Clean Power Plan - Final Rule Overview

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Prepared for –
East-West Gateway Coordinating Council
Air Quality Advisory Committee
September 29, 2015
Presentation Overview

• Background
  – Federal regulations to control CO₂ from power plants

• Clean Power Plan Overview

• Final Clean Power Plan goals for Missouri

• Compliance options and plan approaches

• Timeline
EPA Actions on August 3, 2015

EPA released two final rules and one proposed rule to control CO₂ emissions from power plants

• Two final rules
  – CO₂ emission standards for new power plants - 111(b)
  – CO₂ emission standards for existing power plants - 111(d)

• One proposed rule
  – Proposed Model rules for existing plants - 111(d)
  – Proposed Federal Plan for existing plants - 111(d)
### 21 Affected Missouri Sources Identified in Final CPP Rule

Plants highlighted in red have affected unit(s) with announced retirement and/or plans to switch to natural gas.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Owner/Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labadie</td>
<td>Ameren (Union Electric Company)</td>
</tr>
<tr>
<td><strong>Meramec</strong></td>
<td></td>
</tr>
<tr>
<td>Rush Island</td>
<td></td>
</tr>
<tr>
<td>Sioux</td>
<td></td>
</tr>
<tr>
<td><strong>New Madrid</strong></td>
<td>Associated Electric Cooperative, Inc.</td>
</tr>
<tr>
<td>St Francis Energy Facility</td>
<td></td>
</tr>
<tr>
<td>Thomas Hill</td>
<td></td>
</tr>
<tr>
<td><strong>Chamois</strong></td>
<td>Central Electric Power Cooperative and Associated Electric Cooperative, Inc.</td>
</tr>
<tr>
<td>Sikeston Power Station</td>
<td>City of Carthage, Sikeston Bd. of Municipal Utilities, City of Fulton, and City of Columbia</td>
</tr>
<tr>
<td>Columbia</td>
<td>City of Columbia</td>
</tr>
<tr>
<td>James River Power Station</td>
<td></td>
</tr>
<tr>
<td>John Twitty Energy Center</td>
<td>City of Springfield, MO</td>
</tr>
<tr>
<td><strong>Dogwood Energy Facility</strong></td>
<td>Dogwood Energy, LLC and North American Energy Services</td>
</tr>
<tr>
<td>Asbury</td>
<td>Empire District Electric Company</td>
</tr>
<tr>
<td><strong>State Line Combined Cycle</strong></td>
<td></td>
</tr>
<tr>
<td>Iatan</td>
<td>Empire District Electric Company, KCP&amp;L, KCP&amp;L GMO, and Missouri Joint Municipal Electric Utility Commission</td>
</tr>
<tr>
<td><strong>Blue Valley</strong></td>
<td>Independence Power and Light</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>KCP&amp;L</td>
</tr>
<tr>
<td><strong>Montrose</strong></td>
<td></td>
</tr>
<tr>
<td>Lake Road</td>
<td>KCP&amp;L GMO</td>
</tr>
<tr>
<td>Sibley</td>
<td></td>
</tr>
</tbody>
</table>

*Note: The table lists the plants and their respective owners/operators.*
### Missouri’s Final Clean Power Plan Goals

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Rate Based Goals</th>
<th>Mass-Based Goals (without new units)</th>
<th>Mass-Based Goals (with new units)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂ Rate (lbs/Net MWh)</td>
<td>CO₂ Emissions (Short Tons)</td>
<td>CO₂ Emissions (Short Tons)</td>
</tr>
<tr>
<td>2012 Actuals</td>
<td>2,008</td>
<td>78,039,449</td>
<td></td>
</tr>
<tr>
<td>Interim Step 1 2022-2024</td>
<td>1,621</td>
<td>67,312,915</td>
<td>67,587,294</td>
</tr>
<tr>
<td>Interim Step 2 2025-2027</td>
<td>1,457</td>
<td>61,158,279</td>
<td>62,083,903</td>
</tr>
<tr>
<td>Interim Step 3 2028-2029</td>
<td>1,342</td>
<td>57,570,942</td>
<td>58,445,482</td>
</tr>
<tr>
<td>Interim Average (2022 – 2029)</td>
<td>▼26% 1,490</td>
<td>▼19% 62,569,433</td>
<td>▼28% 63,238,070</td>
</tr>
<tr>
<td>Final Goals (2030 and beyond)</td>
<td>▼37% 1,272</td>
<td>▼28% 55,462,884</td>
<td>▼28% 56,052,813</td>
</tr>
</tbody>
</table>
Available Compliance Options

• Three Building Blocks:
  – Improve efficiency at existing plants
  – Redispatch coal to existing NGCC
  – Increase renewable energy

• Other options:
  – Demand-side EE
  – New nuclear/upgrades to existing nuclear
  – Combined Heat & Power
  – Biomass
  – Natural gas co-firing/convert to natural gas
  – Transmission & distribution improvements
  – Energy storage improvements
  – Retire older/inefficient power plants
State Plan Approaches

- Choose form of the compliance goal
  - Rate-based: (lbs CO$_2$/MWh)
    - Performance rates, statewide rate-goal, or state-defined rates
  - Mass-based: (tons CO$_2$)
    - Include or Exclude new units
    - State measures option

- Different plan elements required depending on plan approach

- Interstate trading ability is affected by plan approach
Clean Energy Incentive Program (CEIP)

- States award CEIP allowances/ERCs to eligible projects and EPA matches the award
  - Renewable Energy
  - Energy Efficiency in low-income communities

- To be eligible
  - Construction (RE) or implementation (EE) must begin after the State submits final plan
  - Generation (RE) or savings (EE) must occur in 2020 and/or 2021 (EM&V plan required)

- State participation is optional
Outreach and Coordination

- DNR plans to engage with numerous stakeholders throughout plan development
  - State Energy Office and Public Service Commission
  - Affected sources
  - ISOs/RTOs (Electricity Grid Operators)
  - EE/RE developers
  - Vulnerable Communities
    - General outreach, EE/RE education, CEIP opportunities

http://dnr.mo.gov/env/apcp/cpp/index.html

- 30-day public comment periods for both Initial and/or Final Plans
## Clean Power Plan - Missouri Timeline *

<table>
<thead>
<tr>
<th>Tentative Date</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 3(^{rd}), 2015</td>
<td>Final Clean Power Plan Released by EPA</td>
</tr>
<tr>
<td>July of 2016</td>
<td>Public Hearing for Initial Submittal/Extension Request</td>
</tr>
<tr>
<td>August of 2016</td>
<td>Adoption for Initial Submittal/Extension Request</td>
</tr>
<tr>
<td>September 6(^{th}), 2016</td>
<td>Initial Submittal Deadline</td>
</tr>
<tr>
<td>August of 2017</td>
<td>MACC Adoption of 2017 CPP Progress Report</td>
</tr>
<tr>
<td>September 6(^{th}), 2017</td>
<td>2017 CPP Progress Report Submittal Deadline</td>
</tr>
<tr>
<td>April of 2018</td>
<td>Public Hearing for Final Plan</td>
</tr>
<tr>
<td>May of 2018</td>
<td>Adoption of Final Plan</td>
</tr>
<tr>
<td>September 6(^{th}), 2018</td>
<td>Final Plan Submittal Deadline</td>
</tr>
<tr>
<td>January 1(^{st}), 2022</td>
<td>Interim Compliance Period Begins</td>
</tr>
<tr>
<td>January 1(^{st}), 2030</td>
<td>Final Compliance Period Begins</td>
</tr>
</tbody>
</table>

* This timeline is tentative and gives the maximum time allowed to meet a Final Plan submittal deadline of September 6\(^{th}\), 2018. The actual schedule for plan development and adoption may be faster.
Division of Environmental Quality Director: Leanne Tippett Mosby

Date: 9/29/15

Nothing in this document may be used to implement any enforcement action or levy any penalty unless promulgated by rule under chapter 536 or authorized by statute.
Backup Slides
Clean Air Act Section 111

• Two parts of Section 111:
  – **New** Sources – Section 111(b)
  – *Existing* Sources – Section 111(d)

• Categories of sources – industry specific versus pollutant specific

• Most Section 111 Standards → 111(b)
Clean Power Plan - Affected sources

• Fossil fuel-fired electric steam generating units and stationary combustion turbines
  – Commenced construction prior to January 8, 2014,
  – Serves a 25 MW (or greater) generator that supplies power to the grid, and
  – Has a heat input capacity of 250 MMBtu/hour (or greater)

• For Stationary Combustion Turbines
  – Only affected if combined cycle or combined heat & power
    (simple cycle combustion turbines not affected)
Clean Power Plan - Overview

• The Clean Power Plan sets CO$_2$ emissions performance rates for existing power plants that reflect the “best system of emission reduction” (BSER)

• EPA identified 3 “Building Blocks” as BSER and calculated nationally consistent performance rates for fossil fuel-fired electric steam generating units and another for natural gas combined cycle units

• EPA translated the performance rates into mass-based and rate-based state goals using each state’s unique mix of power plants in 2012

• The rule establishes guidelines for states to develop plans that require existing power plants to achieve either the performance rates directly or one of the state goals
## Building Blocks Used to Set the Standards

<table>
<thead>
<tr>
<th>Building Block</th>
<th>Description</th>
</tr>
</thead>
</table>
| **1.** Coal Plants – Heat Rate Improvements         | • Applied Regionally  
• Eastern Region  
4.3% Improvement                                        |
| **2.** Redispatch to NGCC                           | • Applied Regionally  
• Phased in  
• 75% of Net Summer Capacity                                      |
| **3.** Renewables & Nuclear                         | • No Nuclear  
• Incremental RE only  
• Based on Historical RE Penetration Levels                        |
| **4.** Demand Side Energy Efficiency                | • No Demand-Side EE                                                        |

* Demand-Side Energy Efficiency and New Nuclear are still allowable compliance options.
Building Block Effects for Eastern Interconnect

**Eastern Interconnect: BSER Fossil Steam Calculation 2030**

- 2012 Baseline: 2,160 lbs/MWh
- Heat Rate Improvement: -89 lbs/MWh
- Redispatch to New RE: -445 lbs/MWh
- Redispatch to NGCC: -321 lbs/MWh
- Final Coal Rate: 1,305 lbs/MWh

**Eastern Interconnect: BSER NGCC Calculation 2030**

- 2012 Baseline: 894 lbs/MWh
- Redispatch to New RE: -123 lbs/MWh
- Final NGCC Rate: 771 lbs/MWh
CPP Comparison: Final vs. Proposal

• Compliance timeframe: starts in 2022 (2020)
• Building Blocks and State Goals have changed
  – Consistent National Performance Rates
• Existing RE and Nuclear no longer compliance options
• Deadlines for state plans September 2016 with option for two-year extension September 2018.
• “Trading Ready” approaches
• Clean Energy Incentive Program (CEIP) provides incentive for early action
## Missouri’s Proposed vs. Final Rule Rate Comparison

<table>
<thead>
<tr>
<th>Step</th>
<th>Proposed Rate (lbs CO₂/MWh)</th>
<th>Final Rate (lbs CO₂/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting rate</td>
<td>1,963</td>
<td>2,008</td>
</tr>
<tr>
<td>2012 statewide adjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>average emission rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interim Period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020-2029</td>
<td>1,621 (↓ 17%)</td>
<td>1,621</td>
</tr>
<tr>
<td>Interim step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022-2024</td>
<td>1,457</td>
<td>1,490 (↓ 26%)</td>
</tr>
<tr>
<td>Interim step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025-2027</td>
<td>1,342</td>
<td>1,272 (↓ 37%)</td>
</tr>
<tr>
<td>Interim step 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028-2029</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Interim Goal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,544 (↓ 21%)</td>
<td>1,272 (↓ 37%)</td>
</tr>
</tbody>
</table>
Consistent National Performance Standards

- EPA divided the country into three regional interconnects and applied the building blocks to each
- The resulting performance standards from the least stringent region were used as the nationwide performance standards

<table>
<thead>
<tr>
<th>Nationwide Performance Standards</th>
<th>2030 Rate (lbs CO₂/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGU Type</td>
<td></td>
</tr>
<tr>
<td>Fossil Steam</td>
<td>1,305</td>
</tr>
<tr>
<td>NGCC</td>
<td>771</td>
</tr>
</tbody>
</table>

Regional Interconnect Grids
Mid-U.S. 2030 CPP Rate-Goals Final vs. (Proposal)

**Mid-U.S. Range** (ND and TX)

- **Proposed Rule Range:** (791 – 1,783)
- **Final Rule Range:** (1,042 – 1,305)

Note: All goals are listed in units of lbs CO$_2$/MWh
Rate-Based Approach (overview)

- Requires compliance with a rate: \( \frac{\text{lbs CO}_2}{\text{MWh}} \)
- Emission Rate Credits (ERCs) are generated \textit{(ex-post)} through EE/RE and other compliance options
  - 1 ERC = 1 MWh with 0 CO\(_2\) emissions
  - EM&V plan required for all ERC generation
- ERCs are added to each source’s denominator to lower their rate
- ERCs may be banked for future years or traded/sold among individual sources
- New units are not subject and cannot generate ERCs
MO Statewide Rate-based Goal

MO 2012 Baseline Fossil Generation

<table>
<thead>
<tr>
<th>Generation Type</th>
<th>2012 Generation (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Generation</td>
<td>72,859,571</td>
</tr>
<tr>
<td>NGCC Generation</td>
<td>4,854,569</td>
</tr>
</tbody>
</table>

\[
\frac{(\text{Coal gen.} \times 1,305) + (\text{NGCC gen.} \times 771)}{\text{Coal gen.} + \text{NGCC gen.}} = 1,272 \text{ lbs CO}_2/\text{MWh}
\]

MO 2030 Statewide Rate Goal
Mass-Based Approach (overview)

• Traditional regulatory trading approach
  – Examples:
    Acid Rain, NO$_x$ Budget Program, CAIR, CSAPR
• State-wide annual budget of allowances (tons CO$_2$)
  – (Emissions are capped)
• Allowances are allocated to individual sources
  – Each allowance permits one ton of emissions
  – Allowances may be banked for future years or traded/sold among individual sources
• Plan must address emission leakage to new units
MO Mass-Based Goal Computation

- EPA accounted for potential RE growth when computing the mass-based goals

Step 1: Determine nationwide potential RE growth beyond building block 3

Step 2: Determine Missouri’s share of extra RE potential

Step 3: Apply EPA’s formula using Missouri’s statewide rate-based goal and 2012 fossil generation

\[
\frac{(1,272 \times \text{MO Gen}_{2012}) + (1,272 \times \text{MO GenExtra}_{RE} \times 2)}{2,000 \text{ lbs/ton}} = 55,462,884 \text{ tons}
\]
Fuel Mix Comparisons

2012 Fuel Mix

- Existing Affected Coal: 79%
- Pre-2012 RE: 2%
- Existing NGCC: 5%
- Non 111(d) fossil: 2%
- Nuclear: 12%

2030 Rate-based Fuel Mix *

- Existing Affected Coal: 46%
- Post-2012 RE: 25%
- Pre-2012 RE: 2%
- Existing NGCC: 13%
- Nuclear: 12%
- Non 111(d) fossil: 2%

2030 Mass-based Fuel Mix *

- Existing Affected Coal: 19%
- Post-2012 RE: 19%
- Pre-2012 RE: 2%
- Existing NGCC: 13%
- Nuclear: 12%
- Non 111(d) fossil: 2%

* 2030 fuel mixes are estimates and could vary significantly based on compliance options selected.
State Plan Options

Rate-Based
- “Emissions Standards” Approach
  - Subcategorized Rates
    - Model Rule
  - State-Wide Rate Goal
  - State-Defined Rates

Mass-Based
- “Emissions Standards” Approach
  - Existing Units Only
    - Model Rule
  - Existing Units + New Source Complement
- “State Measures” Approach
  - State Measures Plan
## Rate-based Approaches (sub-options)

### Performance Standards
- Model rule available
- Fossil Steam: 1,305 lb/MWh
  - NGCC: 771 lb/MWh
- Interstate “Trading Ready”
  - w/other states that use same approach
- Existing NGCC need ERCs to operate
- Existing NGCC generate Gas Shift ERCs
  - Necessary for BB2 credit
  - Can only be used by fossil steam units

### Common Elements
- Emission Rate Credits (ERCs) are generated (ex-post)
  - Clean Affect EGU Gen.
  - Post-2012 EE/RE
  - CHP
  - Biomass (carbon neutral)
  - others
- Apply ERCs to actual rate for compliance
  - 1ERC = 1MWh (0 emissions)
- ERC banking/trading
- EM&V plan required for all ERCs generated
- New fossil units not subject
- Unconstrained growth

### Statewide Rate-Goal
- No model rule
- Use MO Statewide Rate: 1,272 lb/MWh applies to all
- Interstate trading only allowed through multi-state plans
- Multi-state plans require states to blend goals
- Existing NGCC units generate ERCs (don’t need ERCs to operate)
# Mass-based Approaches (sub-options)

<table>
<thead>
<tr>
<th>Exclude New Units</th>
<th>Common Elements</th>
<th>Include New Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>• MO Mass-Goal for existing 55,462,884 tons</td>
<td>• Traditional regulatory emission trading approach</td>
<td>• MO Mass-Goal w/new source complement 56,052,813 tons (can be adjusted)</td>
</tr>
</tbody>
</table>
| • Model rule available | • 1 allowance required for each ton of CO₂ emitted | • New units need allowances to operate  
  - (state-enforceable) |
| • New units not subject | • Mass budgets can’t change once approved | • No requirement to address “leakage” to new units |
| • Plan must address emission “leakage” to new units  
  • Allocation incentives - Set-asides (EE/RE and NGCC); or  
    • Demonstration | • Allowance banking/trading | • Set-asides allowed but not required |
| • EM&V plan required only if set-aside is used to address “leakage” | • Interstate “Trading Ready”  
  • w/other states that use mass approaches | • No EM&V plan required |
Fuel Mix Comparisons

2030 Fuel Mix assumptions

- Growth not accounted for:
  \[2012 \text{ Affected EGU Gen.} = (2030 \text{ Affected EGU Gen.} + \text{post-2012 RE Gen.})\]

- Only building blocks are used to meet goals
  (Coal heat rate improvement, Redispatch to NGCC, Post-2012 RE)

- Existing RE generation stays constant

- Existing nuclear and unaffected fossil generation stay constant

- Trading not accounted for
Proposed Model Rules and Federal Plan

• Two Model Rules
  – Rate (Performance Standards)
  – Mass (Excludes New Units (Allowance Set-Asides))

• States not required to use either model rule

• Federal Plan will be based on either the Rate or Mass model rule with adjustments
  – Under Rate option for Federal Plan
    • Only incremental RE and new nuclear can create ERCs
      – No Demand-side EE or Biomass

• Comment period open through ~December 2015
• Final Model Rules expected in June 2016
Proposed: Mass-Based Model Rule/Federal Plan Set-Asides

- RE set-aside needed to incent new renewables over new fossil units (building block 3 leakage)

Missouri’s Proposed RE set-aside (5%): 2,773,144 tons/year

* Proposed RE set-aside could grow if existing fossil EGUs retire

- NGCC output-based set-aside needed to keep incentive for existing NGCC on par with new fossil units (building block 2 leakage)

Missouri’s Proposed NGCC set-aside: 815,210 tons/year
Clean Energy Incentive Program (CEIP)

State CEIP allowances/ERCs borrowed from interim period, EPA matching allowances are extra

Missouri’s Proposed CEIP Budget (2020-2021)

11,313,966 tons

Missouri’s Proposed CEIP Set-Aside (2022-2024)

3,771,322 tons/year