MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Clean Power Plan - Final Rule Overview

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Prepared for –

East-West Gateway Coordinating Council

Air Quality Advisory Committee

September 29, 2015

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Presentation Overview

- Background
  - Federal regulations to control CO_2 from power plants
- Clean Power Plan Overview
- Final Clean Power Plan goals for Missouri
- Compliance options and plan approaches
- Timeline

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EPA Actions on August 3, 2015

EPA released two final rules and one proposed rule to control CO_2 emissions from power plants

- Two final rules
  - CO_2 emission standards for new power plants - 111(b)
  - CO_2 emission standards for existing power plants - 111(d)

AKA – Clean Power Plan

- One proposed rule
  - Proposed Model rules for existing plants - 111(d)
  - Proposed Federal Plan for existing plants - 111(d)

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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

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

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Missouri's Final Clean Power Plan Goals

Timeframe	Rate Based Goals	Mass-Based Goals (without new units)	Mass-Based Goals (with new units)
	CO_2 Rate (lbs/Net MWh)	CO_2 Emissions (Short Tons)	CO_2 Emissions (Short Tons)
2012 Actuals	**2,008**	**78,039,449**	
Interim Step 1 2022-2024	1,621	67,312,915	67,587,294
Interim Step 2 2025-2027	1,457	61,158,279	62,083,903
Interim Step 3 2028-2029	1,342	57,570,942	58,445,482
Interim Average (2022 – 2029)	↓26% **1,490**	↓19% **62,569,433**	**63,238,070**
Final Goals (2030 and beyond)	↓37% **1,272**	↓28% **55,462,884**	**56,052,813**

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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

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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

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Clean Energy Incentive Program (CEIP)

- States award CEIP allowances/ERCs to eligible projects <u>and EPA matches the award</u>
  - 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

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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

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Clean Power Plan - Missouri Timeline *

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

* This timeline is tentative and gives the maximum time allowed to meet a Final Plan submittal deadline of September 6th, 2018. The actual schedule for plan development and adoption may be faster.

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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.

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Backup Slides

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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)

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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)

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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

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Building Blocks Used to Set the Standards

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.**

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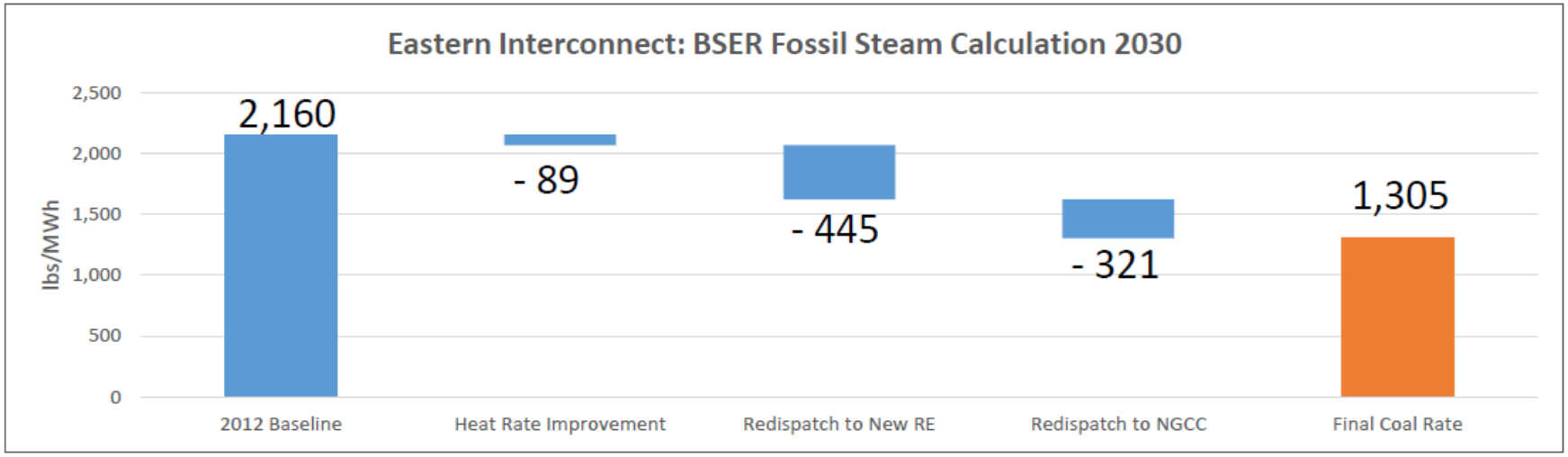
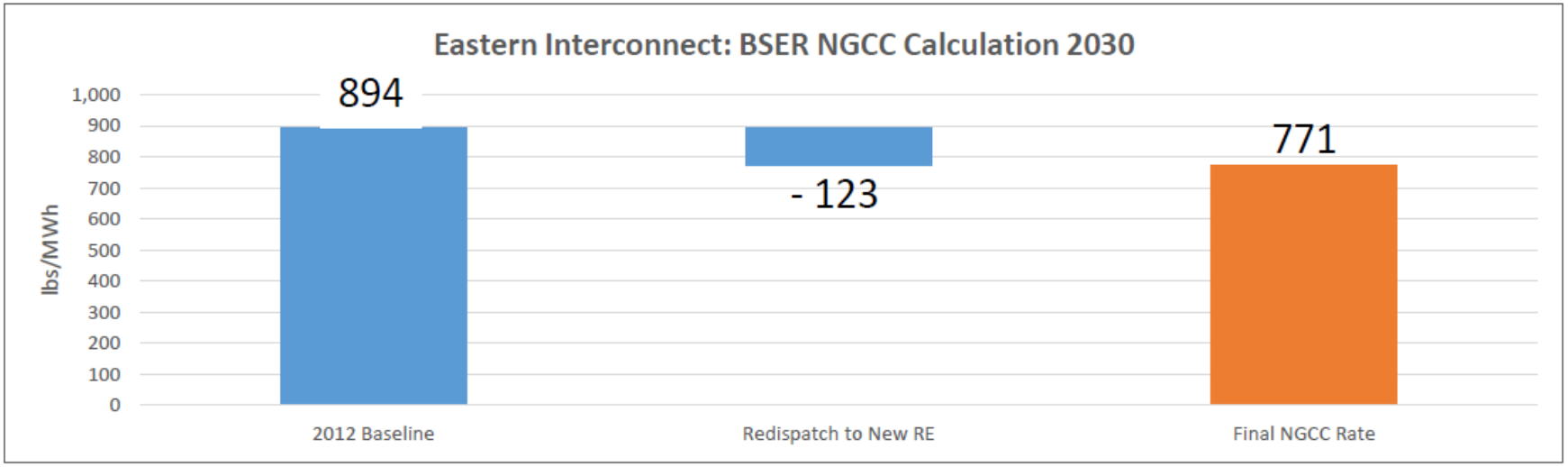
Building Block Effects for Eastern Interconnect





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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

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Missouri's Proposed vs. Final Rule Rate Comparison

Step	Proposed Rate (lbs CO_2/MWh)	Step	Final Rate (lbs CO_2/MWh)
Starting rate 2012 statewide adjusted average emission rate	1,963		2,008
Interim Period 2020-2029	**1,621** ↓17%	Interim step 1 2022-2024	1,621
		Interim step 2 2025-2027	1,457
		Interim step 3 2028-2029	1,342
		Average Interim Goal	**1,490** ↓26%
Final	**1,544** ↓21%		**1,272** ↓37%

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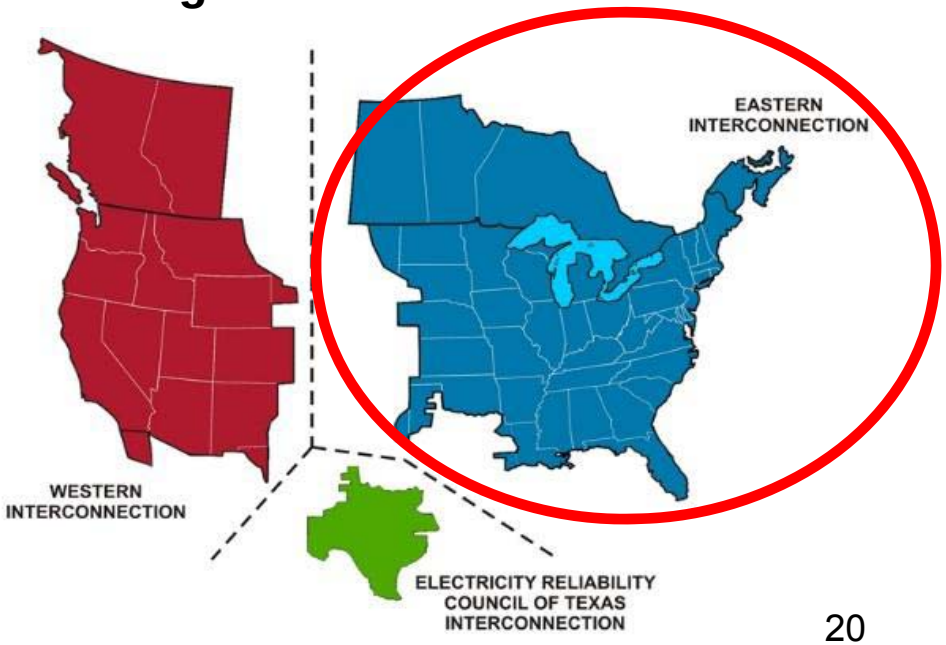
Consistent National Performance Standards

- 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

Nationwide Performance Standards

EGU Type	2030 Rate (lbs CO_2/MWh)
Fossil Steam	1,305
NGCC	771

Regional Interconnect Grids



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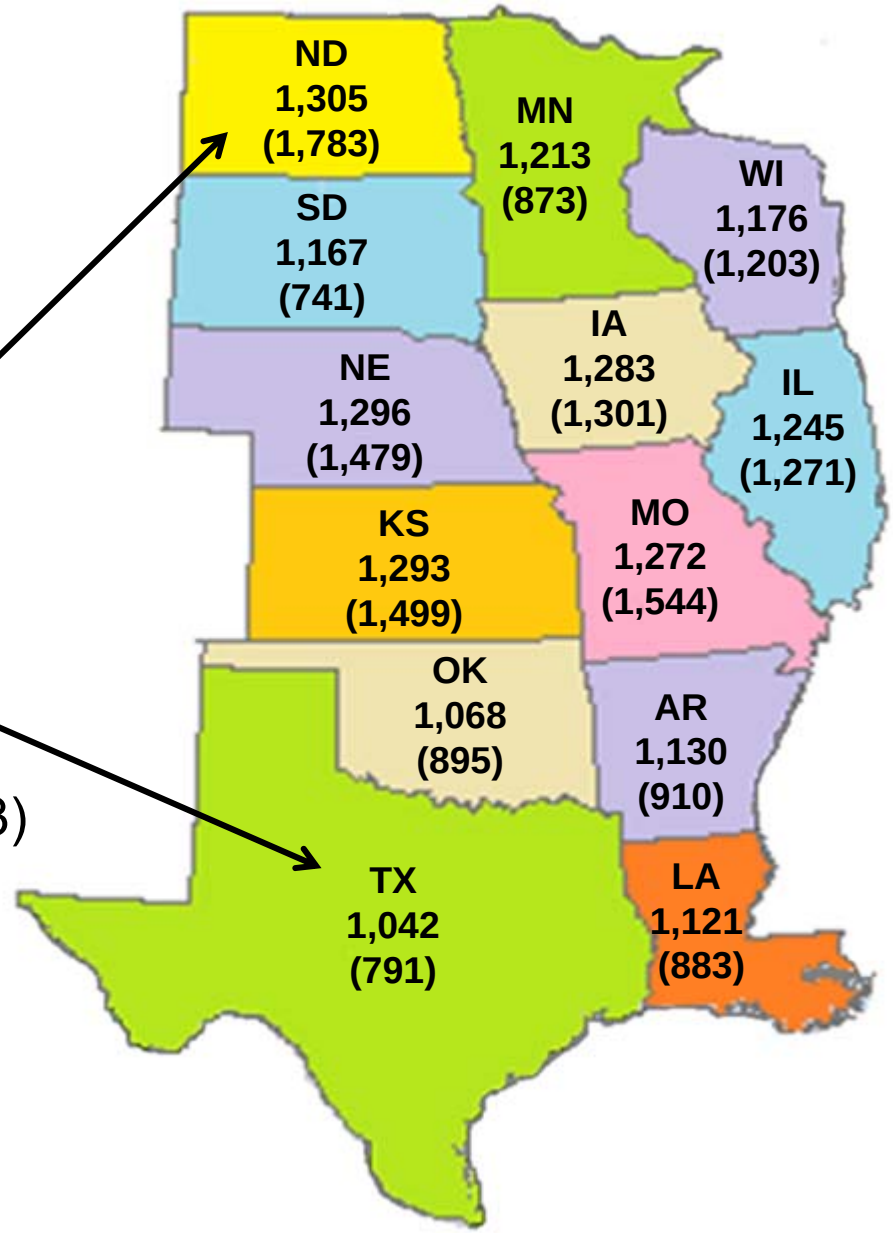
Mid-U.S.
2030 CPP Rate-Goals
Final vs. (Proposal)

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

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Rate-Based Approach (overview)

- Requires compliance with a rate: $\left(\frac{\text{lbs } CO_2}{\text{MWh}}\right)$
- Emission Rate Credits (ERCs) are generated (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

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MO Statewide Rate-based Goal

National Emission Performance Rates **x** Unique State Generation Mix **=** Unique State Goal Rates ➡ Mass Equivalents

MO 2012 Baseline Fossil Generation

Generation Type	2012 Generation (MWh)
Coal Generation	**72,859,571**
NGCC Generation	**4,854,569**

$$\frac{(\text{Coal gen.} * 1{,}305) + (\text{NGCC gen.} * 771)}{\text{Coal gen.} + \text{NGCC gen.}} = 1{,}272 \text{ lbs } CO_2/\text{MWh}$$

MO 2030 Statewide Rate Goal

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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

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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

$$\frac{(1{,}272 * \text{MO Gen}_{2012}) + (1{,}272 * \text{MO GenExtra}_{\text{RE}} * 2)}{2{,}000 \text{ lbs/ton}} = 55{,}462{,}884 \text{ tons}$$

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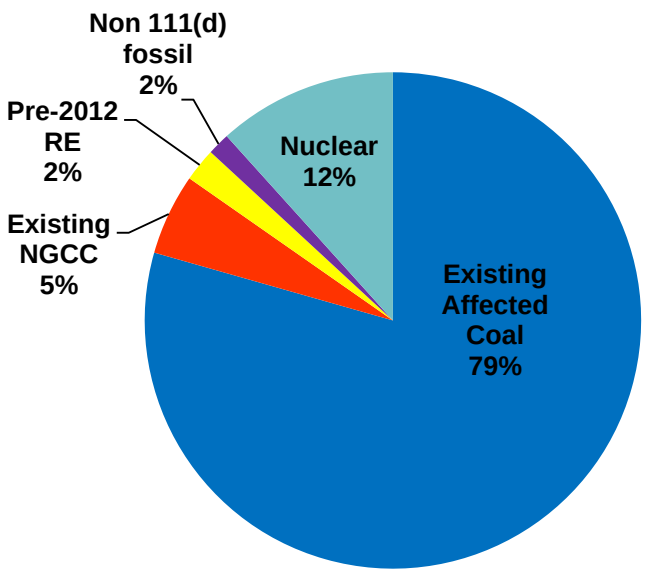
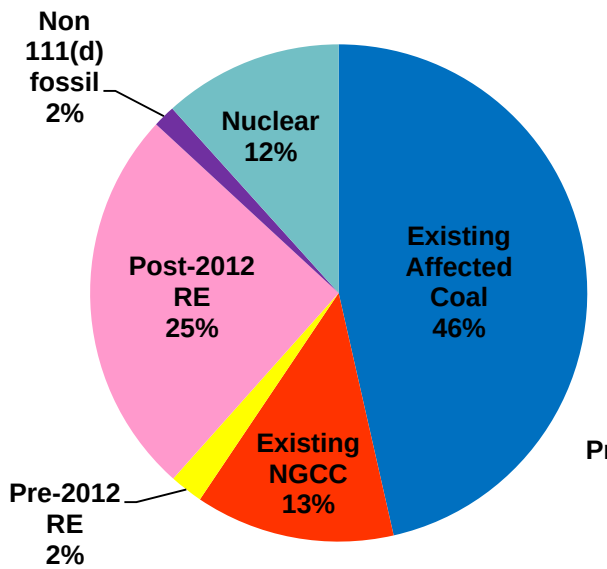
Fuel Mix Comparisons

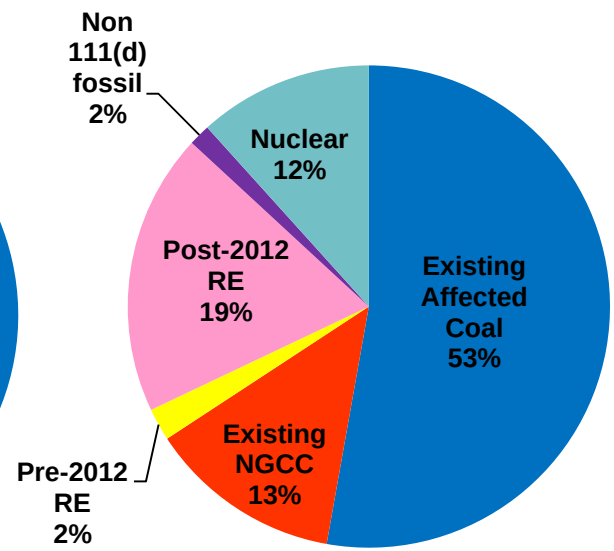
2012 Fuel Mix



2030 Rate-based Fuel Mix *



2030 Mass-based Fuel Mix *



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

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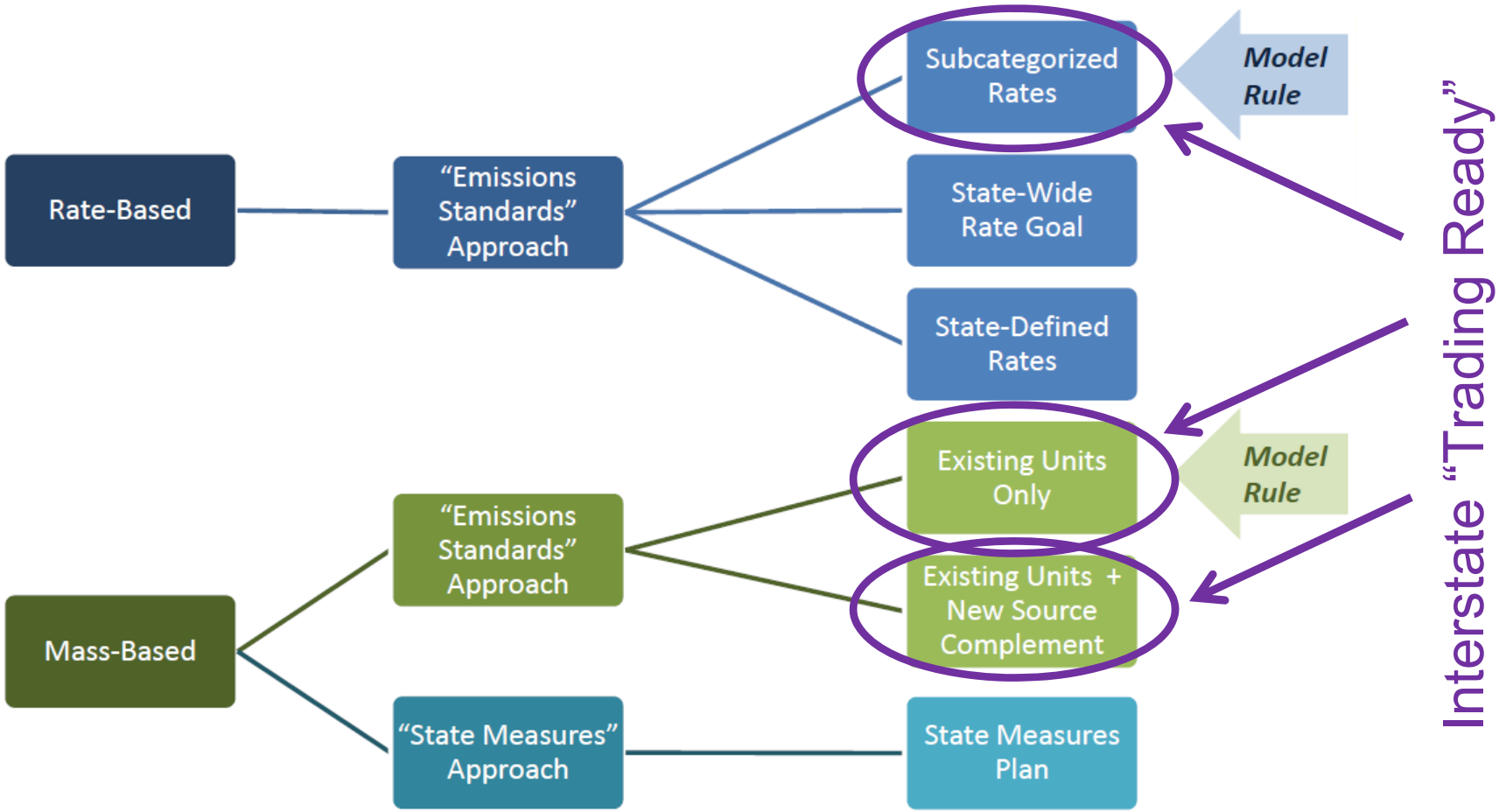
State Plan Options



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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)

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Mass-based Approaches (sub-options)

Exclude New Units

- MO Mass-Goal for existing 55,462,884 tons
- Model rule available
- New units not subject
- Plan must address emission "leakage" to new units
  - Allocation incentives - Set-asides (EE/RE and NGCC); or
  - Demonstration
- EM&V plan required only if set-aside is used to address "leakage"

Common Elements

- Traditional regulatory emission trading approach
- 1 allowance required for each ton of CO_2 emitted
- Mass budgets can't change once approved
- Allowance banking/trading
- Interstate "Trading Ready"
  - w/other states that use mass approaches

Include New Units

- MO Mass-Goal w/new source complement 56,052,813 tons (can be adjusted)
- New units need allowances to operate
  - (state-enforceable)
- No requirement to address "leakage" to new units
- Set-asides allowed but not required
- No EM&V plan required

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Fuel Mix Comparisons

2030 Fuel Mix assumptions

- Growth not accounted for:
  2012 Affected EGU Gen. = (2030 Affected EGU Gen. + 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

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Proposed Model Rules and Federal Plan

- Two Model Rules
  - Rate (Performance Standards)
  - Mass (Excludes New Units (Allowance Set-Asides))
- <u>States not required to use either model rule</u>
- 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

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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**

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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