measures
7. Identification of emission standards and any other measures
8. Demonstration that each standard is quantifiable, non-duplicative, permanent, verifiable, and enforceable
9. Identification of monitoring, reporting, and recordkeeping requirements
10. Description of state reporting
11. Certification of state plan hearing
12. Supporting material

Potential compliance strategies

	Supply Side	Demand Side
Building Blocks	• Heat rate improvements at coal plants • Increased dispatch of NGCC units • Nuclear and renewable energy	• Energy efficiency
Alternative Measures	• Heat rate improvements at non-coal fossil plants • Carbon capture and storage • Fuel switching • Co-firing with biomass • Integrated renewable technology • New natural gas capacity • Credits from new plant over-compliance • Increased utilization of NGCCs • Plant retirements	• Transmission and distribution efficiency • Distributed energy storage • Distributed generation • Combined heat and power • Alternative forms of energy efficiency • Smart grid innovations • Demand response

Model input assumptions

1. Sales and peak load
2. Fuel prices
3. Capital costs of generation, transmission and distribution equipment
4. Technology performance characteristics
5. Renewable energy potential
6. Energy efficiency potential and program cost
7. Avoided cost of generation
8. Resource availability and constraints
9. Transmission upgrades or constraints
10. Lead times for permitting and construction
11. Future regulations
12. Resource adequacy and reliability

Characterizing the current and future Electric System

- Generator longevity
- Utilization rates relative to nameplate capacity
- Ramping abilities
- Emission rates and installed environmental controls
- Variable operating costs
- Purchase Power Agreements
- Transmission constraints
- Effectiveness of existing energy efficiency programs
- Current levels of distributed generation

Modeling compliance scenarios

	Screening tools	Integrated models	Simulation dispatch	Capacity expansion
Clean Power Plan Planning Tool (CP3T)	X			
National Energy Modeling System (NEMS)		X		
Integrated Planning Model (IPM)		X		
PROMOD IV			X	
Market Analytics			X	
MIDAS			X	
ReEDS			X	X
AuroraXMP			X	X
EGEAS				X
Strategist				X
System Optimizer				X

Scenarios vs. sensitivities

Scenario	A variation representing distinct policy outcomes
Sensitivity	Analysis of the uncertainty around specific input variables

Possible scenarios

Scenario #1: Reference Scenario

Sensitivities

- High NG price
- Low NG Price
- High carbon price
- Low carbon price
- Mid PV price

Scenario #2: High RPS

Sensitivities

- High NG price
- Low NG Price
- High carbon price
- Low carbon price
- Mid PV price

Scenario #3: Strict Environmental Retrofit

Sensitivities

- High NG price
- Low NG Price
- High carbon price
- Low carbon price
- Mid PV price

Selecting a compliance plan

- Lowest long-term system cost
- Meeting other energy policy goals
- Flexibility

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