



PPL companies

EPA's Clean Power Plan — Reducing Greenhouse Gas Emissions from Existing Sources

September 2, 2014



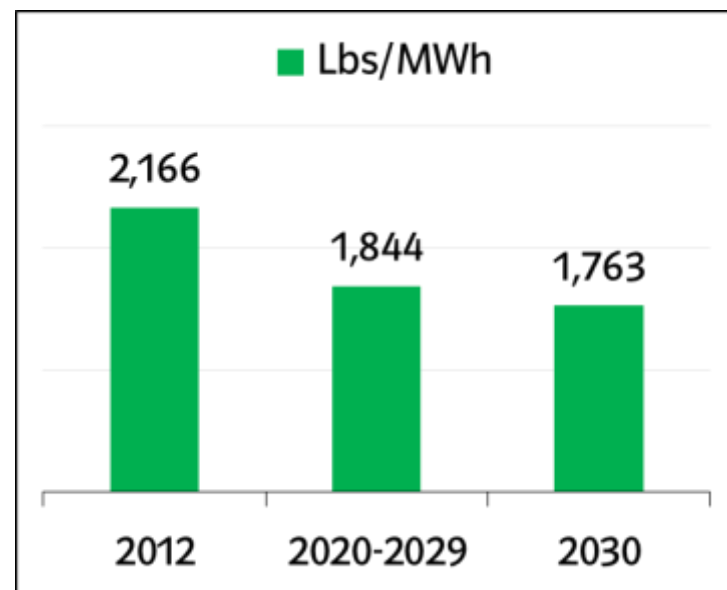
EPA Greenhouse Gas Proposed Regulations

- *Sept. 2013: EPA re-proposed regulations for **new** coal plants*
- *June 18, 2014: EPA published proposed regulations for **existing** plants*
- *June 18, 2014: EPA published proposed regulations for **modified or reconstructed** plants*
- *June 2015: EPA to finalize standards for existing power plants*



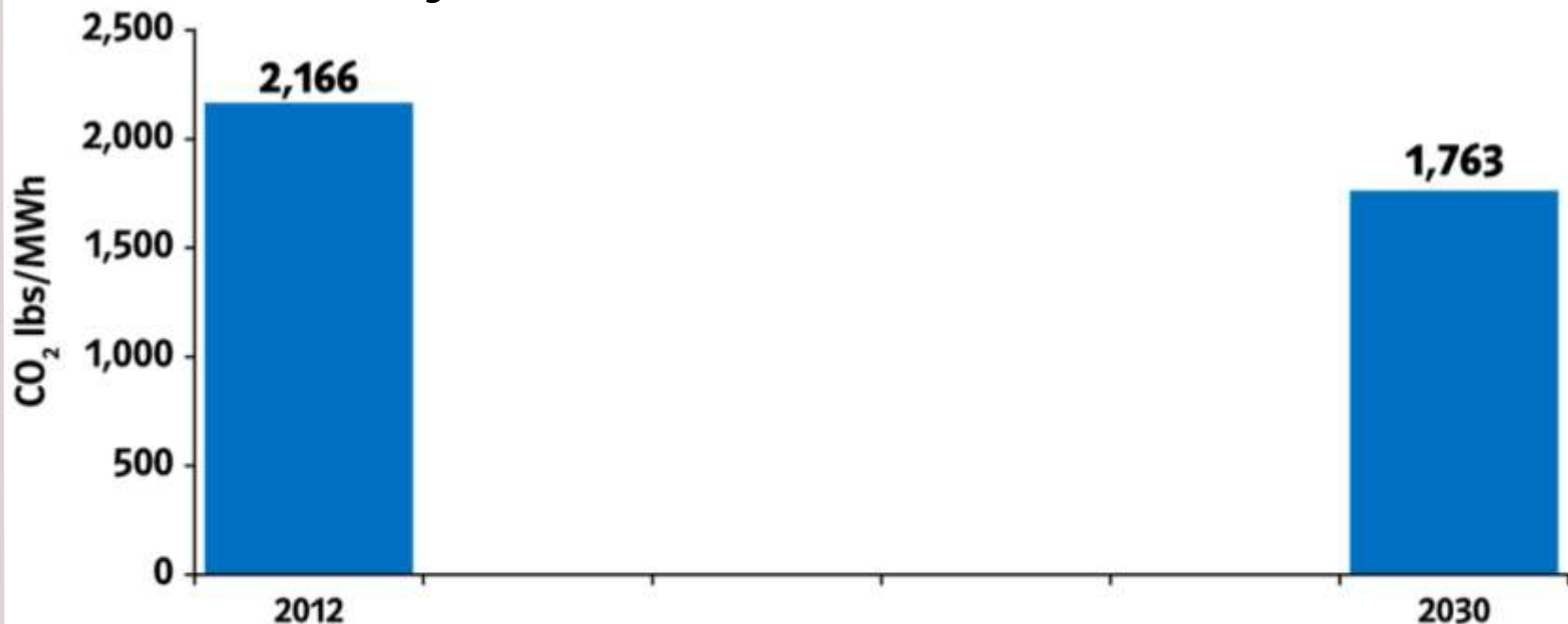
Existing Unit Proposed GHG Regulations

- *Nationwide average mass emission reductions from 2005 levels between 26 and 30% based on proposed state goals*
- *State goals based on 2012 emission rate data*
- *Kentucky goals*
 - *2012 avg. rate 2,166 Lbs/MWh*
 - *15% lower between 2020 - 2029*
 - *18% lower by 2030*



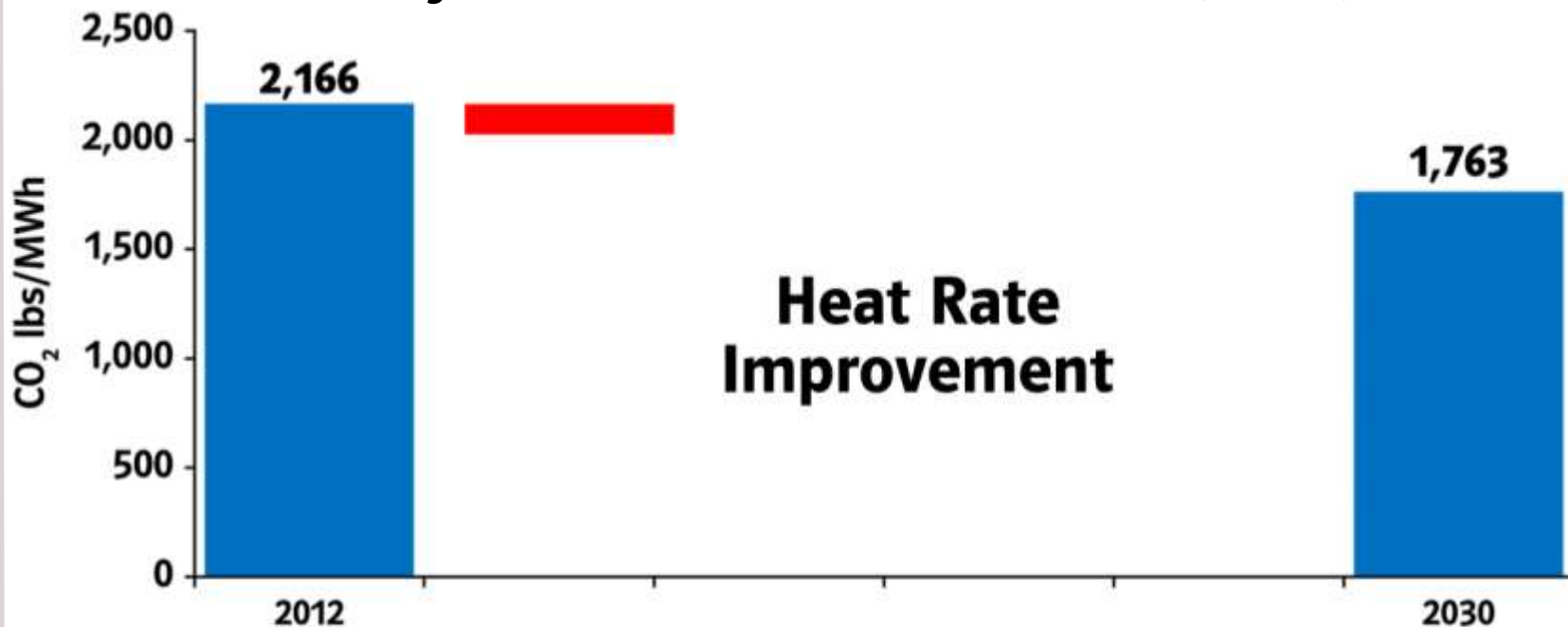
EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

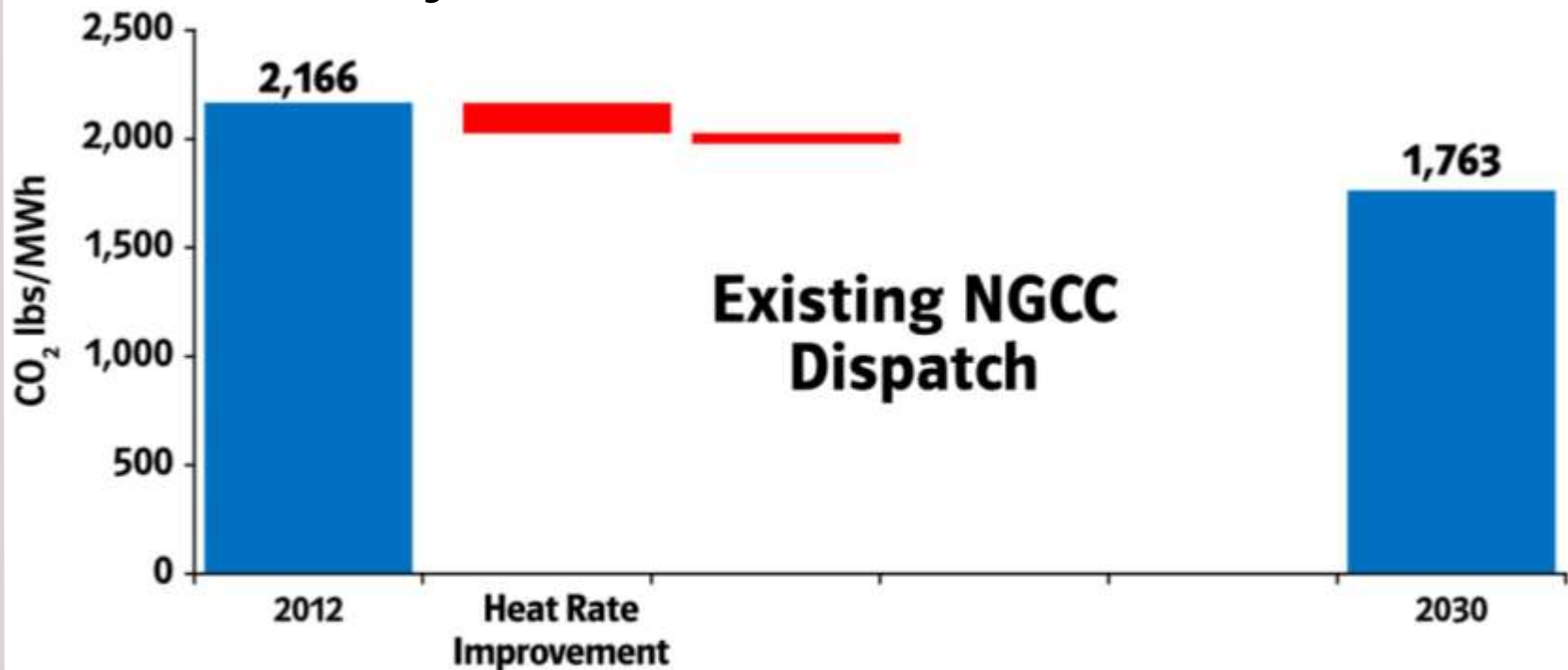
EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA assumes a 6% improvement in each fossil unit's heat rate is possible.

EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

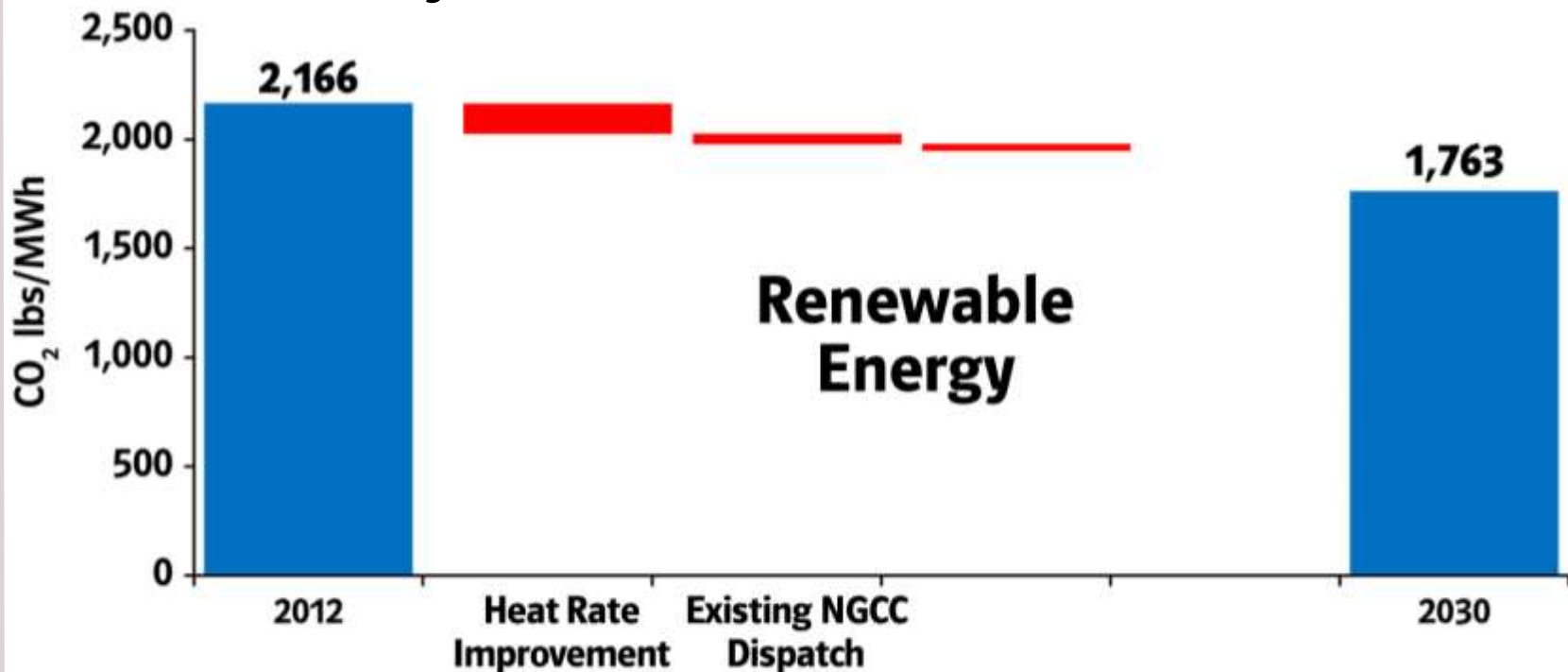
EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA assumed all NGCC units could achieve 70% a capacity factor; For KY's goal, only a 15% impact from Cane Run 7 was used.

EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

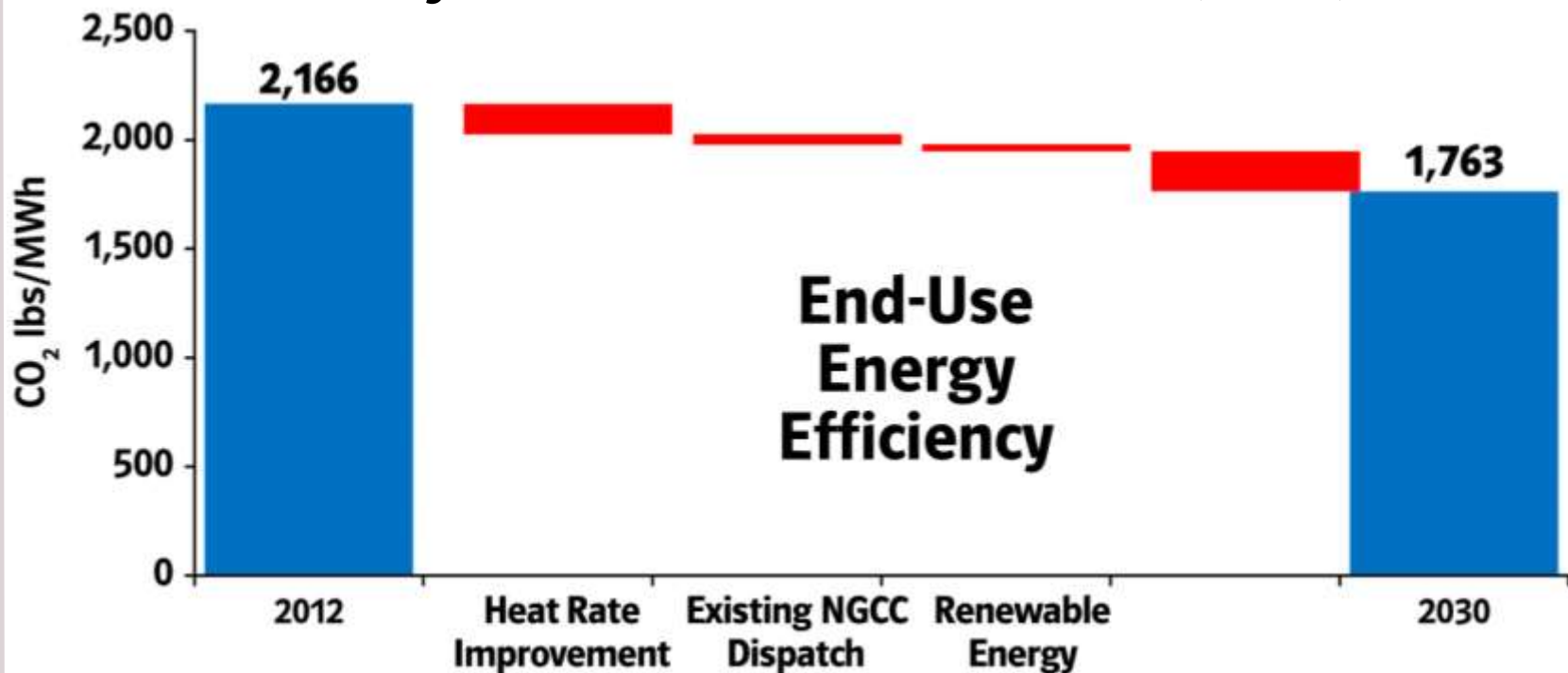
EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA assumed approximately 2% renewable energy in KY's goal.

EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

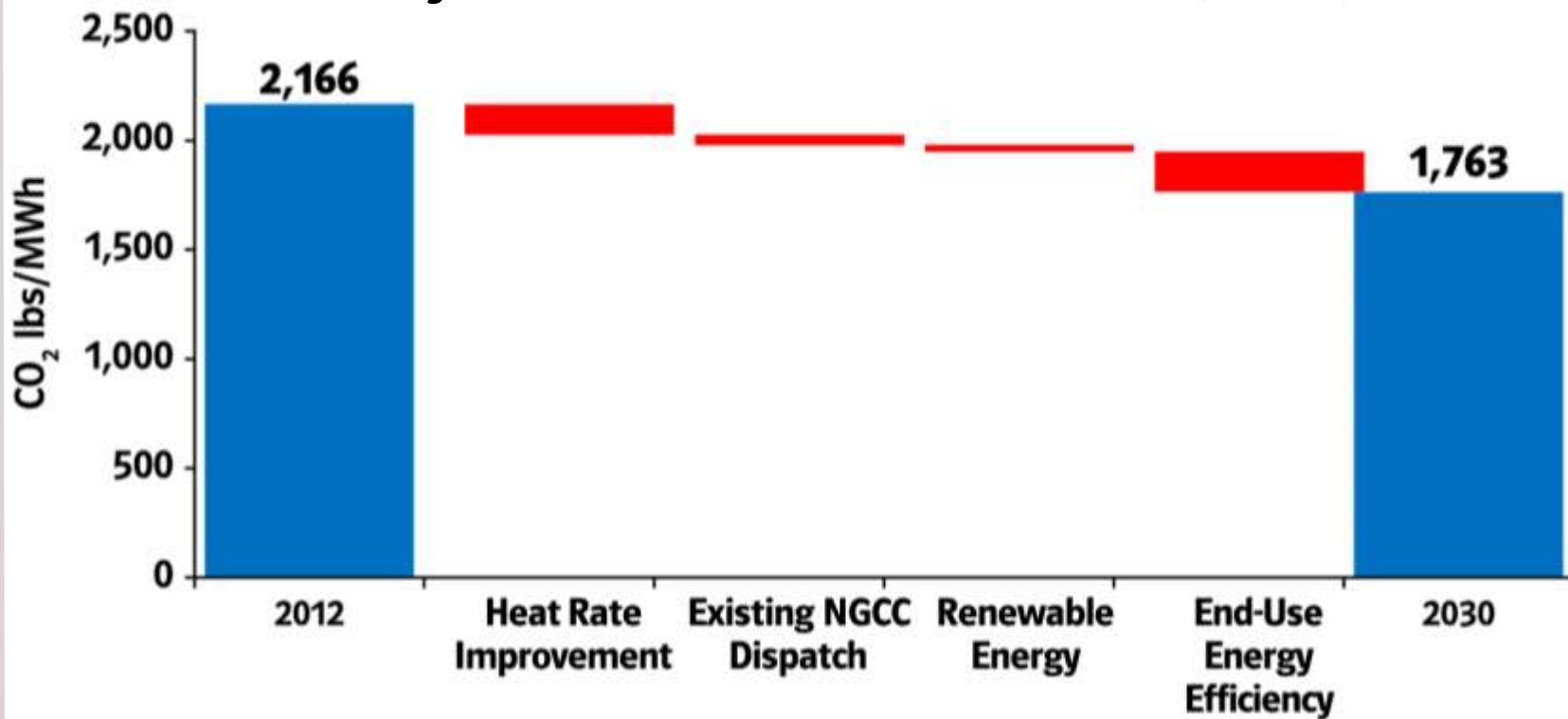
EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA assumed an annual increase rate of 1.07% per year for 10 years in KY's goal.

EPA's Development of Kentucky's 2030 CO₂ Emission Rate Goal

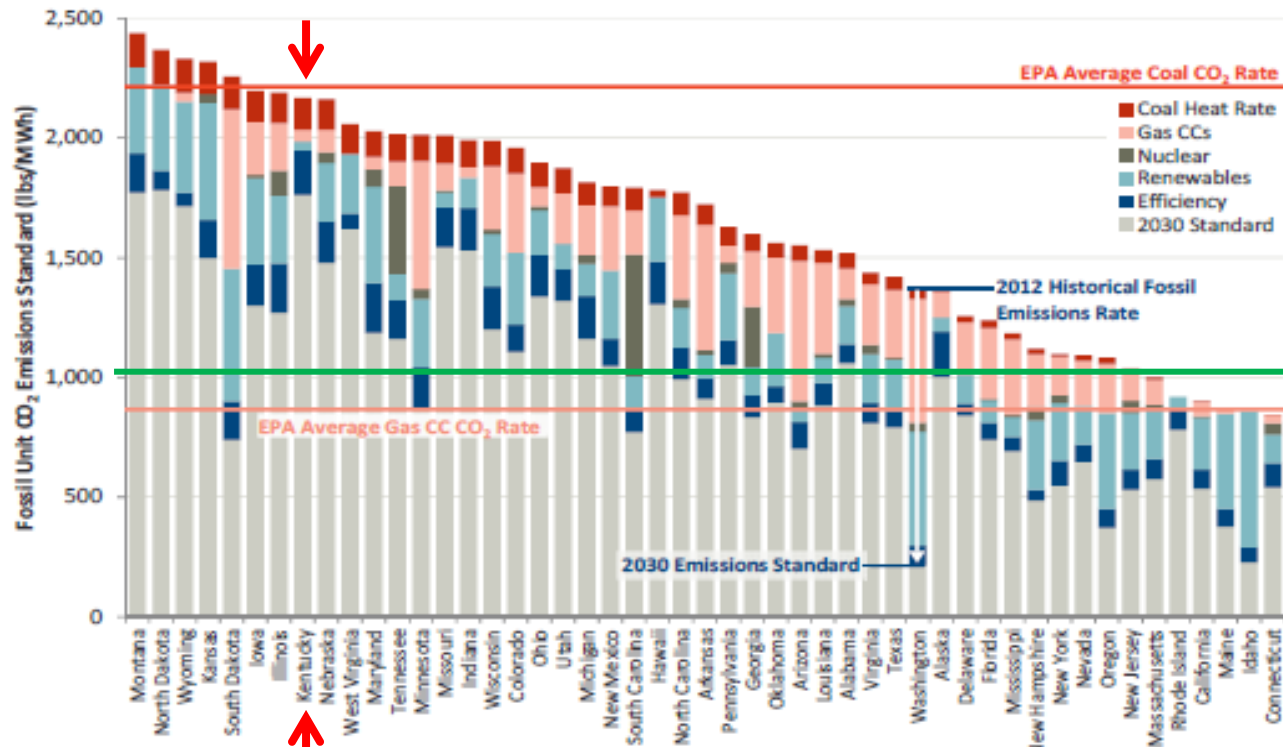
EPA Defines the Combination of 4 "Building Blocks" as the Best System of Emission Reductions (BSER)



EPA Proposed Reductions Vary by State

Fossil EGU Emissions Standard by State

State standards vary considerable relative to current fossil emission levels, due to differences in perceived BSER opportunities within each state



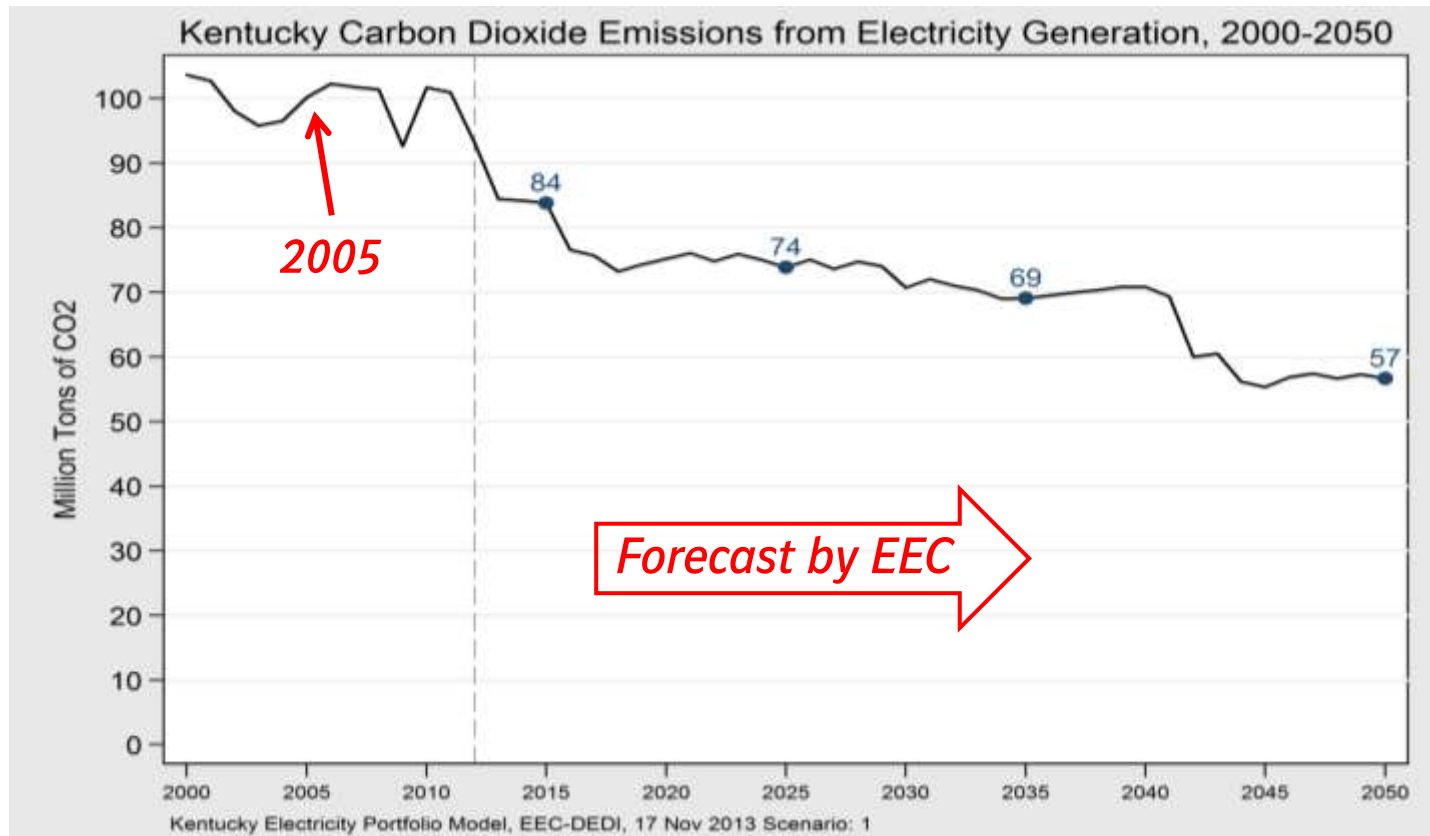
Reflects Option 1 final rate for years 2030 (EPA Technical Support Document: Goal Computation, Appendix 1)

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Kentucky

Kentucky's Electric Generation Emissions

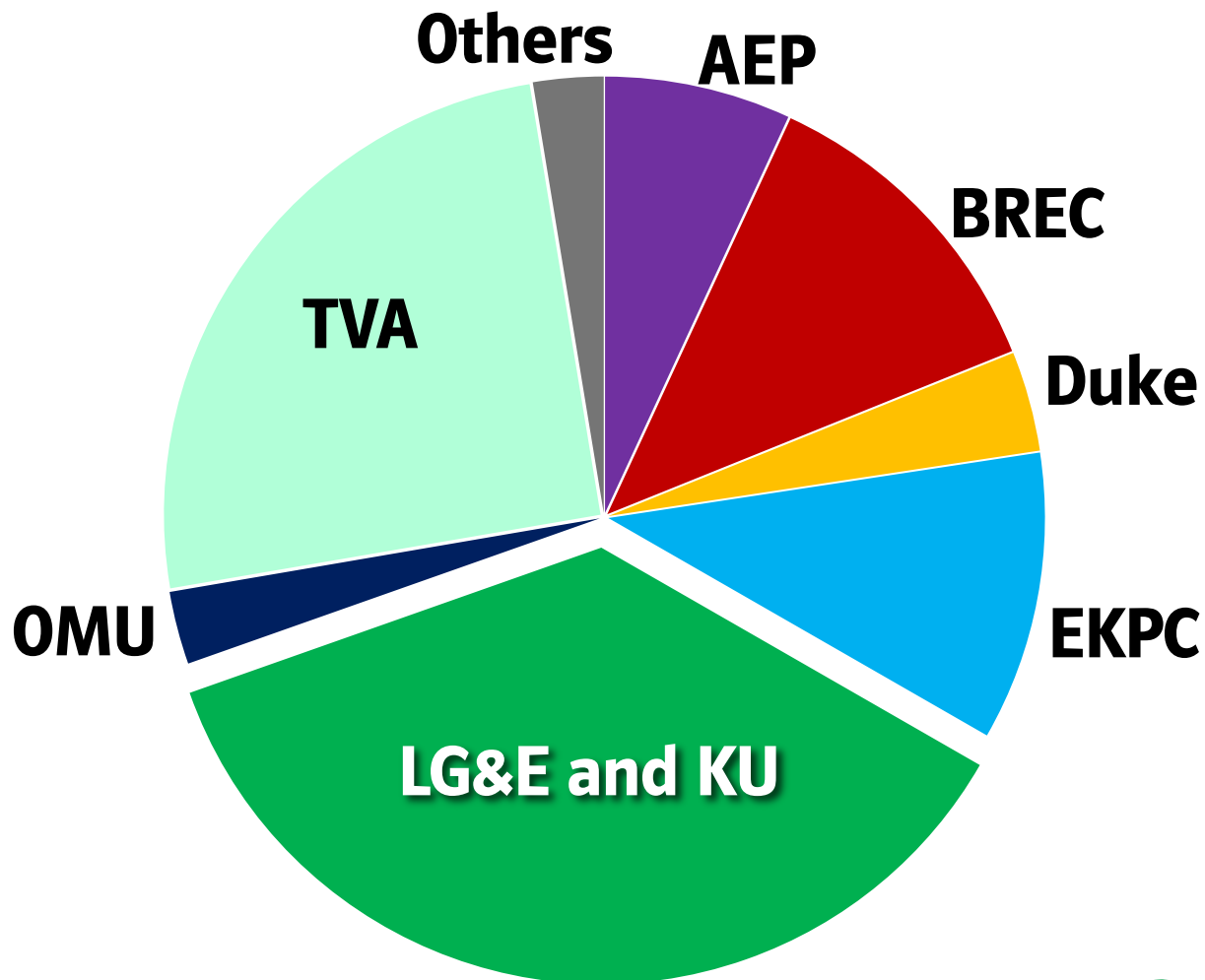
(From Energy and Environment Cabinet 2013 Report — Mass basis)



Projected reductions prior to GHG Regulations

Kentucky's Mass Emissions — 2005

100 Million Tons



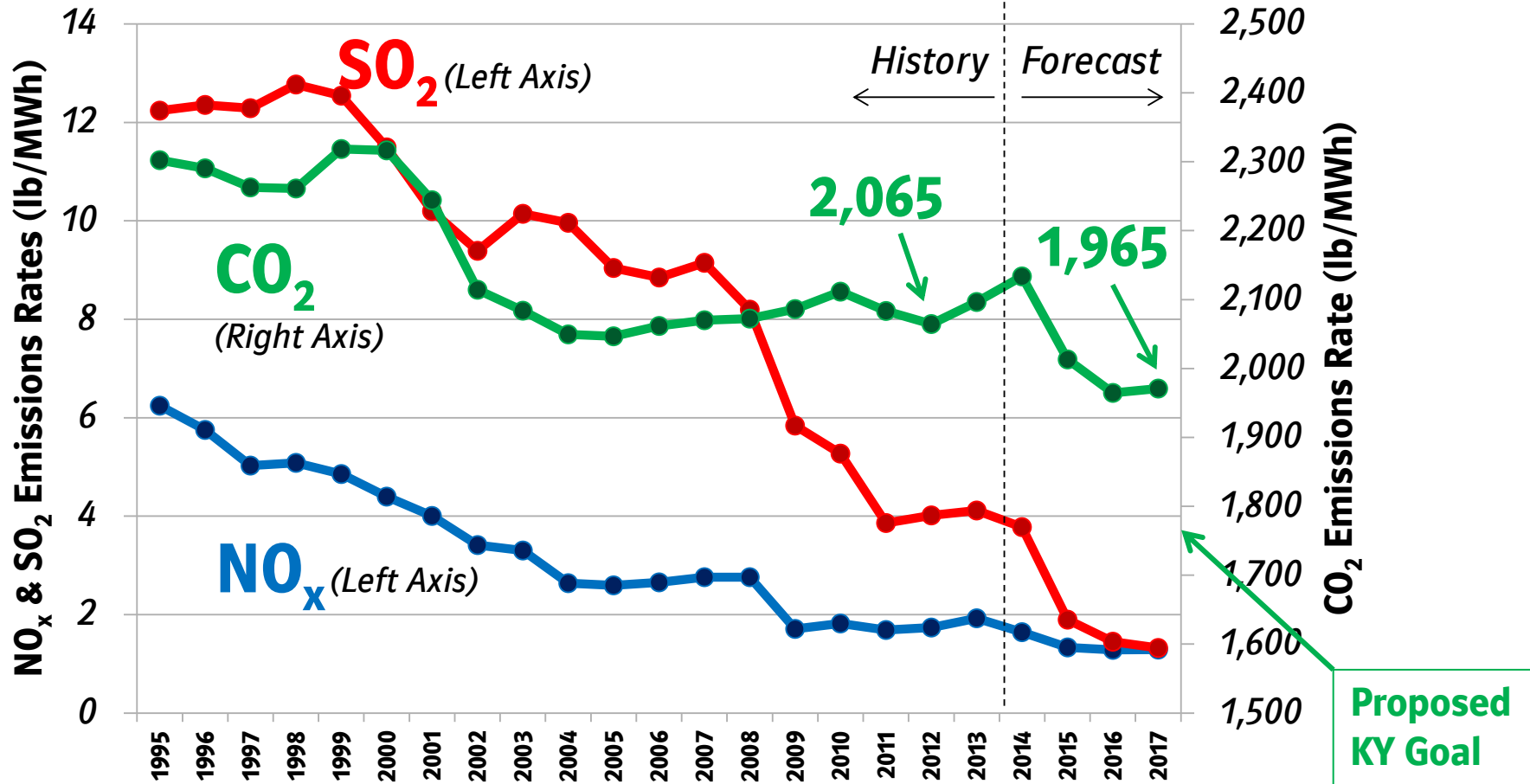
Existing Unit Proposed GHG Regulations

- *State can choose rate or equivalent mass based program*
- *Compliance plans can be for individual state or based on a regional, multi-state option*
- *State Implementation Plan due to EPA by June 2016*
 - *Can request a 1-yr extension for individual state plan*
 - *Or a 2-yr extension for multi-state plan*

Existing Unit Proposed GHG Regulations

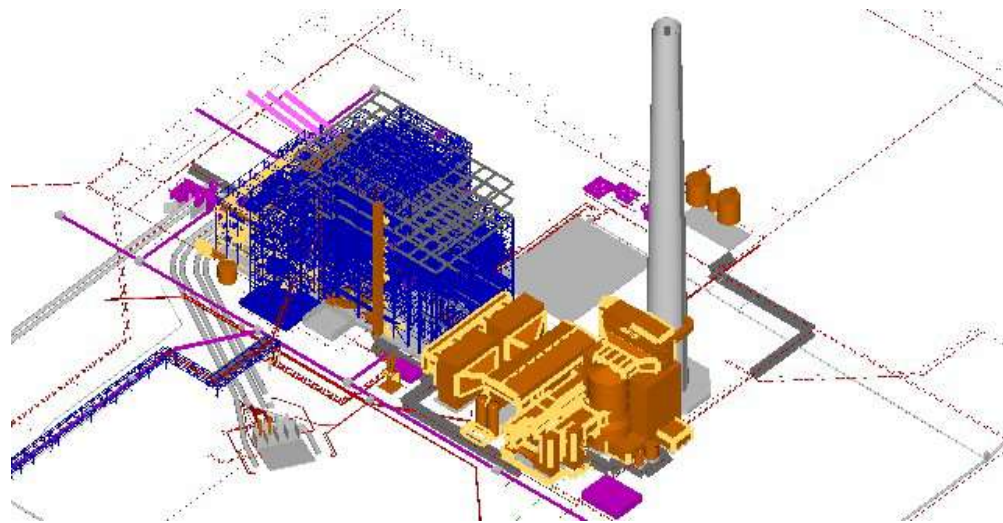
- *EPA must approve all state plans*
- *General criteria for approval*
 - *Enforceable measures*
 - *Emission performance equivalent to or better than state CO₂ goal on the proposed timeline*
 - *Quantifiable and verifiable*
 - *Process for state reporting and implementation of corrective measures*

KU and LG&E continue to reduce emission rates

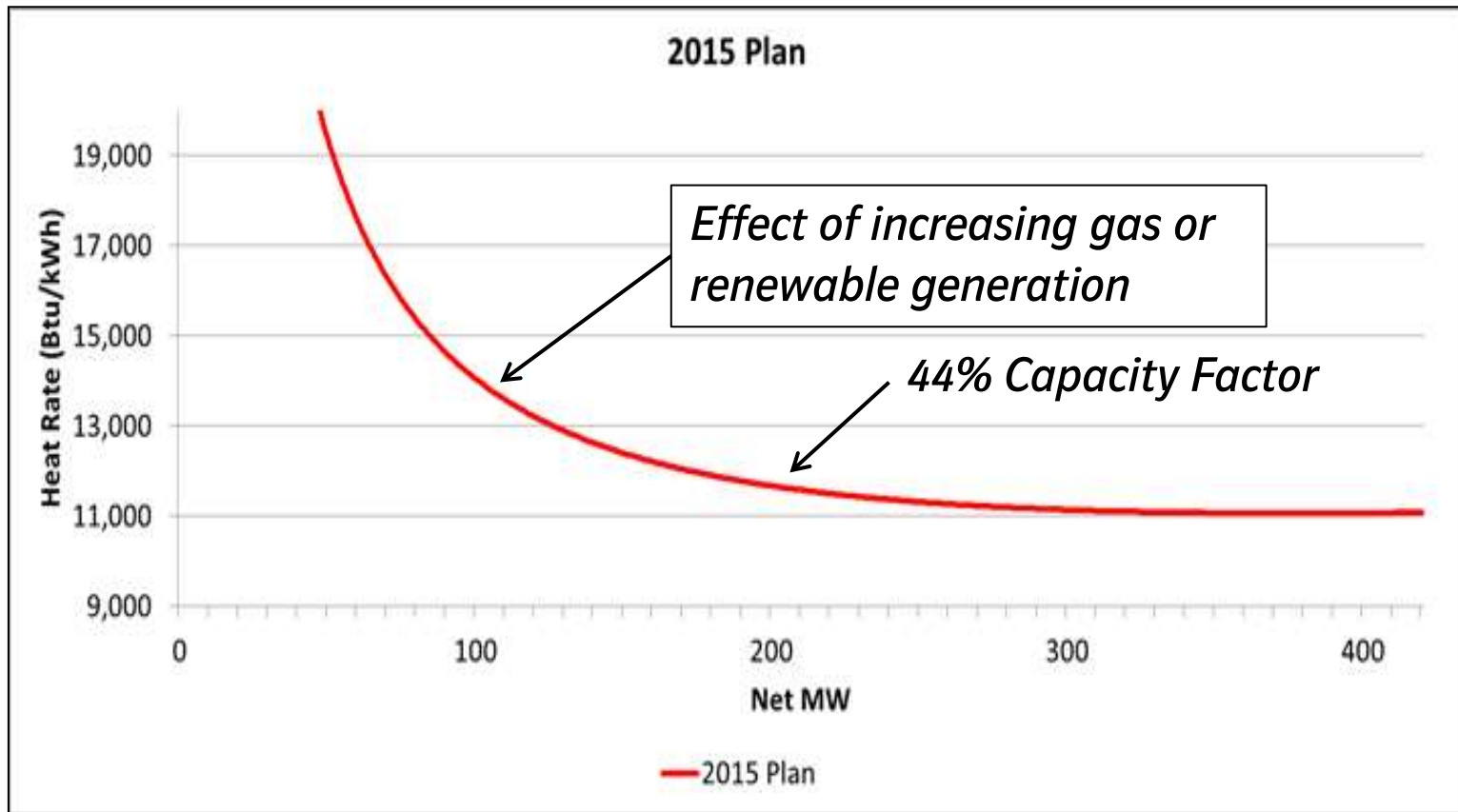


EPA's 6% Plant Heat Rate Efficiency Improvement is Not Achievable

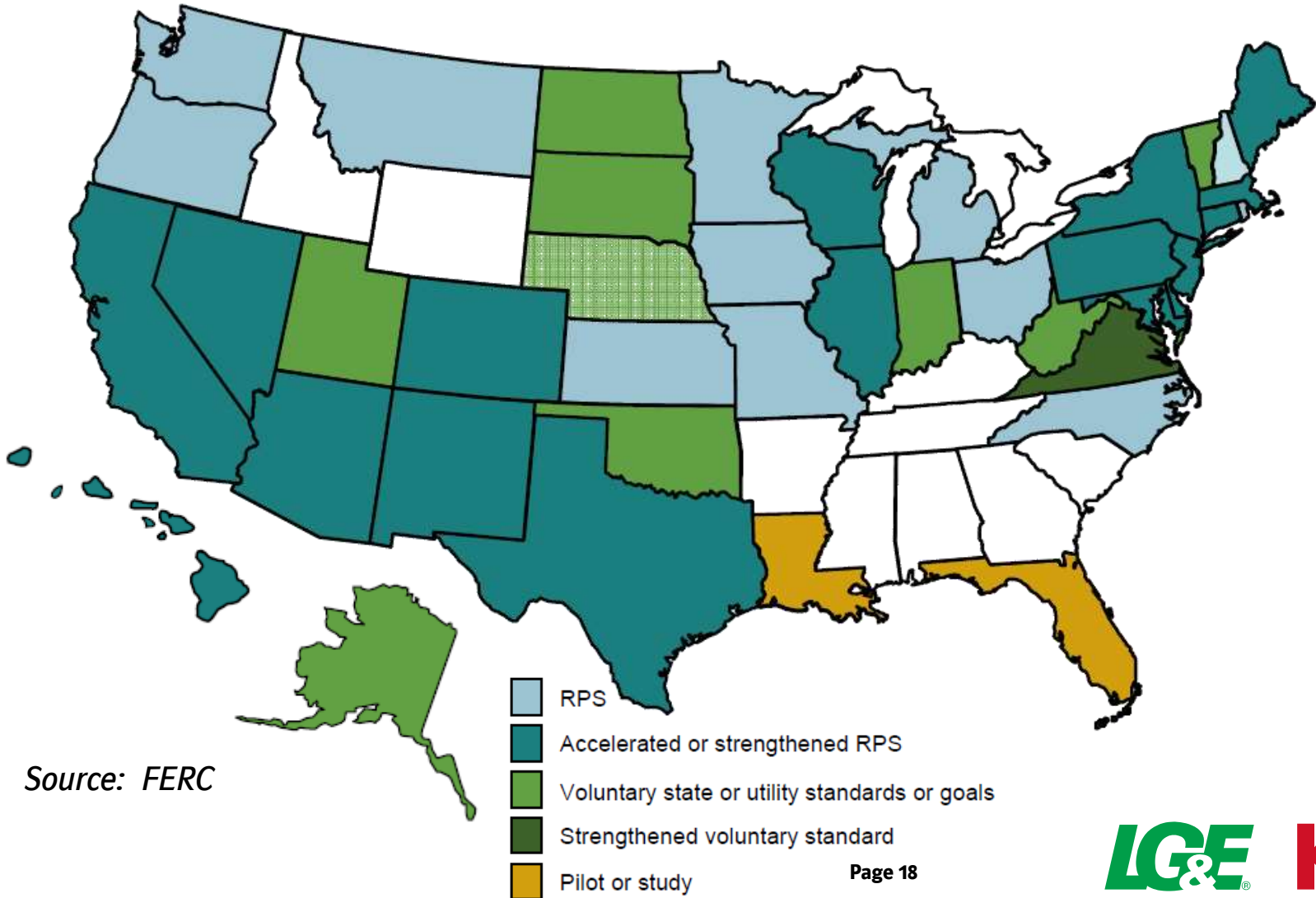
- *Cycle Optimizations may already be deployed*
- *Addition of emission controls cause efficiency losses*
- *Improvements deteriorate between maintenance intervals*
- *Turbine upgrades may trigger New Source Review*



Increasing Dispatch from Gas Units or Renewables Degrades Heat Rate



29 States and D.C. Have RPS Mandates, Kentucky Does Not



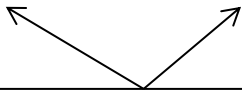
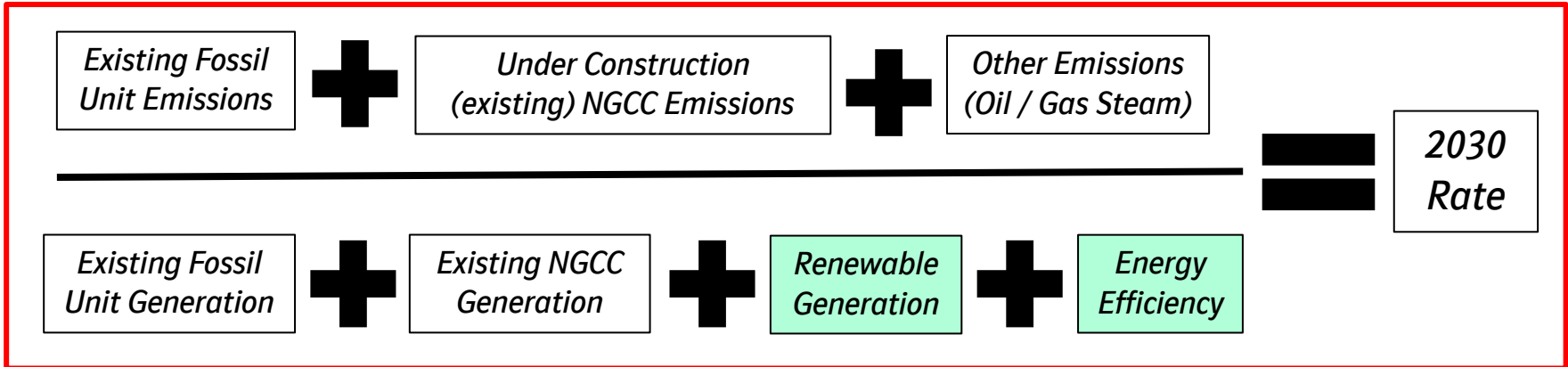
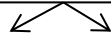
Source: FERC

Energy Efficiency Ramp Rates — Are High Annual Increases Sustainable?

- *EPA's Building Block 4 Goal for Kentucky*
 - *Annual ramp rate of 1.07% per year during 2020-29*
 - *10.7% credited toward the State's goal*
- *Kentucky's 2012 Energy Efficiency Rates from EPA's Technical Support Documents (EIA Form 867)*
 - *0.23% of Total Sales annual increase rate*
 - *1.04% of Total Sales Cumulative performance*
- *LG&E and KU Energy Efficiency Program Rates*
 - *~ 0.5% of Retail and Commercial Sales annual ramp rate*
 - *~ 0.3% of Total Sales annual ramp rate*
 - *~ 2.0% of Total Sales Cumulative performance by 2019*

2030 Goal - Impacting the Calculation

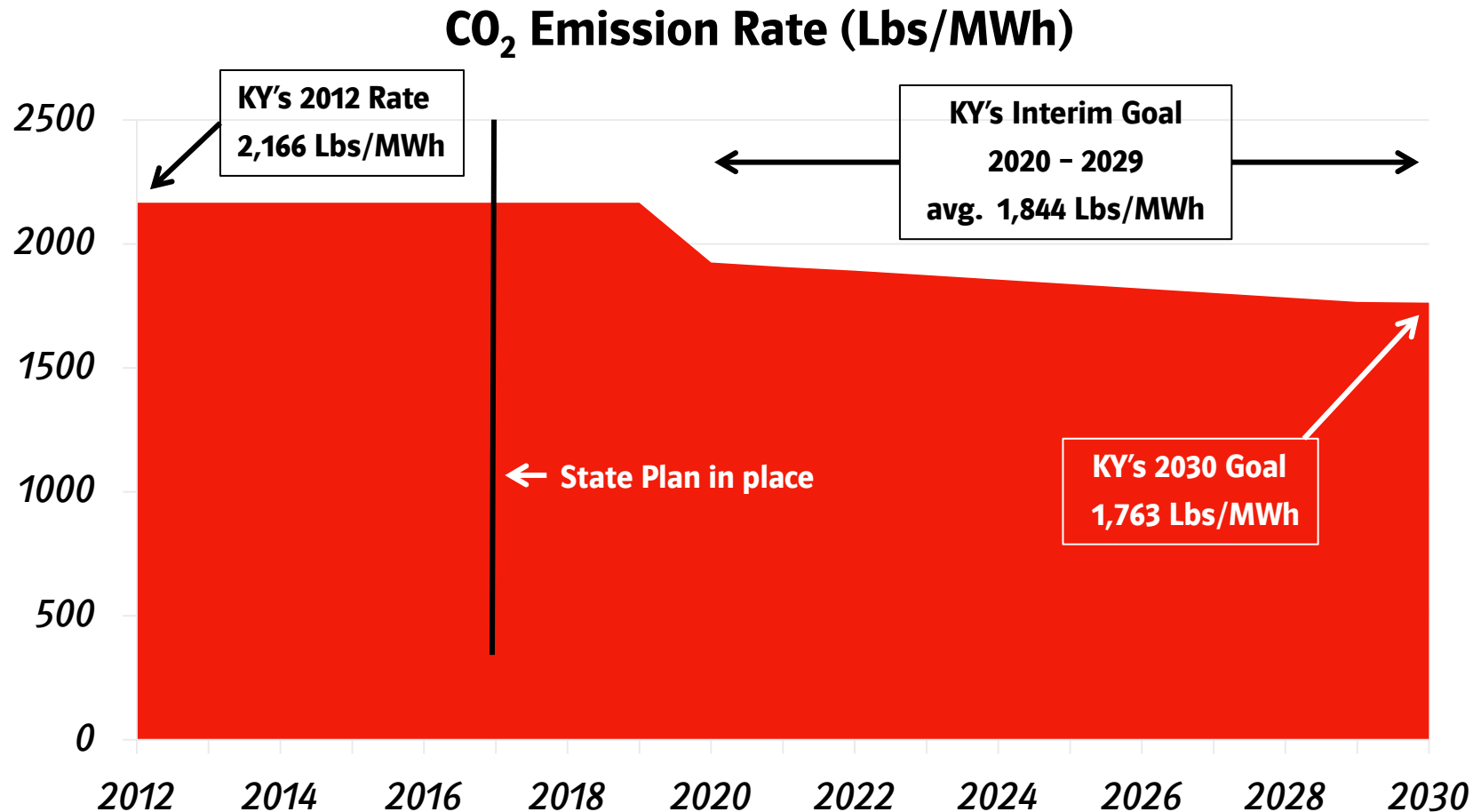
- Heat Rate at 6%?
- Retired Units?
- New NGCC Units?



- Hydro upgrades may not count?
- Retired Units?
- New NGCC units?

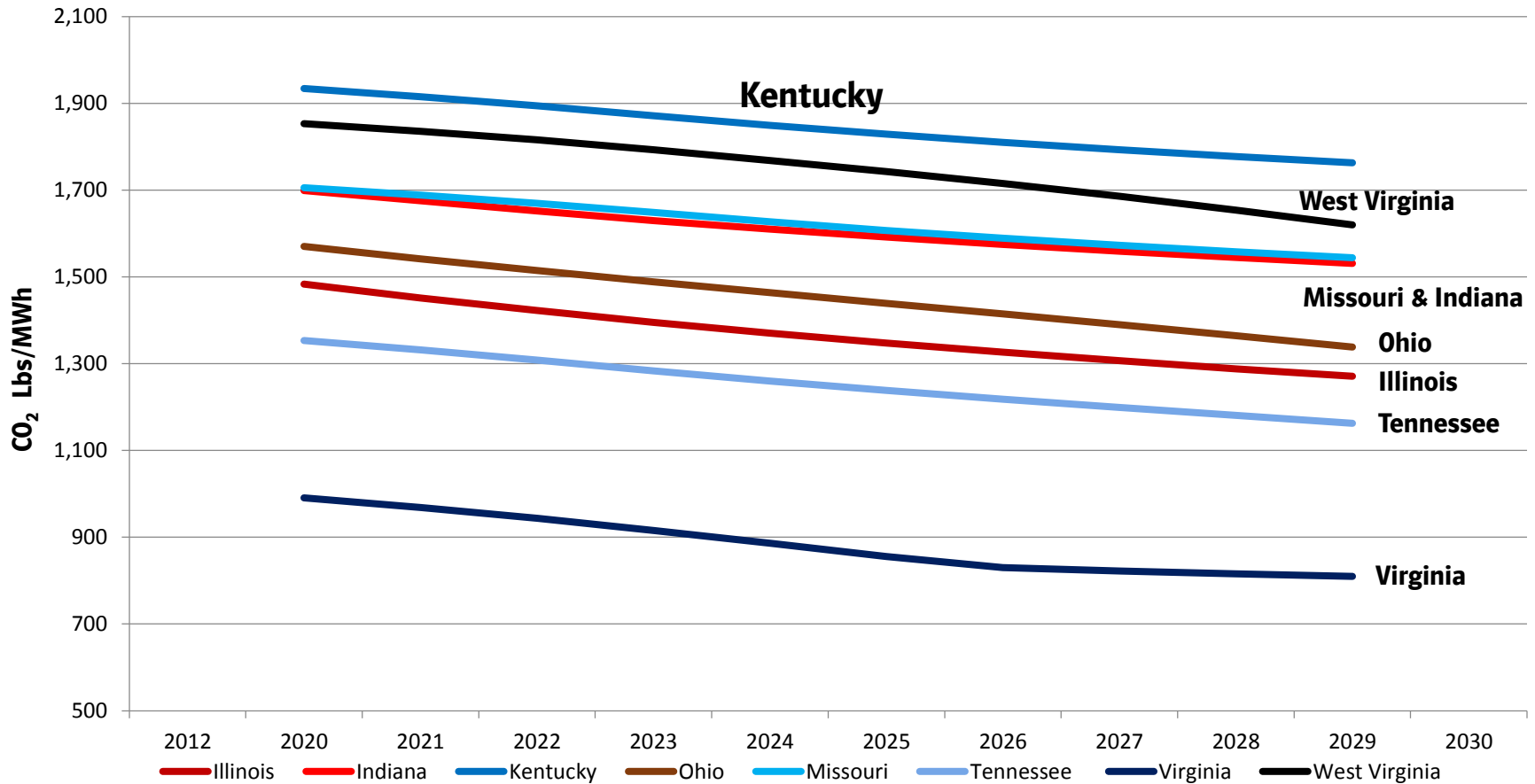
- Achieving EE Annual Increase Rate?
- Treatment of non-jurisdictional utilities?
- Biomass treatment as carbon neutral?
- Out of state Renewable Energy sources?
- Ability to make these blocks federally enforceable via KDAQ processes (e.g. via Title V Permits)?

State Interim Goals: Pace and Timing Not Practical



Individual or Multi-state Regional Plan?

Interim Goal Glide Paths From 2020 to 2030



Existing Unit Proposed GHG Regulations: Issues and Concerns for State Plan

- *Rate vs. Mass based approach*
- *Production or consumption based (Interstate)*
- *Role of new NGCC units*
- *Role of post-2012 and pre-2020 activities*
- *Reaching and Sustaining Energy efficiency annual increases*
- *Individual or multi-state approach*

Existing Unit Proposed GHG Regulations: Issues and Concerns

- *Compliance option limitations posed by HB 388*
- *Enabling legislation may be required*
- *Time too short from State Plan approval to beginning of interim compliance period*
- *Legal challenges are underway*
- *Can Section 111 include "outside the fence" mechanisms?*