

# Clean Power Plan Final Goals and Compliance Options

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September 23, 2015

# 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)

## 21 Affected Missouri Sources Identified in Final CPP Rule

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

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

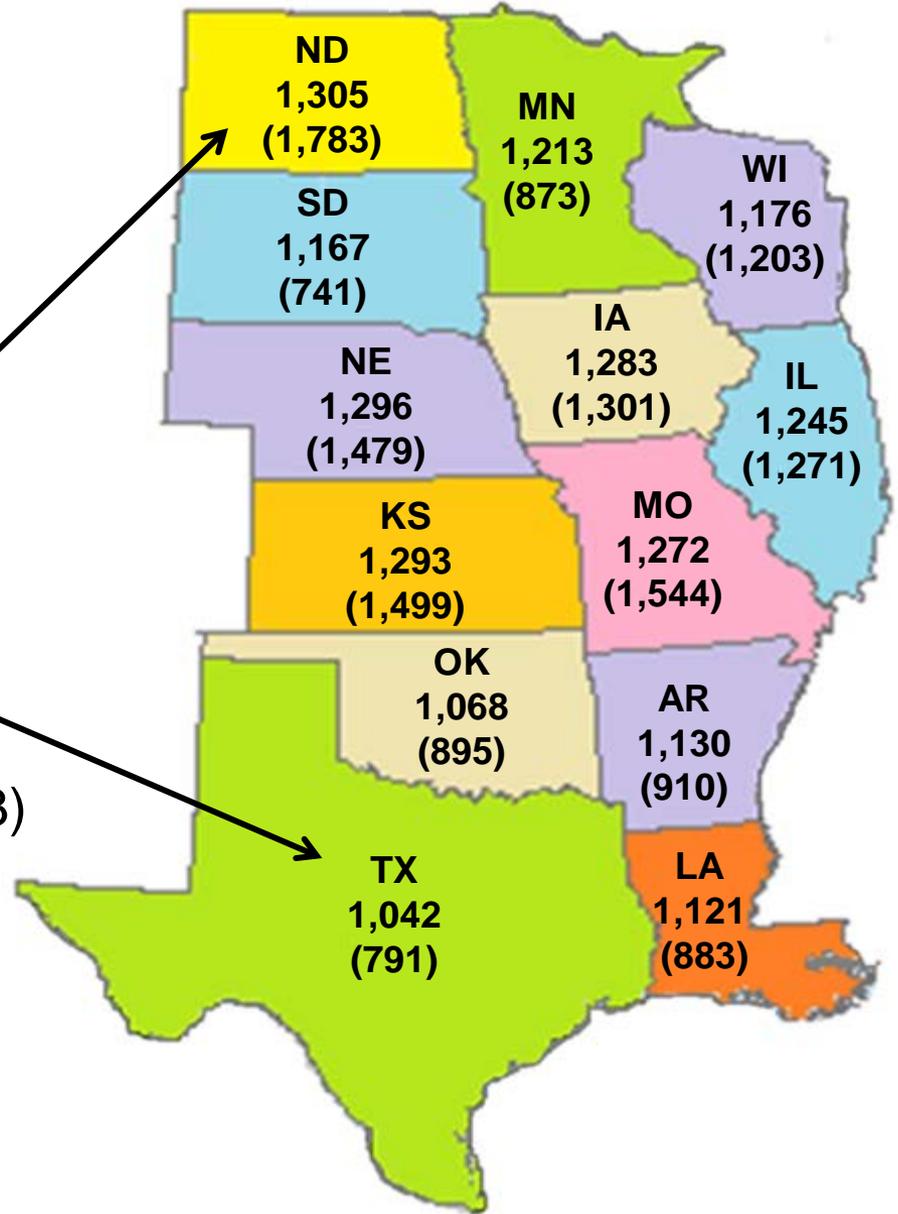
# CPP Comparison: Final vs Proposal

- 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

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

**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<sub>2</sub>/MWh



# Missouri's Proposed vs. Final Rule Rate Comparison

Step	Proposed Rate (lbs CO <sub>2</sub> /MWh)	Step	Final Rate (lbs CO <sub>2</sub> /MWh)
Starting rate 2012 statewide adjusted average emission rate	1,963		2,008
Interim Period 2020-2029	<b>1,621</b> ↓ 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	<b>1,490</b> ↓ 26%
Final	<b>1,544</b> ↓ 21%		<b>1,272</b> ↓ 37%



# Goal Computation - 1 of 4

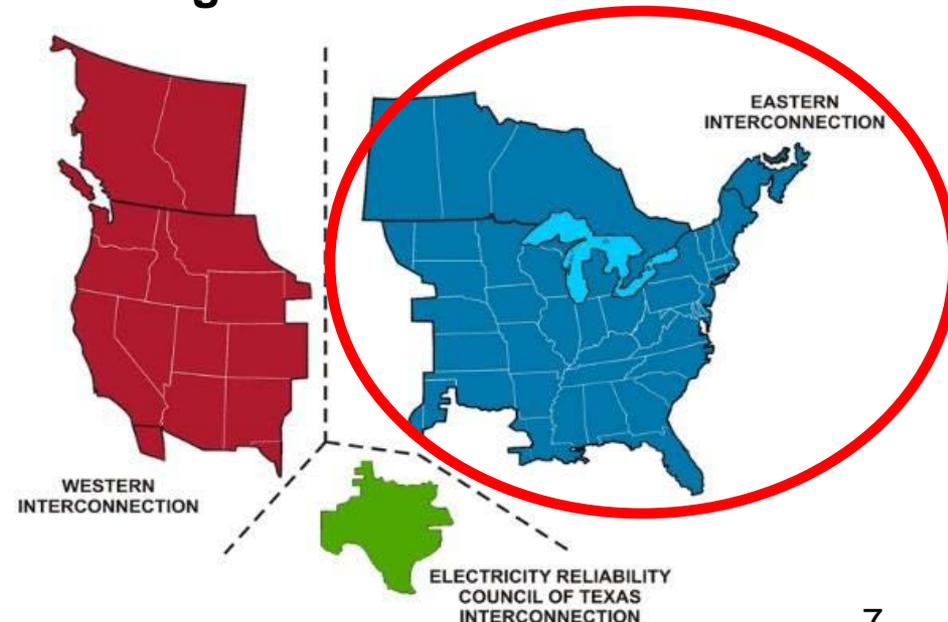
- EPA divided the country into three regional interconnects and applied the best system of emission reduction (BSER) to each
- The resulting performance standards from the least stringent region were used as the nationwide performance standards

## Eastern Region

### Performance Standards

EGU Type	2030 Rate (lbs CO <sub>2</sub> /MWh)
Fossil Steam	1,305
NGCC	771

## Regional Interconnect Grids



# Goal Computation - 2 of 4

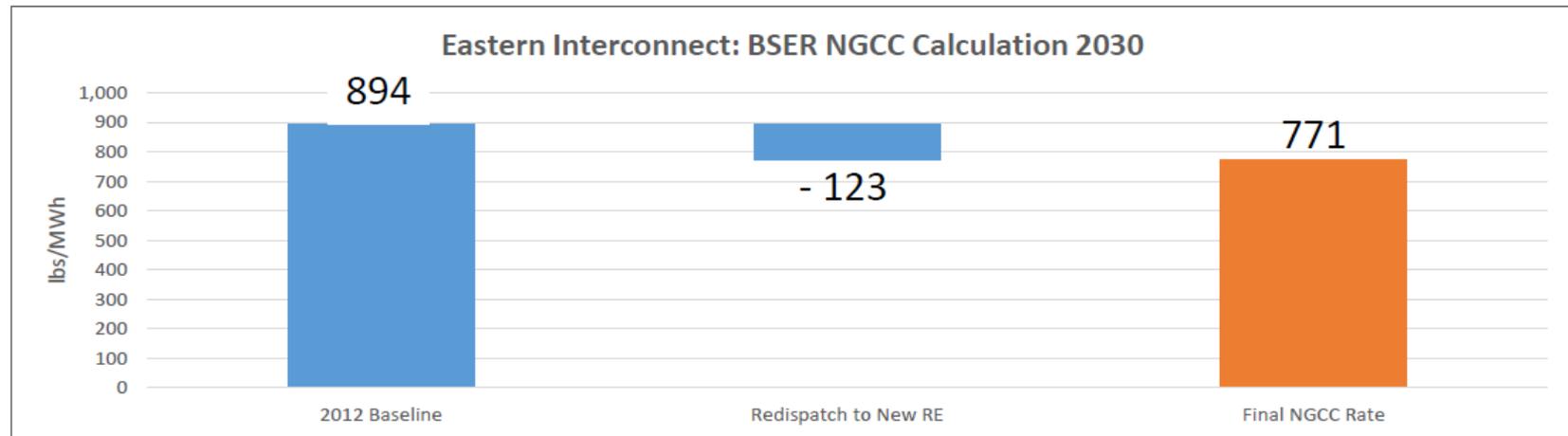
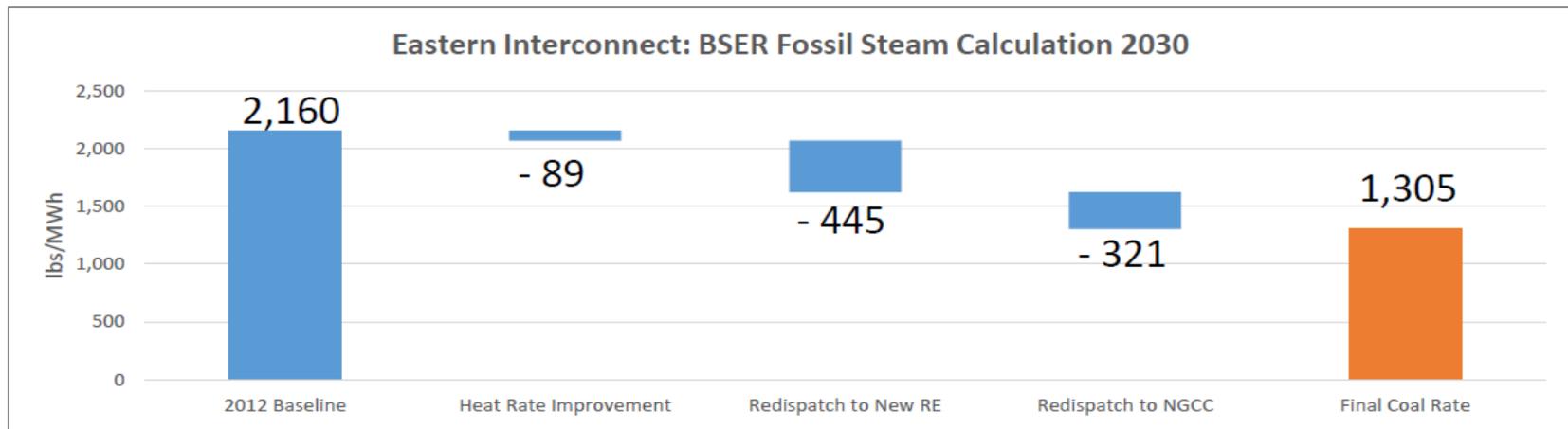
## Building Blocks Comprising the BSER

1.	Coal Plants – Heat Rate Improvements	<ul style="list-style-type: none"> <li>• Applied Regionally</li> <li>• Eastern Region</li> <li>4.3% Improvement</li> </ul>
2.	Redispatch to NGCC	<ul style="list-style-type: none"> <li>• Applied Regionally</li> <li>• Phased in</li> <li>• 75% of Net Summer Capacity</li> </ul>
3.	Renewables <del>&amp; Nuclear</del> *	<ul style="list-style-type: none"> <li>• No Nuclear</li> <li>• Incremental RE only</li> <li>• Based on Historical RE Penetration Levels</li> </ul>
<del>4.</del>	<del>Demand Side Energy Efficiency</del> *	<ul style="list-style-type: none"> <li>• No Demand-Side EE</li> </ul>

\* Demand-Side Energy Efficiency and New Nuclear are still allowable compliance options.

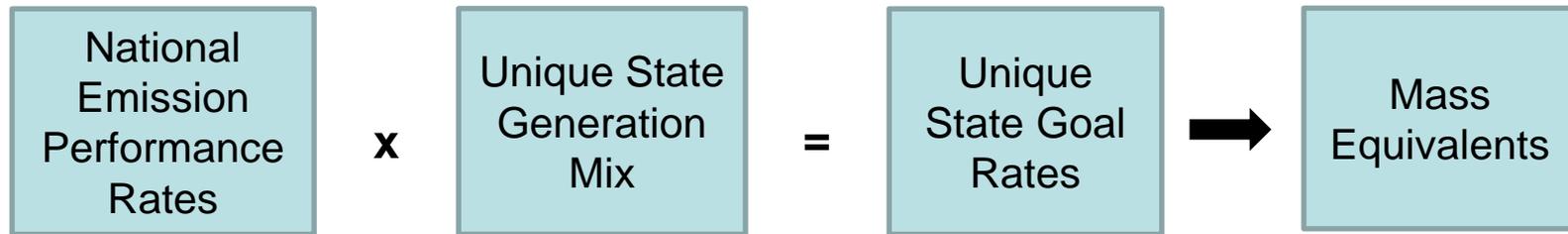
# Goal Computation - 3 of 4

## Building Block Effects for Eastern Interconnect



# Goal Computation - 4 of 4

## MO Statewide Rate-based Goal



MO 2012 Baseline Fossil Generation

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

$$\frac{(72,859,571 \times 1,305) + (4,854,569 \times 771)}{72,859,571 + 4,854,569} = 1,272 \text{ lbs CO}_2/\text{MWh}$$

MO 2030 Statewide Rate Goal

# 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 –  
2030 Nationwide extra RE potential: 166,255,493 MWh

Step 2: Determine Missouri's share of extra RE potential –  
2030 Missouri extra RE potential: 4,758,080 MWh

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

$$\frac{(1,272 * 77,714,140) + (1,272 * 4,758,080 * 2)}{2,000 \text{ lbs/ton}} = 55,462,884 \text{ tons}^*$$

\*Does not compute exactly due to rounding

# Missouri's Final Clean Power Plan Goals

Timeframe	Rate Based Goals		Mass-Based Goals (without new units)		Mass-Based Goals (with new units)
	CO <sub>2</sub> Rate (lbs/Net MWh)		CO <sub>2</sub> Emissions (Short Tons)		CO <sub>2</sub> Emissions (Short Tons)
<b>2012 Actuals</b>		<b>2,008</b>		<b>78,039,449</b>	
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
<b>Interim Average (2022 – 2029)</b>	↓26%	<b>1,490</b>	↓19%	<b>62,569,433</b>	<b>63,238,070</b>
<b>Final Goals (2030 and beyond)</b>	↓37%	<b>1,272</b>	↓28%	<b>55,462,884</b>	<b>56,052,813</b>

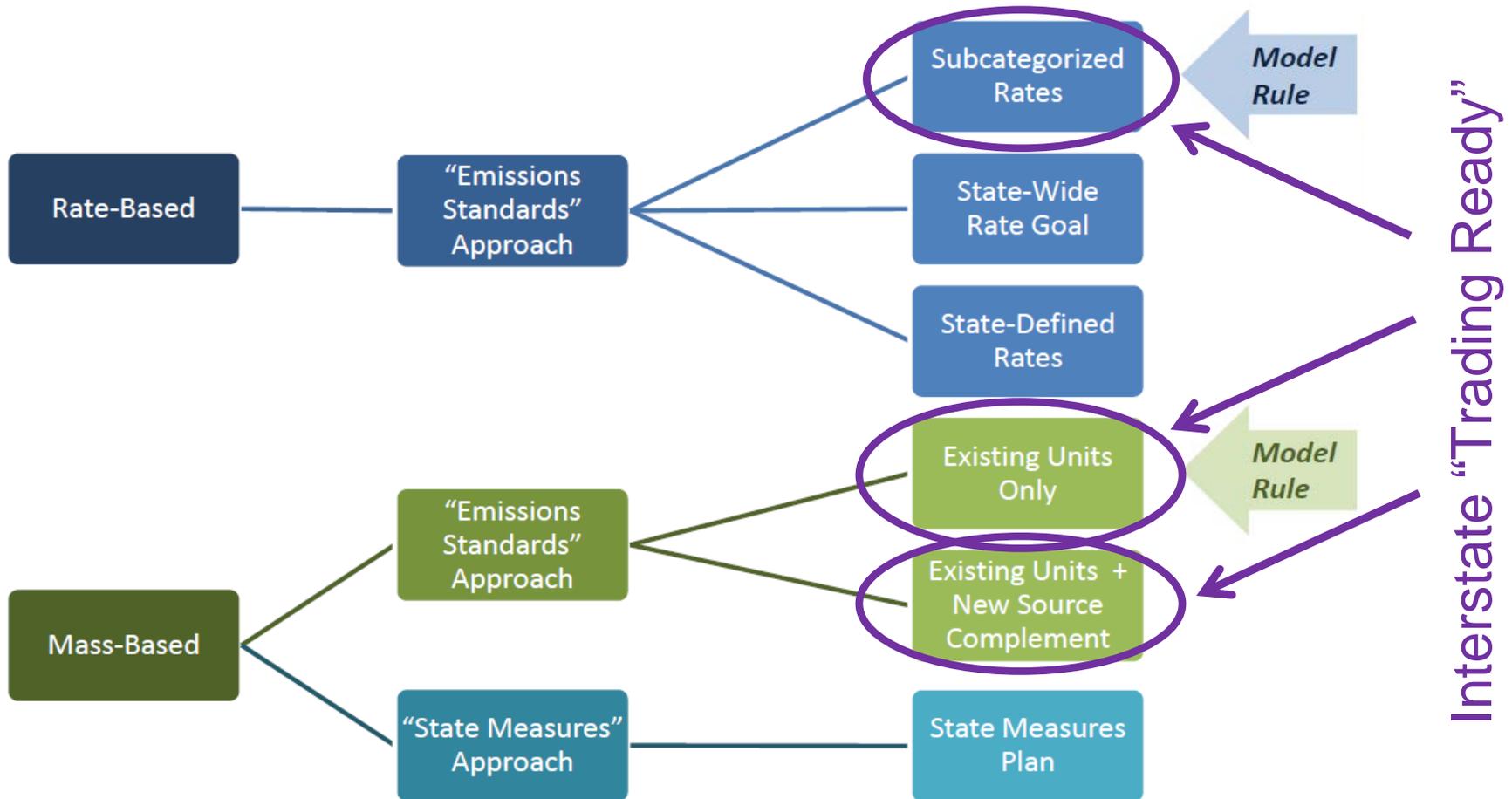
# Available Compliance Options

- 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
  - Trading

# State Plan Approaches

- Choose form of the compliance goal
  - Rate-based: (lbs CO<sub>2</sub>/MWh)
    - Performance rates, statewide rate-goal, or state-defined rates
  - Mass-based: (tons CO<sub>2</sub>)
    - Include or Exclude new units
    - State measures option
- Different plan elements required depending on plan approach
- Interstate trading ability is affected by plan approach

# State Plan Options



# 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<sub>2</sub> 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

# 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 Approach (overview)

- Traditional regulatory trading approach
  - Examples:  
Acid Rain, NO<sub>x</sub> Budget Program, CAIR, CSAPR
- State-wide annual budget of allowances (tons CO<sub>2</sub>)
  - (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

# 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<sub>2</sub> 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

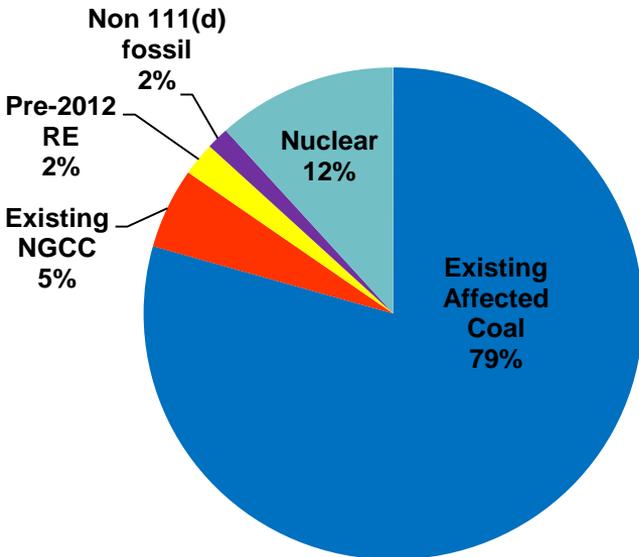
# Fuel Mix Comparisons

## 2030 Fuel Mix assumptions

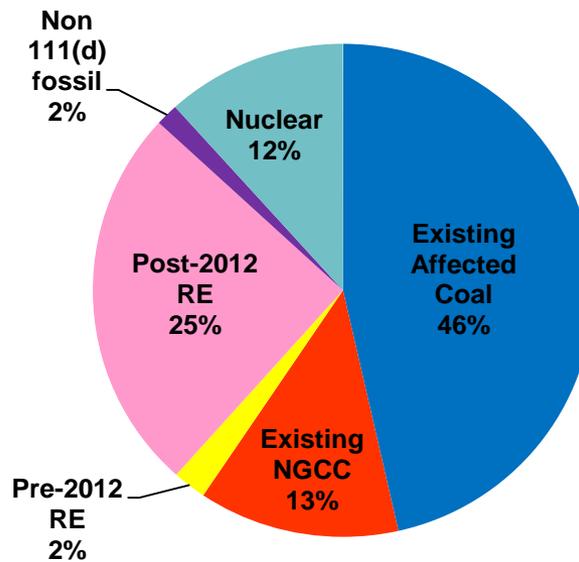
- Growth not accounted for:  
2012 Affected EGU Gen. = (2030 Affected EGU Gen. + post-2012 RE Gen.)
- Only building blocks are used to meet goals  
(Coal heat rate improvement, Redispatch to NGCC, Post-2012 RE)
- Existing (2012) RE generation stays constant
- Existing (2012) nuclear and unaffected fossil generation stay constant
- Trading not accounted for

# Fuel Mix Comparisons cont.

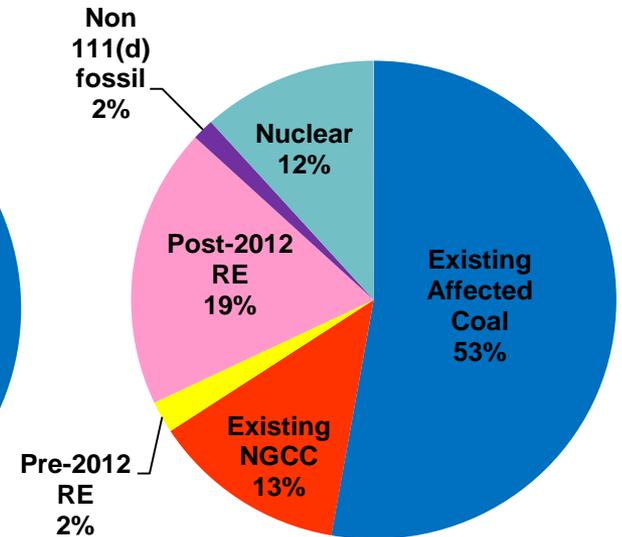
2012 Fuel Mix



2030 Rate-based  
Fuel Mix \*



2030 Mass-based  
Fuel Mix \*



\* 2030 fuel mixes are projections based on assumptions from slide 20. Actual 2030 fuel mix could vary significantly based on compliance options selected.

# 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 (taking comment)
- 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)

- 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

# Clean Energy Incentive Program (CEIP) cont.

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 \***

# 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
  - Public engagement; particularly vulnerable communities
    - General outreach, EE/RE education, CEIP opportunities
- 30-day public comment periods for both Initial and/or Final Plans

# Clean Power Plan Timeline

Summer  
2015

- August 3, 2015 - Final Clean Power Plan

1 Year

- September 6, 2016 – States make initial submittal with extension request or submit Final Plan

3 Years

- September 6, 2018 - States with extensions submit Final Plan

7 Years

- January 1, 2022 - Compliance period begins

15 Years

- January 1, 2030 - CO<sub>2</sub> Emission Goals met

Division of Environmental Quality Director: Leanne Tippett Mosby

Date: 9/23/15

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