Hydropower and the EPA Section 111(d) Proposal

Abridged Version

PREPARED FOR

National Hydropower Association

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Note

This presentation is an abbreviated version of an analysis that The Brattle Group presented to NHA members in a webinar held on August 14, 2014. This presentation is intended for discussion and external distribution.

Overview

- Faced with Congressional inaction, the Administration has proposed to regulate CO_2 emissions using existing authority
  - Section 111(d) for existing sources is a state-level, emission rate focused approach designed for source-level control
  - Not generally compatible with cost-effective CO_2 policy
- The §111(d) proposal attempts to incorporate cost-effective measures into this framework through innovative formulas
  - Redefines "source," "emission rate," and "system of reduction" to set state targets, and allow "outside the fence" compliance options
  - Leaves actual implementation to the states
- The EPA conducted an impact analysis illustrating the price, cost, and CO_2 impacts under an assumed set of state compliance scenarios (although actual implementation approaches will vary more widely)

Overview

Primary Implications for Hydro

- The proposed rule introduces a number of concerns for hydro, which is effectively ignored and thus at a disadvantage compared to other CO_2 abatement options under the rule, *e.g*. coal-to-gas switching, nuclear, and non-hydro renewables
- These asymmetries could be addressed either in the EPA rule or in state implementation plans by:
  1. Establishing existing and new **hydro as a "qualifying" resource** for the purposes of both setting state emissions rate targets, as well as demonstrating compliance, and
  2. Implementing a **mass-based CO_2 allowance trading** approach (or administrative carbon-pricing approach) that uniformly applies a single carbon price for every ton of CO_2 emitted across all CO_2-emitting resource types, across the broadest regional areas possible
- Eliminating these asymmetries would not only benefit hydro, but also increase economic efficiency and move toward meeting the underlying policy objectives at lowest cost

What are the Key Rule Provisions?

On June 2, the EPA under Section 111(d) set CO_2 emissions standards on existing fossil generation units (EGUs)

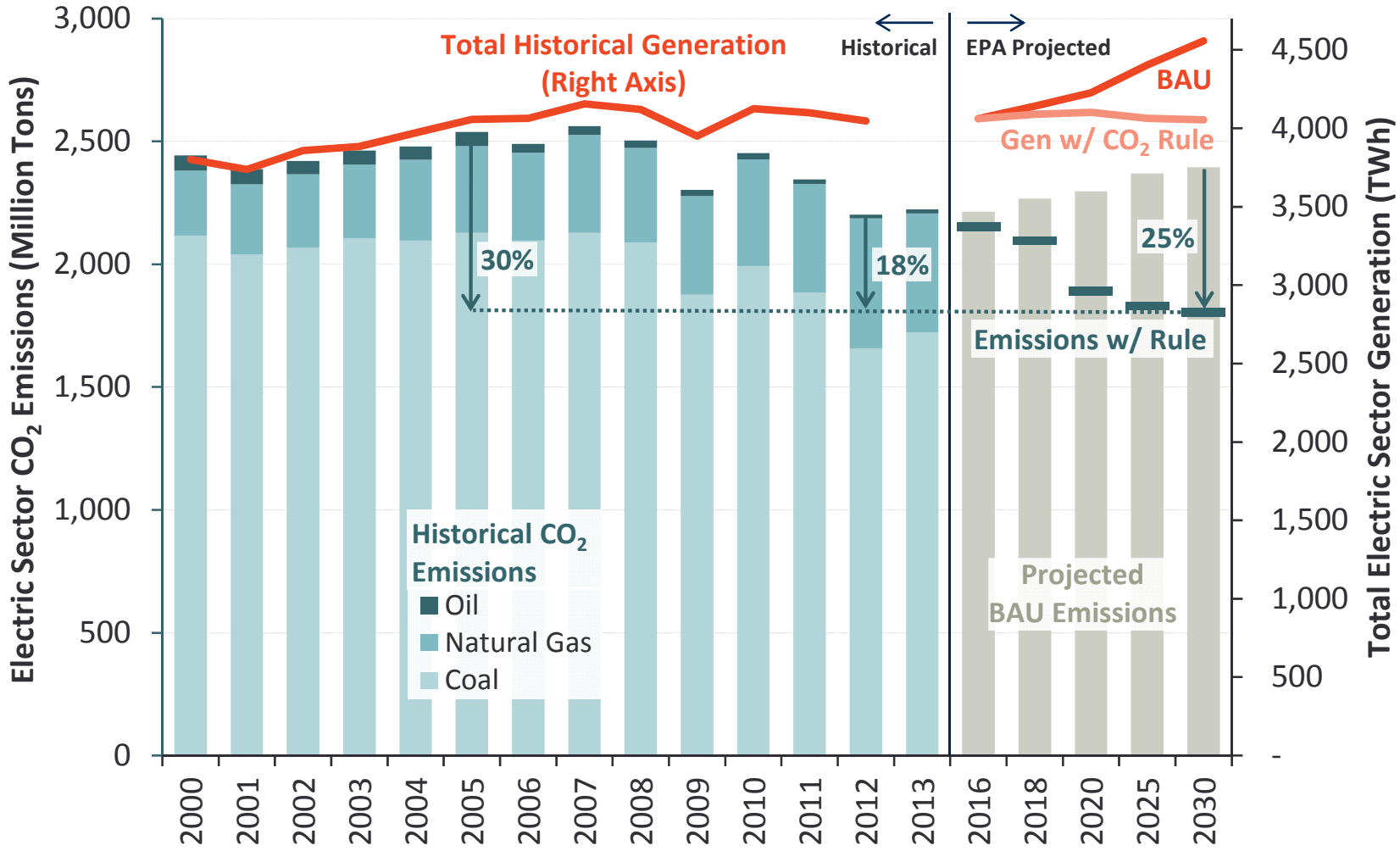
- EPA reviewed existing emissions reductions methods to establish the Best System of Emissions Reduction (BSER)
- BSER is applied to each state's current fossil EGU emissions rate to set state-specific fossil emissions rate standards for 2020 – 2030
- Option 1: interim goal for 2020 – 2029 (to meet on average) and a final goal for 2030 and beyond; EPA is also considering Option 2: less stringent but sets earlier goals over 2020 – 2024 with final goal for 2025 and beyond
- States given flexibility in how to meet the standards

Timeline for Compliance	
2014	Proposed Rule - 120 day comment period by October 16, 2014
2015	Final Rule
2016	Initial report on State Implementation Plans (SIPs)
2017	Final SIPs (for single-state plans)
2018	Final SIPs (for multi-state plans)
2020-30	Compliance period

Rule Provisions

Projected Effect of Standards on Emissions

The proposed standards are designed to bring emissions to 30% below 2005 levels.



Rule Provisions

EPA's Best System of Emissions Reductions (BSER)

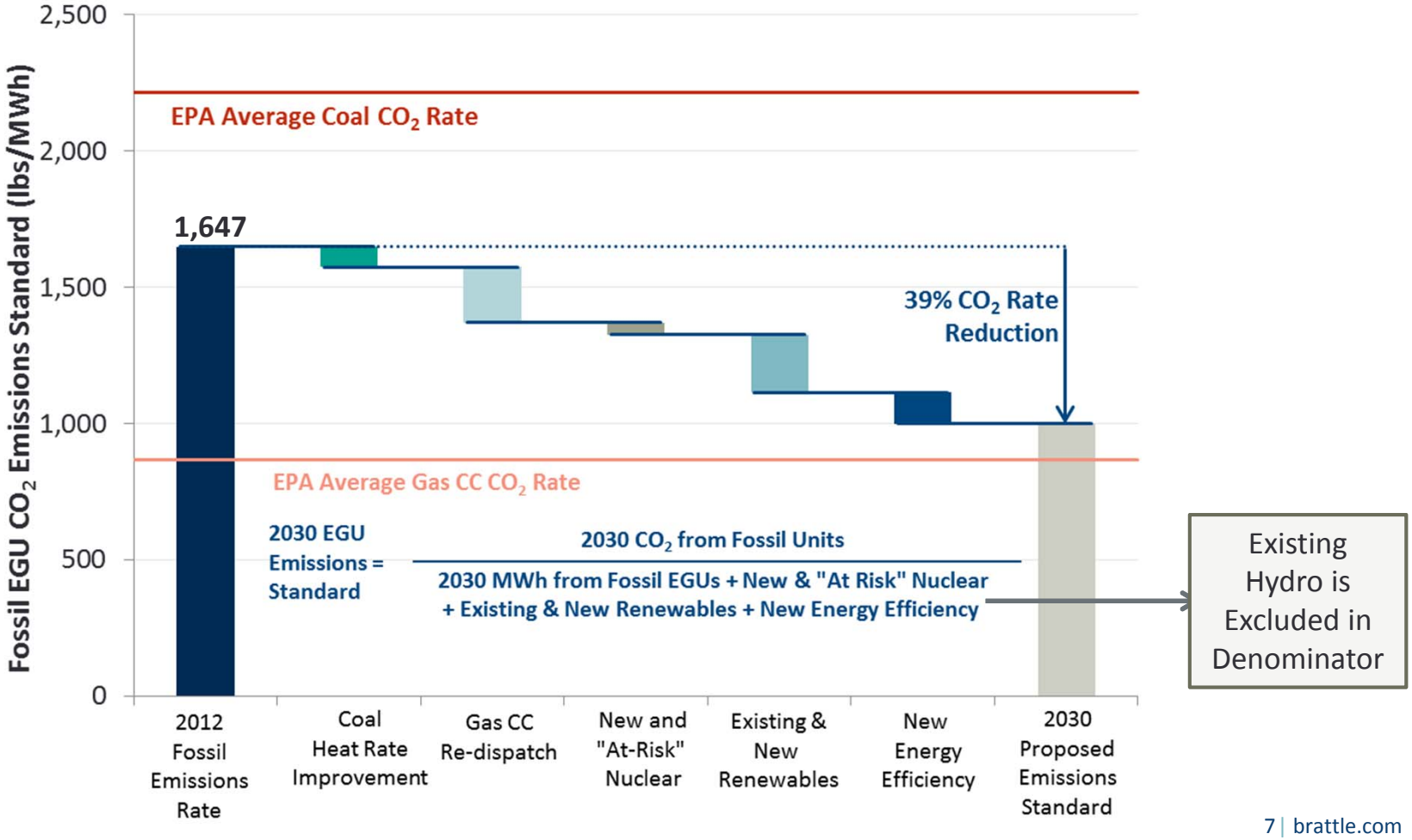
BSER includes four methods of emissions reduction, assessed for feasibility in each state.

BSER Building Block	EPA Basis for BSER Determination	EPA Estimated Average Cost	% of BSER CO_2 Reductions
1. **Increase efficiency of fossil fuel power plants**	EPA reviewed the opportunity for coal-fired plants to improve their heat rates through best practices and equipment upgrades, identified a possible range of 4–12%, and chose 6% as a reasonable estimate. BSER assumes all coal plants increase their efficiency by 6%.	$6–12/ton	12%
2. **Switch to lower-emitting power plants**	EPA determined for re-dispatching gas for coal that the average availability of gas CCs exceeds 85% and that a substantial number of CC units have operated above 70% for extended periods of time, modeled re-dispatch of gas CCs at 65–75%, and determined 70% to be technically feasible. BSER assumes all gas CCs operate up to 70% capacity factor and displace higher-emitting generation (*e.g.* , coal and gas steam units).	$30/ton	31%
3. **Build more low/zero carbon generation**	EPA identified 5 nuclear units currently under construction and estimated that 5.8% of all existing nuclear capacity is "at-risk" based on EIA analysis. BSER assumes the new units and retaining 5.8% of at-risk nuclear capacity will reduce CO_2 emissions by operating at 90% capacity factor.	Under Construction: $0/ton "At-Risk": $12–17/ton	7%
Existing and Potential New Hydro Excluded	EPA developed targets for existing and new renewable penetration in 6 regions based on its review of current RPS mandates, and calculated regional growth factors to achieve the target in 2030. BSER assumes that 2012 renewable generation grows in each state by its regional factor through 2030 (up to a maximum renewable target) to estimate future renewable generation.	$10–40/ton	33%
4. **Use electricity more efficiently**	EPA estimated EE deployment in the 12 leading states achieves annual incremental electricity savings of at least 1.5% each year. BSER assumes that all states increase their current annual savings rate by 0.2% starting in 2017 until reaching a maximum rate of 1.5%, which continues through 2030.	$16–24/ton	18%

Rule Provisions

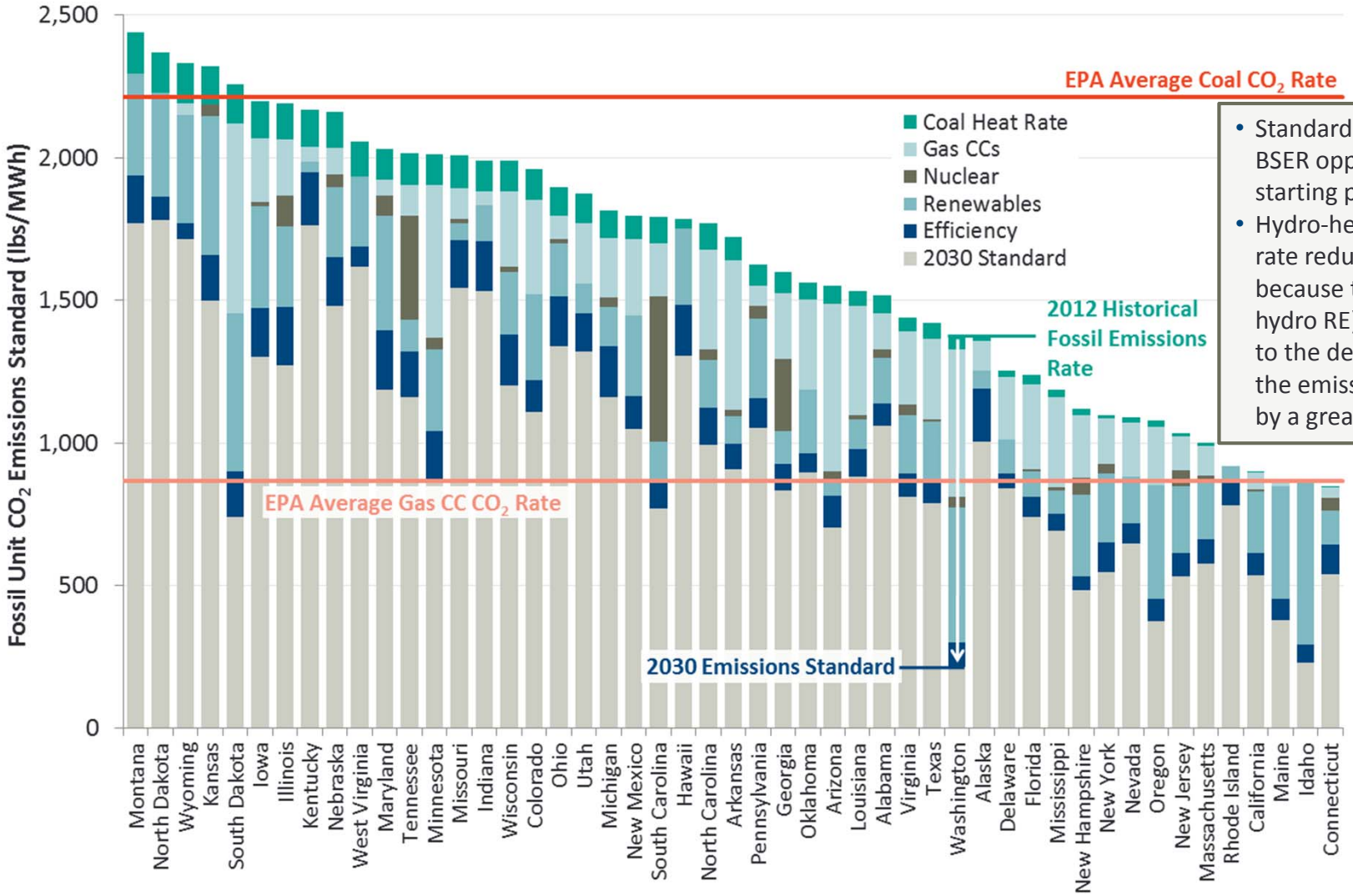
CO_2 Rate Standards on Existing Fossil Units

The EPA standards are not true emission rates for fossil plants, because some BSER elements affect the numerator (emissions) and other, non-fossil CO_2-abatement elements affect the denominator.



Rule Provisions

Fossil Unit Emission Rate Standards by State



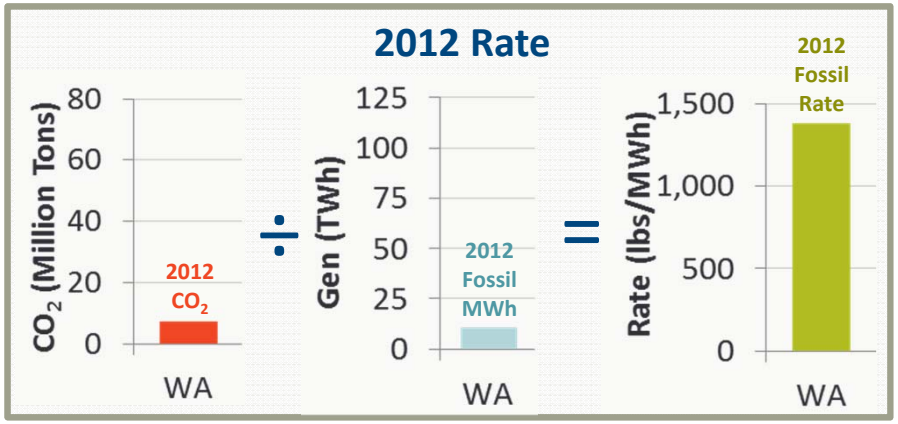
- Standards differ by estimated BSER opportunities and starting points
- Hydro-heavy states have large rate reductions, in part because the same EE (or non-hydro RE) MWh contributions to the denominator reduces the emission "rate" formula by a greater amount

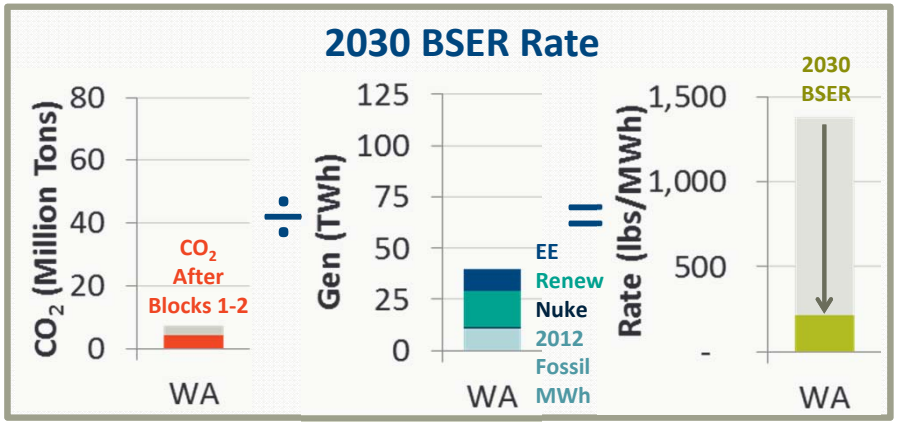
Rule Provisions

Why Rates Drop So Substantially in Hydro States

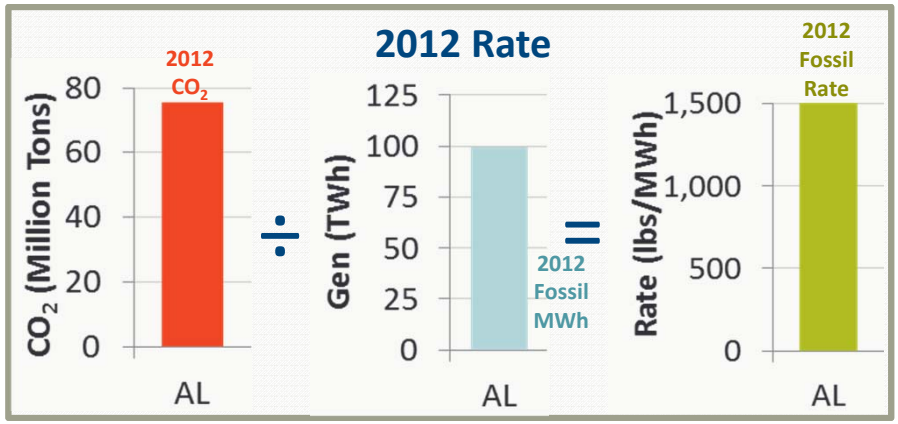
- Compare Washington to Alabama, which have similar 2012 generation and fossil rate
- Hydro states have smaller CO_2 emissions (numerator), but building blocks add similarly-sized efficiency and renewable upgrades (denominator) with bigger effects on the rate

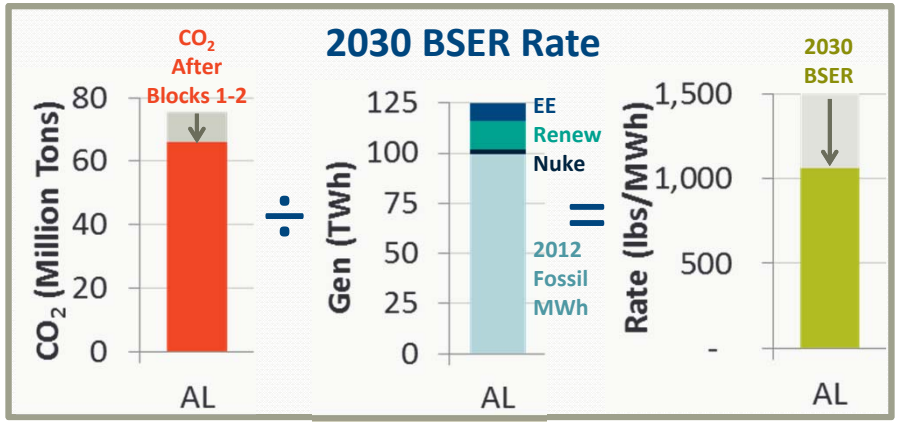
Washington





Alabama





Rule Provisions

Summary of Asymmetries in Hydro Treatment

- Hydro assets are placed at a disadvantage compared to other zero-CO_2 asset types including other renewables and "at-risk" nuclear
- A disadvantage relative to coal-to-gas switching may be an even greater concern if states implement a rate-based compliance approach (but issues can be resolved by comprehensive mass-based CO_2 pricing mechanisms)

Asset Class	Hydro Assets	Other Zero-CO_2 Assets
Existing	• **Excluded** from BSER and compliance (except possibly for a small amount of RPS-eligible hydro, not modeled in IPM)	• Other existing renewables **included** for both BSER and compliance
Existing but "At Risk" for Retirement	• Hydro is **excluded** from BSER	• 5.8% of Nuclear considered "at risk" **included** in BSER
New	• Hydro potential **excluded** from BSER (except as counted in states' current RPS targets) • New hydro may count toward compliance depending on state implementation	• Renewable potential **included** for BSER and compliance

What Impacts does the EPA Project?

- As with every new proposed rule, the EPA has conducted a Regulatory Impact Analysis (RIA), using their Integrated Planning Model (IPM) to project the potential rule impacts
- Interpretation of results requires understanding of key model input assumptions:
  - EPA assumes a particular state implementation approach (rate-based, with two scenarios showing with or without regional cooperation)
  - BSER level of energy efficiency is an input assumption (effect is to eliminate load growth)
  - **Hydro generation remains the same (does not consider new build nor hydro at risk for retirement)**
- Acknowledging these caveats, we summarize here EPA's projections regarding primary metrics of interest for hydro (prices, new builds, retirements, etc.)

EPA's Projected Impacts

2030 Fleet Capacity and Generation Mix

- IPM builds no hydro (by assumption)
- Even though non-hydro renewables are 33% of the BSER blocks, IPM projections add only 2% more non-hydro renewables by 2030 vs. BAU
- Assumed energy efficiency and coal-to-gas re-dispatch dominate

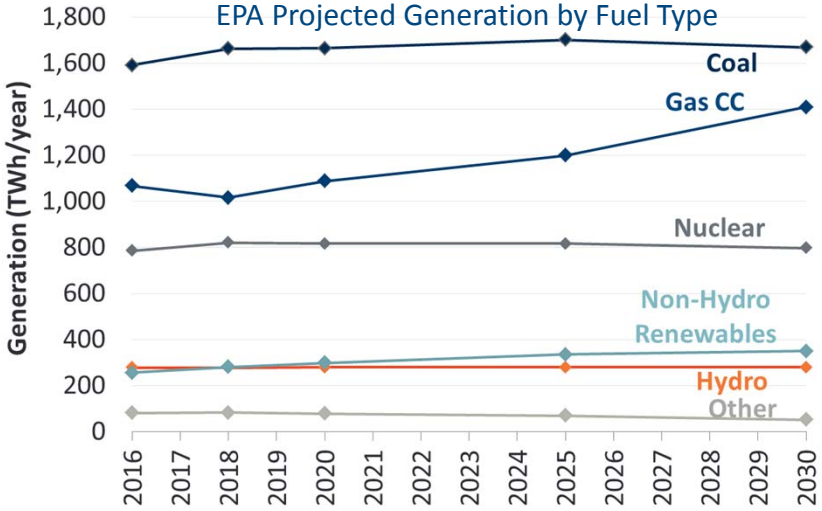
EPA Projected Generation (TWh) by 2030

Generation	BAU (TWh)	Option 1: No Cooperation (TWh)	Change (TWh)
Coal	1,668	1,216	(452)
Gas CC	1,409	1,345	(64)
Hydro	**280**	**280**	**0**
Non-Hydro RE	350	356	6
Nuclear	797	797	0
Others	52	57	5
Total	**4,557**	**4,051**	**(506)**

Source: EPA IPM

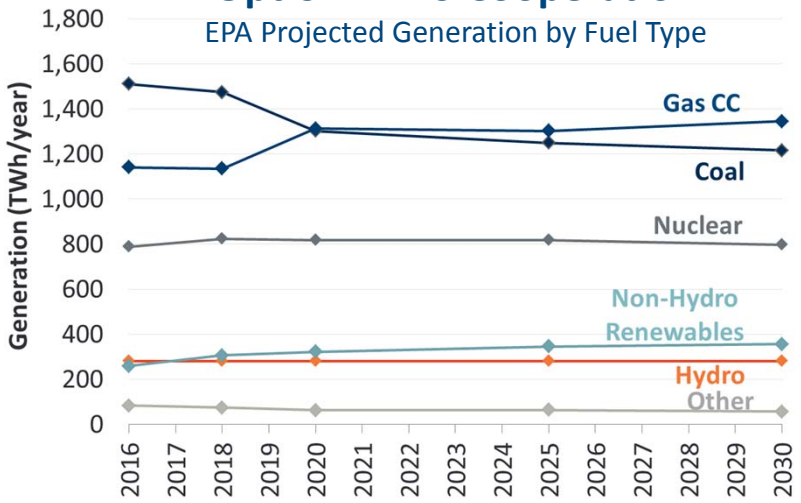
Business as Usual

EPA Projected Generation by Fuel Type



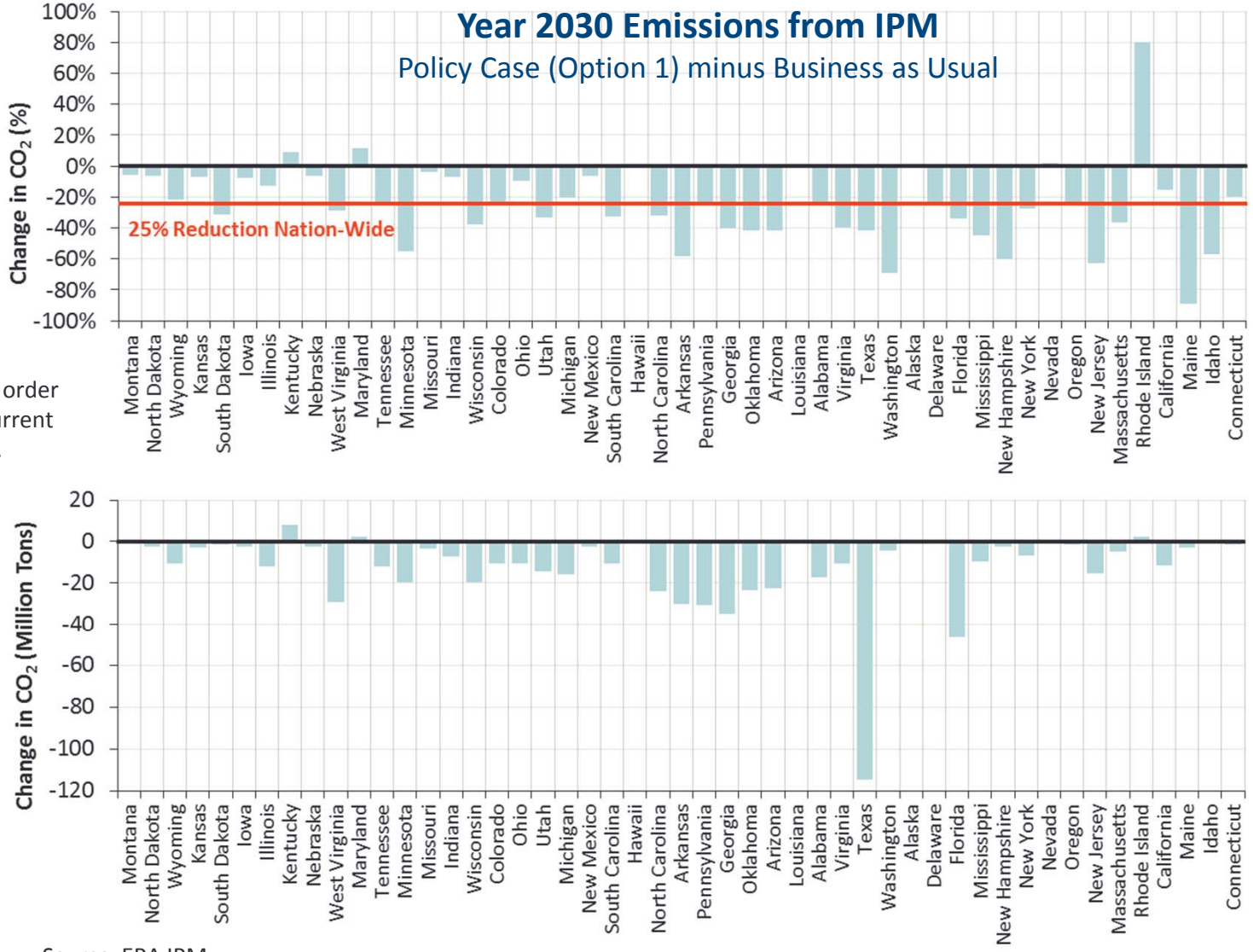
Option 1: No Cooperation

EPA Projected Generation by Fuel Type



EPA's Projected Impacts

Projected 2030 Emissions Reductions

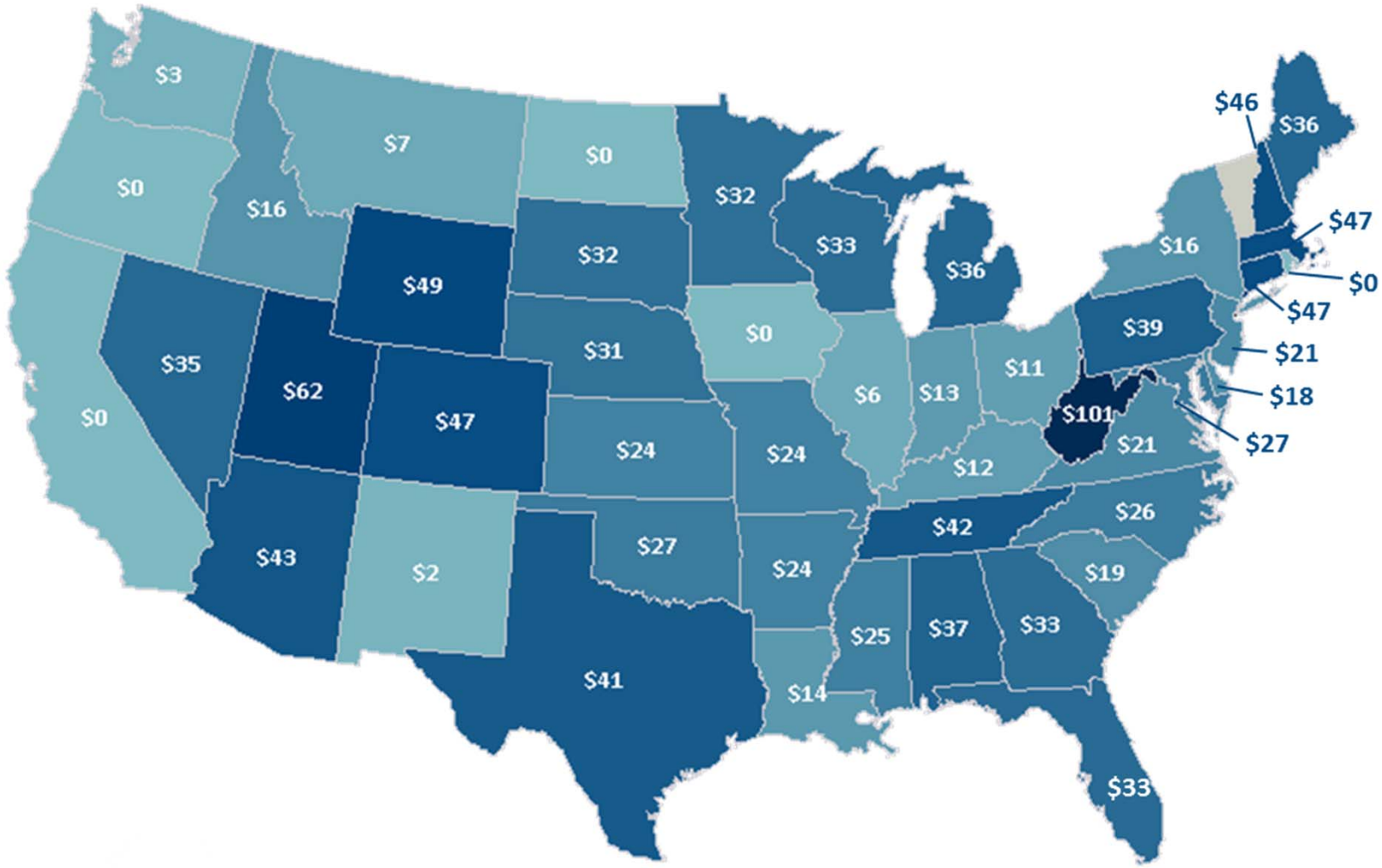


States listed in order of declining current emission rates.

Source: EPA IPM

EPA's Projected Impacts

EPA Indicative CO_2 Prices (No Cooperation)



Sources and Notes:

EPA IPM Option 1, No Cooperation scenario. Values reflect "shadow prices" on emissions rate constraint, expressed in $/ton of CO_2.

EPA's Projected Impacts

Implications of EPA Projections for Hydro

- Aside from energy efficiency (which is an IPM input assumption), EPA projects that by far the largest CO_2 abatement option selected will be coal-to-gas switching (including coal retirements)

- EPA projects only very small increases in renewable power by 2030:
  - Assumes no change to states' RPS in response to 111(d), however IPM accelerates most non-hydro renewable builds into 2017-2020 timeframe
  - IPM shows that new renewables are not cost-competitive with coal-to-gas switching under rate-based implementation in 2020-2030 timeframe

- Most important observation is the potentially counter-intuitive result that wholesale energy prices go down somewhat under rate-based compliance:
  - Existing gas units get paid for creating CO_2 offsets if they produce power at a CO_2 rate lower than the state-wide emission standard (lowering offer prices)
  - Puts existing gas units at an advantage compared to zero-emitting supply types (and even new gas)
  - Incentives for retaining at-risk hydro and nuclear decline, although nuclear risk is addressed in BSER