EPA's Clean Power Plan

Basics of the Rule, and Implications for Texas

PRESENTED TO

Texas House of Representatives
Environmental Regulation Committee

PRESENTED BY

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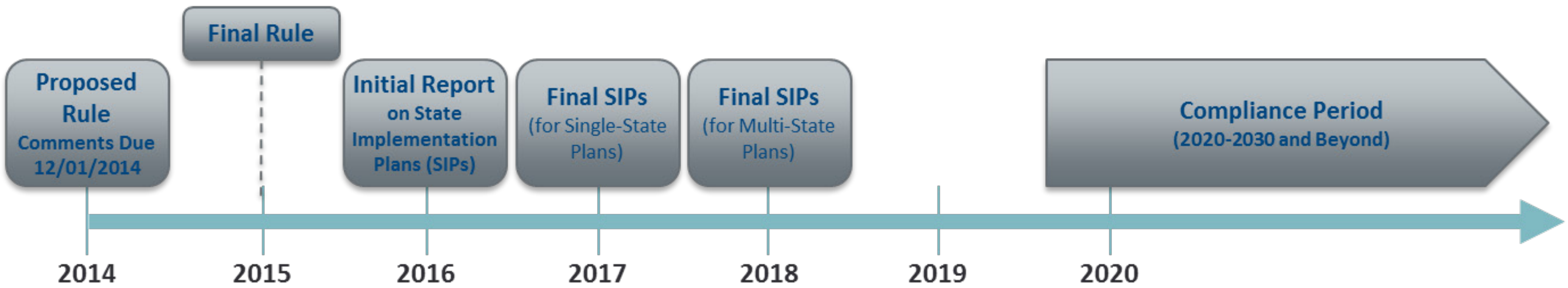
Agenda

- Basics of the Proposed Rule, and the Varying Impact Among States
- EPA's "Building Blocks" for Establishing Texas's Rate
- Compliance Approaches for Minimizing Texas's Costs and Risks

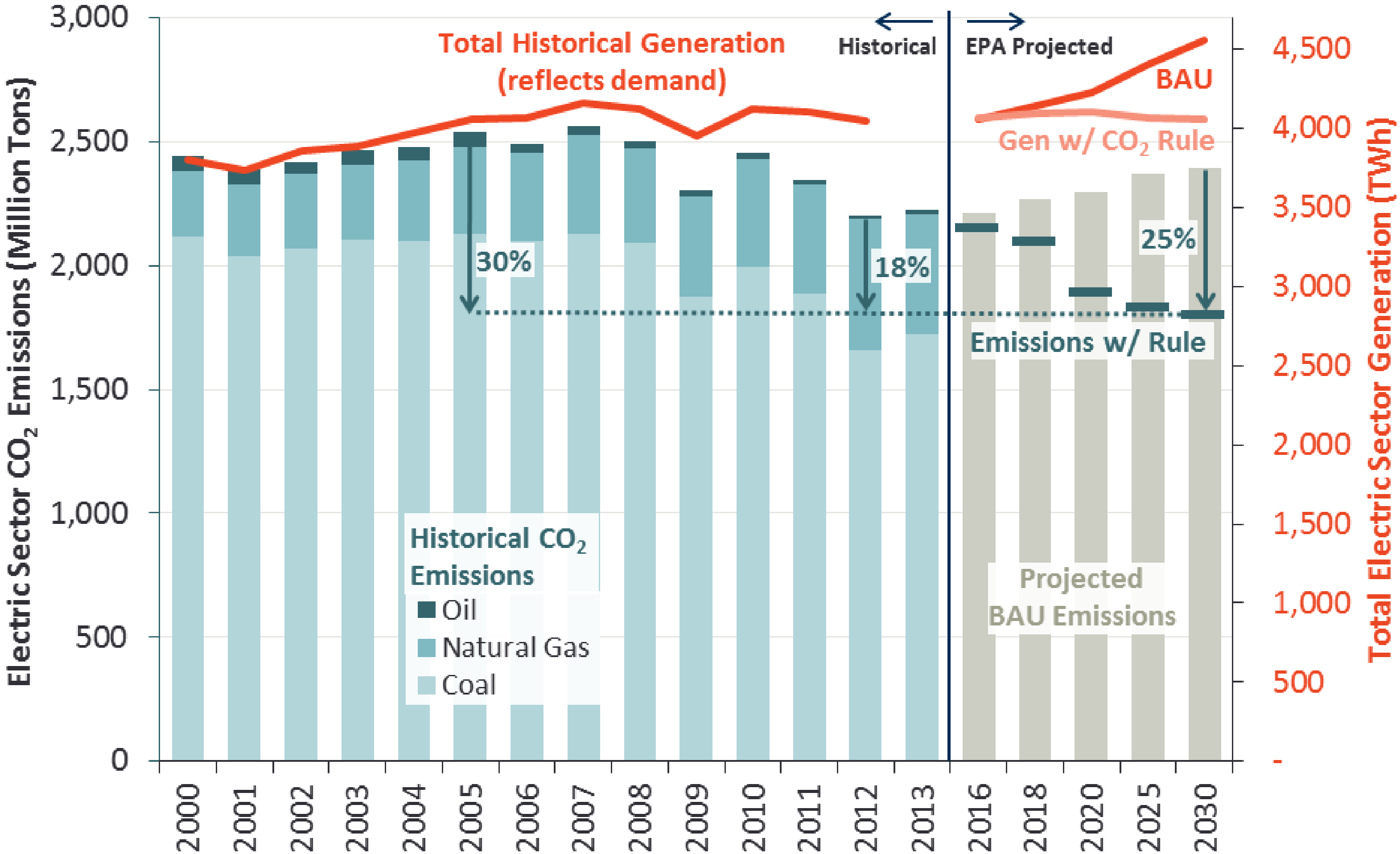
Clean Power Plan Overview and Timeline

- **On June 2, the EPA under Section 111(d) set CO_2 emissions standards on existing fossil generation units**
  - 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 2020-30
  - Option 1: interim goal for 2020-29 (to meet on average); final goal for 2030 and beyond
  - Option 2: less stringent but earlier goals for 2020-24; final goal for 2025 and beyond
  - States given flexibility in how to meet the standards



Projected Effect of Standards on Emissions

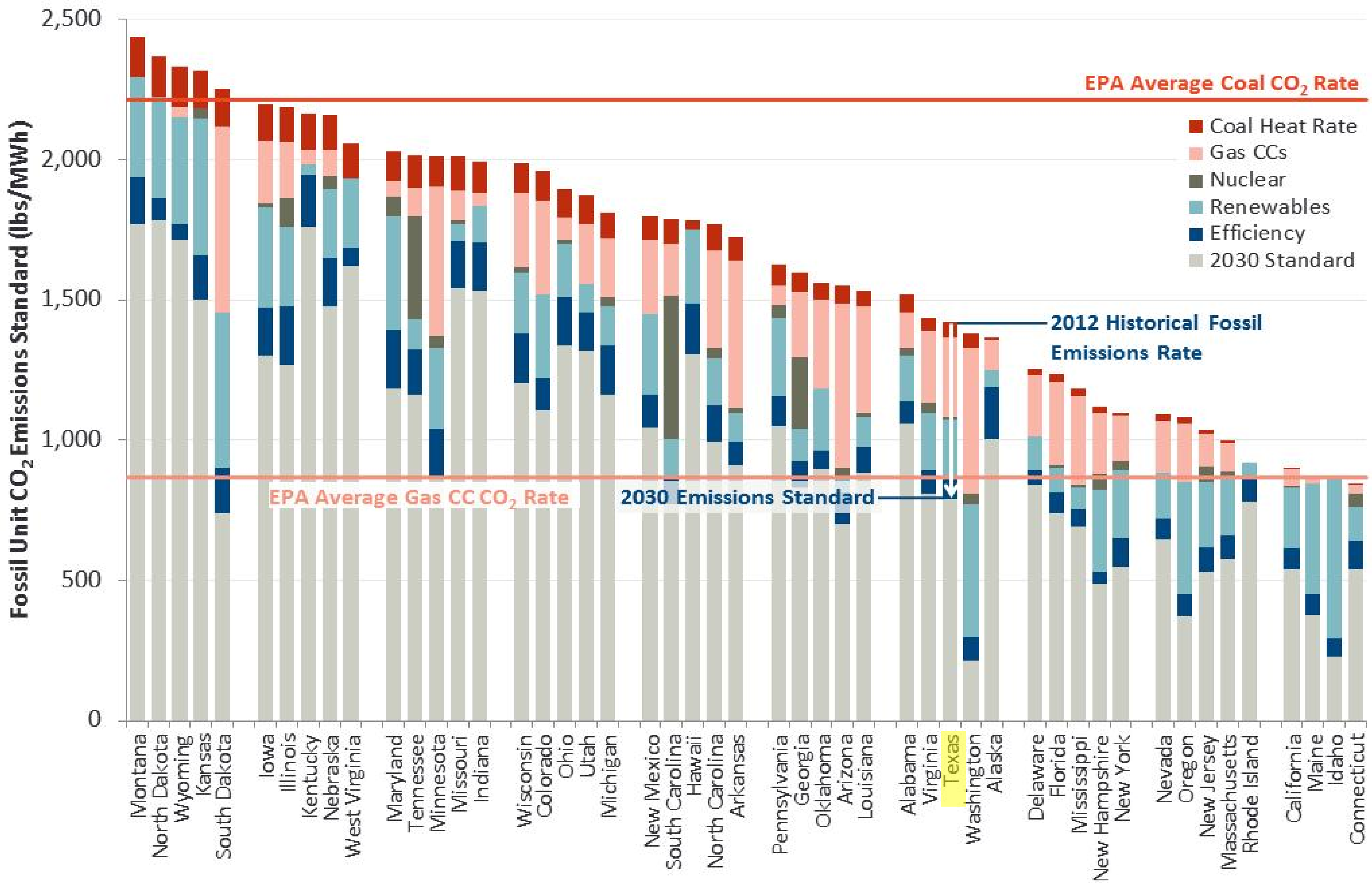
The proposed standards are designed to bring emissions to 30% below 2005 levels



Sources and Notes:
Historical emissions from EPA's CEMS database; historical generation from EIA; Projected generation and CO_2 from EPA's IPM model results, comparing its "Business as Usual" Base Case to its Policy (Option 1 w/o cooperation) scenario.

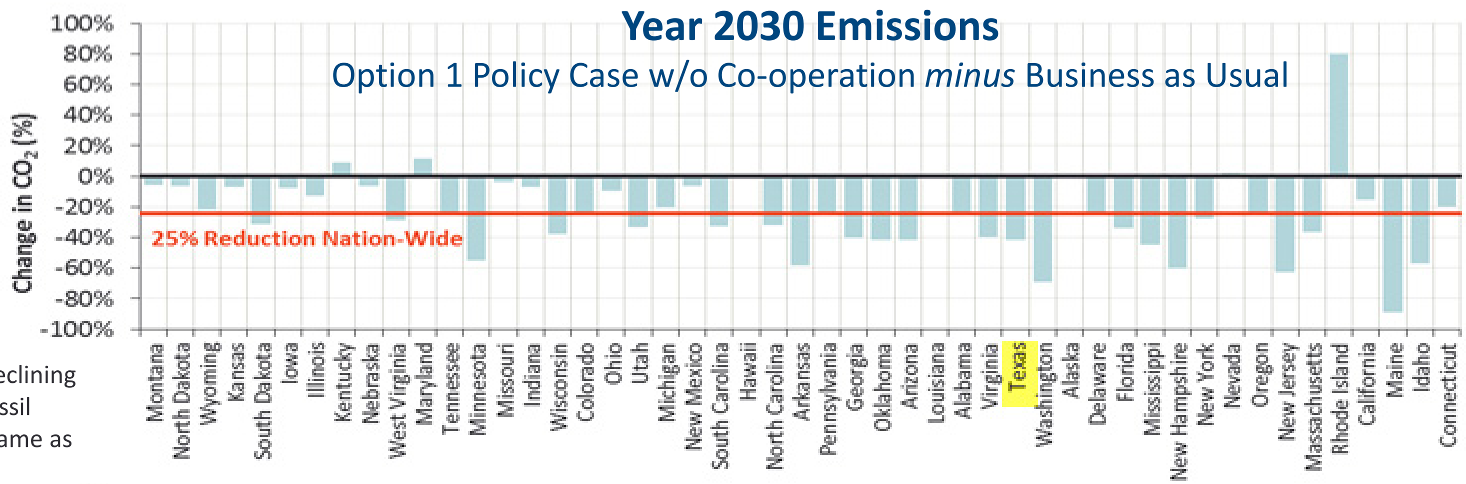
Fossil EGU Emissions Standards, by State

State standards vary considerably relative to current fossil emission levels, due to differences in EPA's perceived emissions reduction opportunities in each state

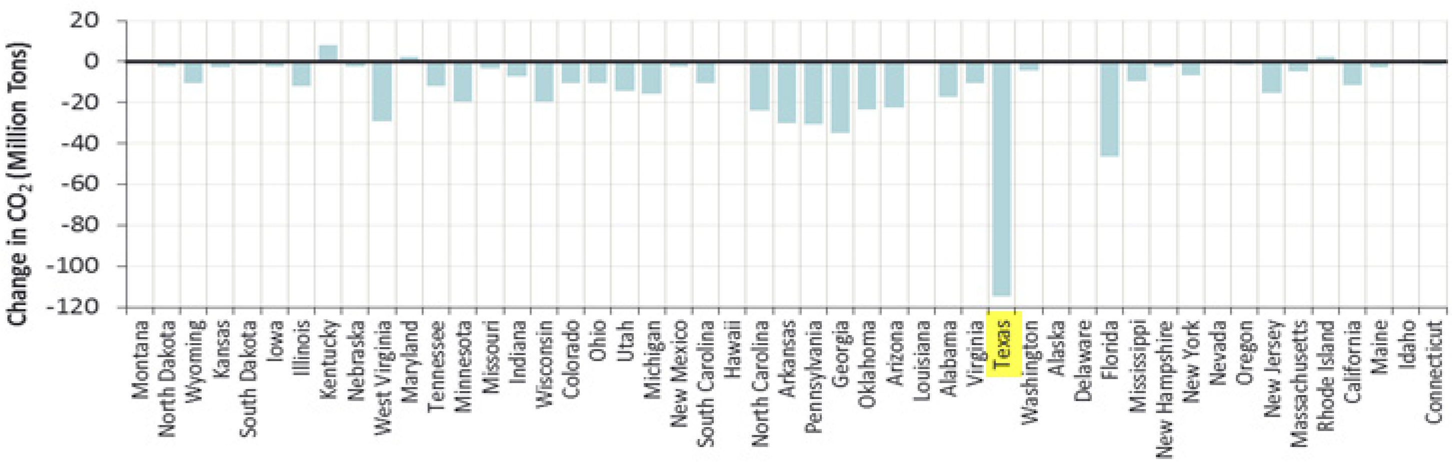


Sources and Notes:
Reflects Option 1 final rate for year 2030 (and beyond) from EPA Technical Support Document: Goal Computation, Appendix 1.

EPA's Projected 2030 Emissions Reductions



States listed in declining order of 2012 fossil emission rates (same as prior slide)



Texas accounts for 11.3% of national emissions in EPA's 2030 Base Case, but accounts for 19.0% of national CO_2 *reductions* in EPA's analysis of its rule

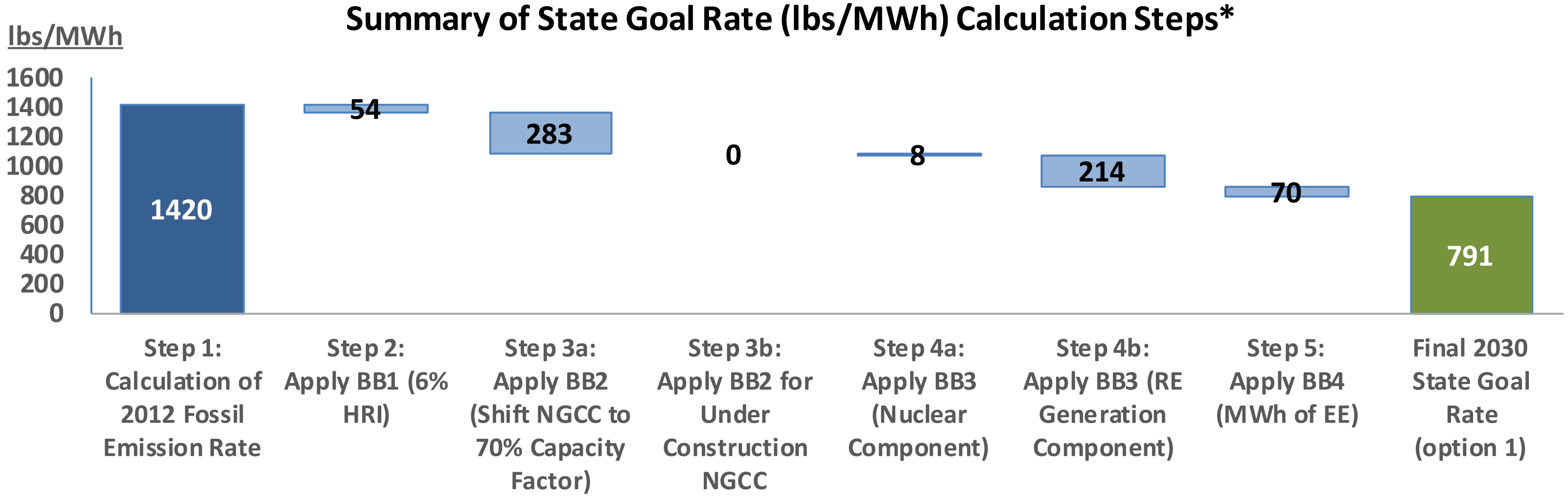
Sources and Notes:
EPA Technical Support Documentation, GHG Abatement
Reflects differences in state emissions from EPA IPM model results, comparing its Policy (Option 1 w/o cooperation) scenario to its "Business as Usual" Base Case .

The Building Blocks of Texas's Rate Limit

EPA "Building Block" Process for Setting Texas's Emission Rate Target
(although compliance would not have to follow these building blocks)

Building Block 1 (step 2)	Improve the heat rate at existing coal units 6% to reduce the emission rate from 2,239 lbs/MWh to 2,104 lbs/MWh
Building Block 2 (steps 3a and 3b)	Shift generation from fossil-fired boilers to NGCC units up to a 70% capacity factor, increasing NGCC generation from 148,010 GWh to 230,873 GWh
Building Block 3 (steps 4a and 4b)	Increase generation from renewable sources from 34,017 GWh in 2012 to 85,963 GWh in 2030. Incentivize preservation of 2,291 GWh of generation (~5.8%) from historic nuclear fleet
Building Block 4 (step 5)	Improve end-use energy efficiency to decrease electricity demand 44,996 GWh, equivalent to avoiding 10.5% of projected electricity sales in 2030

Summary of State Goal Rate (lbs/MWh) Calculation Steps*



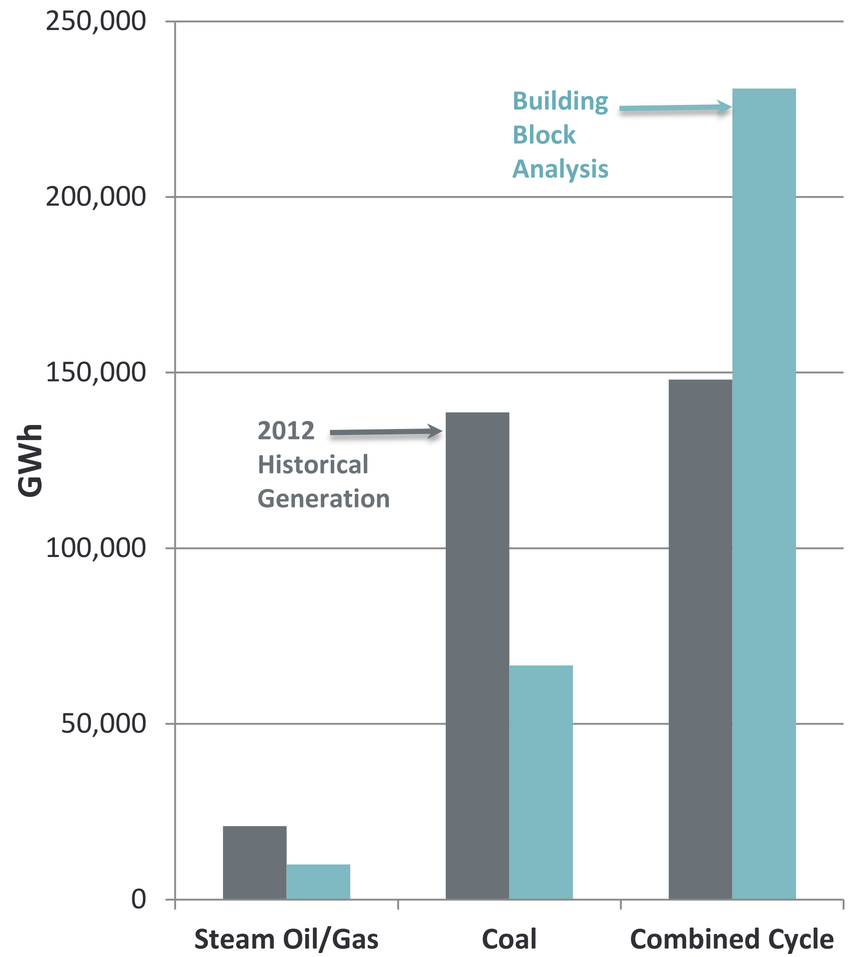
Sources and Notes:
Data Viewer EPA Proposed Clean Power Plan, State 2030 Goal Calculation: Texas.

Coal to Gas Switching Targets for Texas

Shifting from coal to gas-fired combined cycle (CC) generation is the largest "building block"

- The EPA assumes CCs increase to 70% capacity factor, displacing more than half of coal generation
- This effects such a large "rate" reduction because Texas has more coal generation and low-utilization CCs than most states
- This level of coal-to-gas switching is achievable, but will likely drive many coal plants to retire: the EPA's simulation analysis estimates 11,700 MW coal would retire in Texas by 2020
- This much retirement could threaten resource adequacy if many plants retired nearly simultaneously
  - With an interim (2020-29) average target so close to the 2030 target, most emissions reductions have to happen in the early 2020s under Option 1
  - But energy peak price feedbacks make mass exodus unlikely even if run hours are sharply reduced
  - However, if even half of 12 GW retired over a few years, reserve margins (and reliability) could be quite volatile since CC developers cannot accurately predict retirements

Building Block Analysis of Coal to Gas Switching



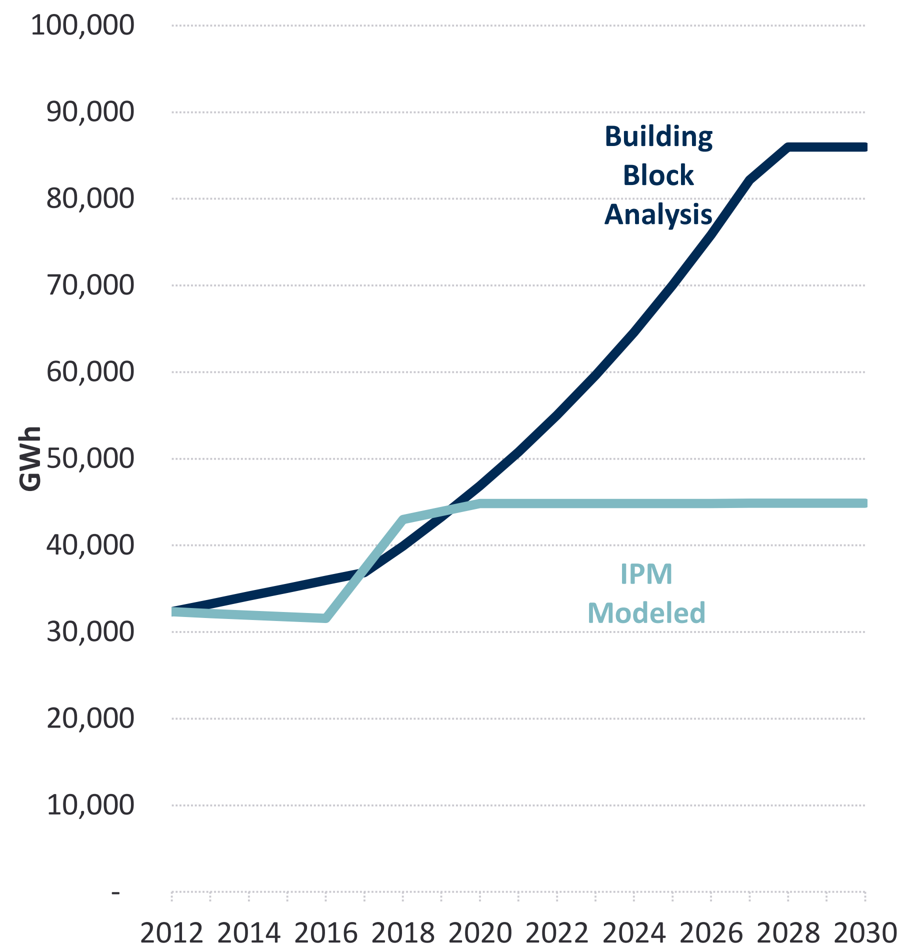
Source: EPA Technical Support Documentation, State Goal Computation Data

Renewable Energy Targets for Texas

EPA's Building Blocks assumes Texas renewable generation increases 153%

- Target is for 20% of Texas's generation to be renewable (based on Kansas's 20% capacity RPS), compared with 8.3% in 2013
- Assumes bigger increase in Texas than in most other states:
  - 20% endpoint is higher than the national average of 13% (but also has better wind)
  - The 153% increase is only slightly higher than the national average, but it's applied to Texas's high existing base
- This level of renewable penetration could create operational reliability challenges and possibly put some pressure on resource adequacy
- But EPA's simulation analysis suggests that Texas will achieve compliance with far less renewable energy generation, favoring greater coal-to-gas switching

Texas Renewable Energy Generation

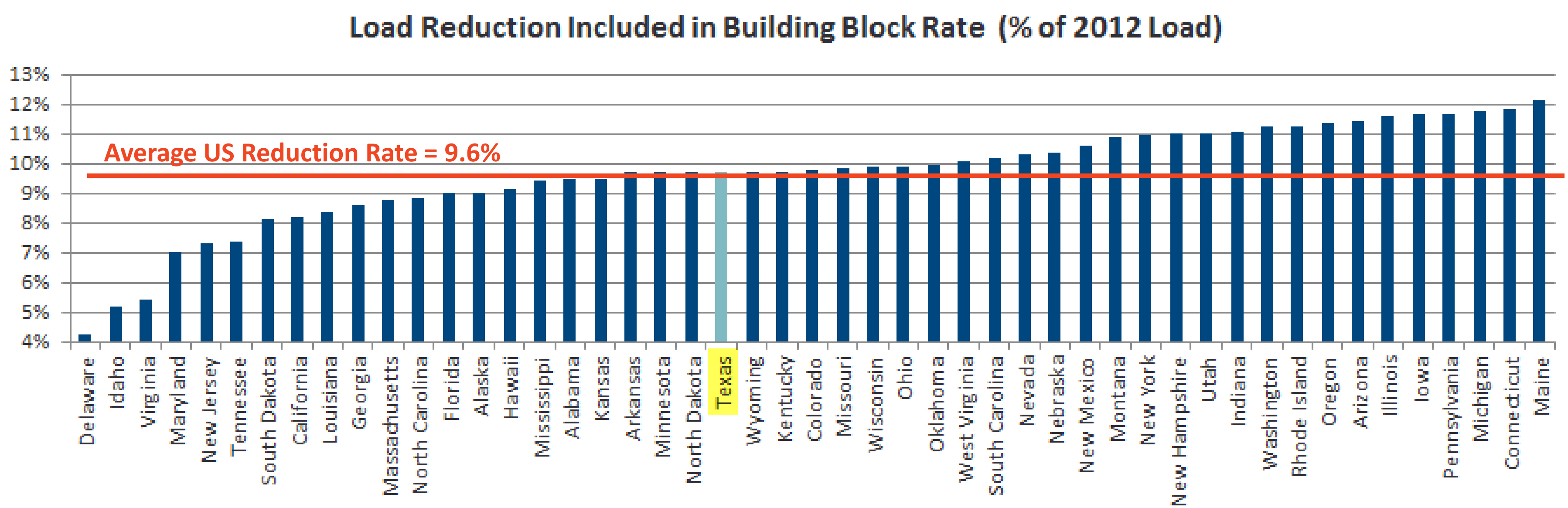


Source: EPA Technical Support Documentation, GHG Abatement

Texas Energy Efficiency Goal

The EPA Building Block Analysis assumes Texas can achieve 0.18% energy efficiency savings in 2017, increasing to 1.50% per year by 2024 and beyond

- This translates into a 9.7% assumed reduction in load
- The energy efficiency target for Texas is in line with other states
- Since Texas has historically implemented less energy efficiency programs than other states, achieving its target could be relatively easy and affordable compared to other states that have already gotten the "low-hanging fruit"



Source: EPA Technical Support Documentation, GHG Abatement Measures Scenario 1

Ways for Texas to Reduce Compliance Costs/Risks (1)

- The EPA will allow states flexibility to use any physical measures or allowance trading that achieves their target rates
- Start with state goals on energy efficiency (EE) and maybe renewable energy
  - Adding EE and renewables is important for compliance, since Texas's "rate" target is below that of a gas plant, so every MWh of continued coal generation requires 2 MWh of EE or renewable generation; the more EE and renewables, the less impact on the coal fleet
  - Aggressive EE programs likely offer relatively low-cost compliance, with many measures being cost effective even without the rule (but facing barriers that programs can overcome)
  - Consider a substantial renewable energy requirement within technical achievability, or leave it to the market under a market-based compliance approach
- Use market-based approaches to allow the market to find the least cost solutions (see next slide)

Ways for Texas to Reduce Compliance Costs/Risks (2)

- Consider implementing a mass-based CO_2 allowance trading program
  - Mass-based trading requires all emitters to use allowances; this adds to wholesale prices and equally rewards all reductions in CO_2 emissions, including new gas and existing nuclear
  - Can use auction proceeds to achieve policy goals (e.g., fund EE programs, offset taxes, or make lump payments back to taxpayers); or allocate some allowances to generators that stay online
  - Alternative rate-based offset trading approach could also work, but harder to harmonize efficiently with other states
- Consider combining with other states if they also implement mass-based allowance trading
  - Could reduce compliance costs, especially if they have a relatively less stringent standard than Texas and/or more low-cost compliance opportunities
  - Establishment of regional cap and agreeing on allowance allocations is quite involved
  - Partner states don't have to be contiguous
- Monitor and address resource adequacy challenges from compliance "cliff"
  - Similar to the resource adequacy issues already being discussed but with additional stress
  - Increasing EE and renewables, and allocating some allowances to generators could reduce and delay retirement pressures

Presenter Information

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Dr. Samuel Newell, a Principal of The Brattle Group, is an economist and engineer with experience in electricity wholesale markets, the transmission system, and RTO/ISO rules. He supports clients throughout the U.S. in regulatory, litigation, and business strategy matters involving wholesale market design, generation asset valuation, transmission development, integrated resource planning, demand response programs, and contract disputes. He has provided testimony before the FERC, state regulatory commissions, and the American Arbitration Association.

Dr. Newell earned a Ph.D. in Technology Management and Policy from MIT, and a M.S. in Materials Science and Engineering from Stanford University. Prior to joining Brattle, Dr. Newell was Director of the Transmission Service at Cambridge Energy Research Associates.

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