

Impact of the Clean Power Plan Annual Energy Outlook 2016 Reference/Alternative Cases



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*by
Thaddeus J. Huetteman, Senior Electricity Analyst*

Key conclusions: variety of potential impacts of Clean Power Plan (CPP) in AEO2016- Reference Case vs. Alternatives

- How the states implement the Clean Power Plan influences its impact on the power sector
- CO2 emission reduction requirements under Clean Power Plan accelerate a shift in generation mix already underway
- Pressure on coal continues even in absence of Clean Power Plan, leading to natural gas as predominant utility fuel
- Significant level of coal retirements expected even without CPP

Key updates in AEO2016

- Incorporation of the U.S. Environmental Protection Agency's final rules for the Clean Power Plan
- Updated renewable capital costs
- Latest California zero-emission vehicle sales mandates, which have been adopted by a number of other states
- Extension of the production tax credit for wind and 30% investment tax credit for solar
- Lower near-term crude oil prices

What everyone must know about CPP

- EPA's application of Clean Air Act framework to utility CO2 emissions
- Federal role: EPA sets CO2 performance standards for existing generators
- State role: states develop implementation plans with significant potential flexibility
 - Major choices available to states: 1) type of approach to regulation; 2) cooperation with other states, 3) integration with other programs.
- Rule stayed by Supreme Court Feb. 2016, pending arguments before D.C. Circuit (now scheduled for Fall 2016.)

Logic behind Clean Power Plan (CPP) implementation in AEO2016

Reference case

- Familiarity: selected mass-based as apparent preferred option
- Uniformity: all states assumed to follow same program type
- Avoid regulatory pitfalls: applied budgets covering existing units and new source complement (no “leakage”)
- Minimize rate impacts: assumes allocation to load-serving entities

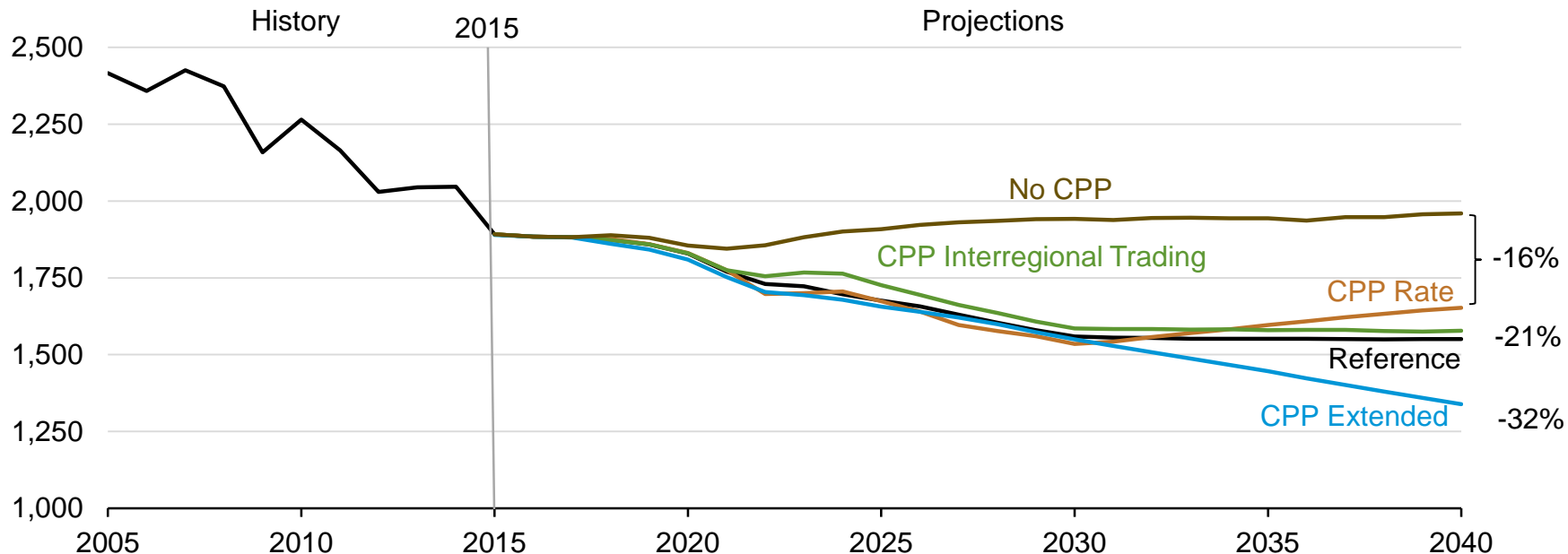
How states choose to implement CPP influences its impact on power sector

Case	What type of target to set?	What level of cooperation w/ other states?	To whom to allocate CO2 allowances?	General impact vs. Reference	Avg retail electricity price impact per yr vs No CPP 2022-2040
<i>Reference</i>	Mass	Intra-regional (EMM level)	Load-serving entities	N/A	2.8%
<i>No CPP</i>	N/A	N/A	N/A	Stable coal generation	N/A
<i>CPP Rate</i>	Rate	Intra-regional	N/A	More renewable generation	2.9%
<i>CPP Interregional Trading</i>	Mass	Inter-regional (Interconnect level)	Load-serving entities	More renewable generation, fewer coal retirements	2.5%
<i>CPP Allocation to Generators</i>	Mass	Intra-regional	Generators	Higher electricity prices	4.3%
<i>CPP Extended</i>	Mass	Intra-regional	Load-serving entities	More coal retirements, gas, renewables	3.2%

Source: EIA, Annual Energy Outlook 2016

By 2040, CPP electric sector CO2 emissions are 32-36% below the 2005 level vs. a 19% reduction in No CPP and 45% drop in Extended case

electric power sector carbon dioxide (CO2) emissions
million metric tons

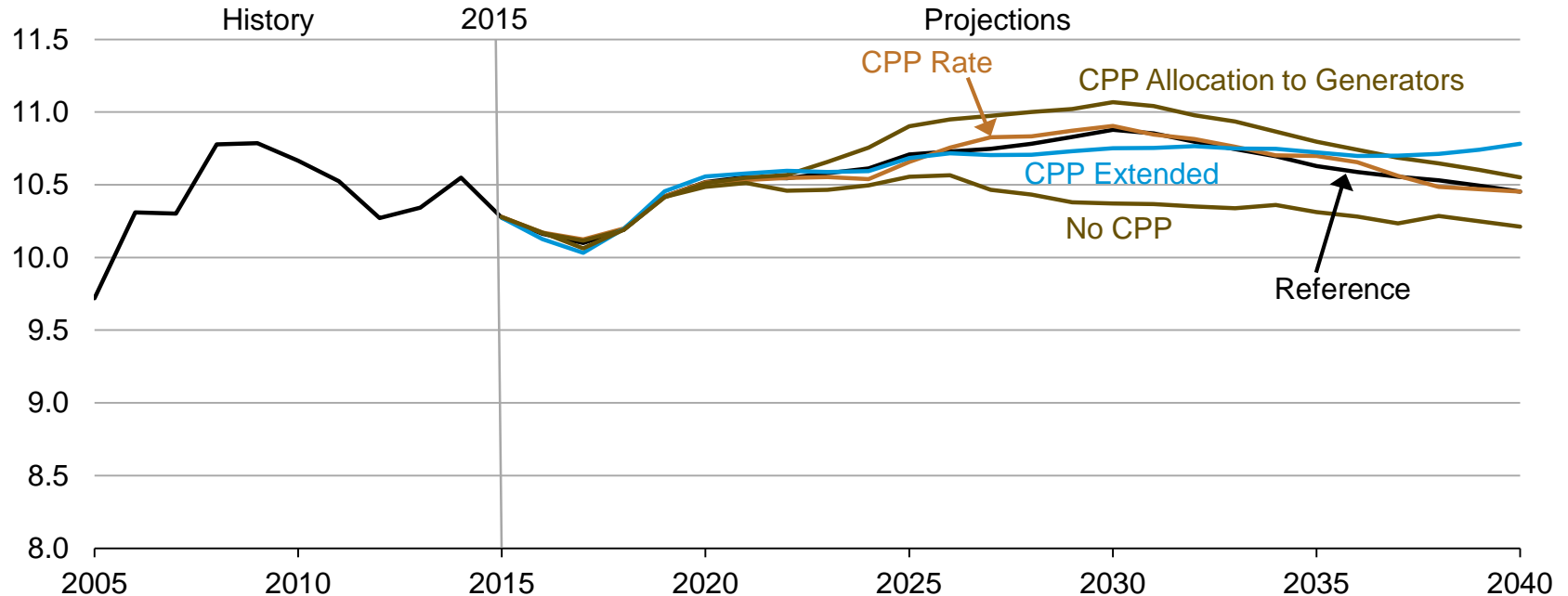


Source: EIA, Annual Energy Outlook 2016

CPP increases retail electricity prices between 4% - 7% in 2030 due to higher fuel and capital costs and allowance treatment

average electricity price

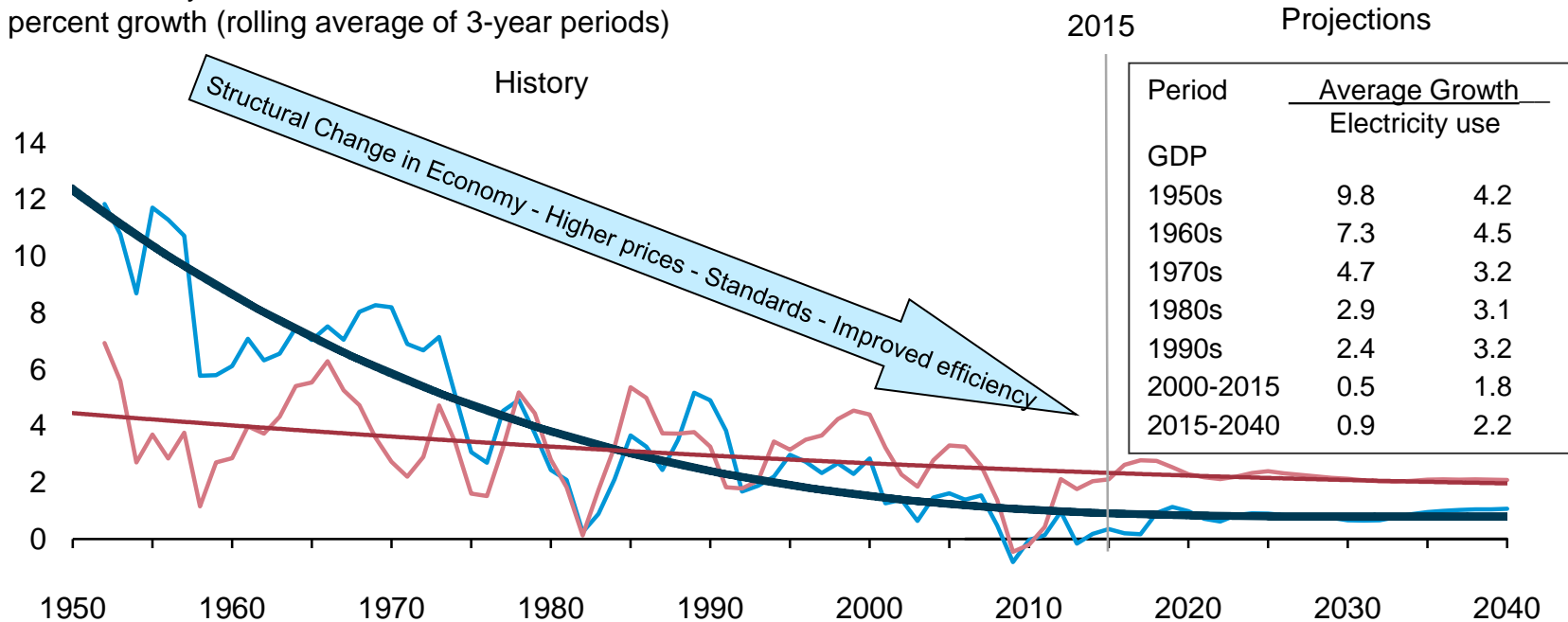
2015 cents per kilowatthour



Source: EIA, Annual Energy Outlook 2016

Electricity demand growth slows while onsite generation increases, dampening the need for central power station generation.

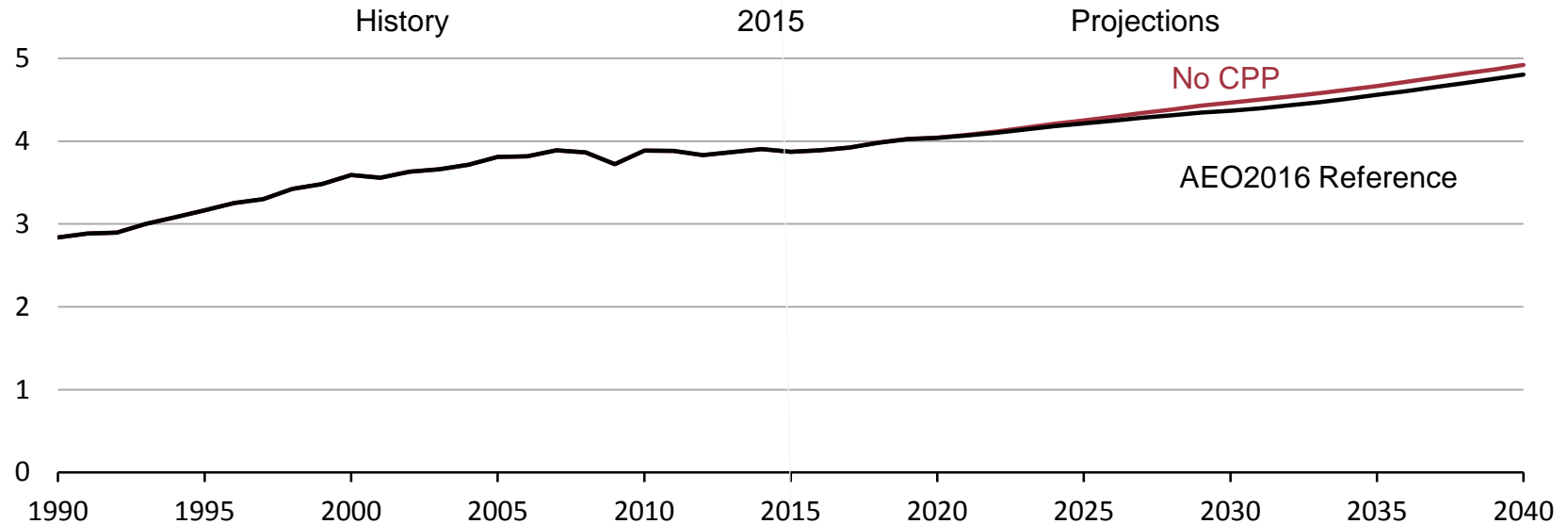
U.S. electricity use and GDP
percent growth (rolling average of 3-year periods)



Source: EIA, Annual Energy Outlook 2016

Electricity demand is 2% lower in 2030 in the Reference case than in the No CPP case, reflecting both CPP compliance actions and higher prices

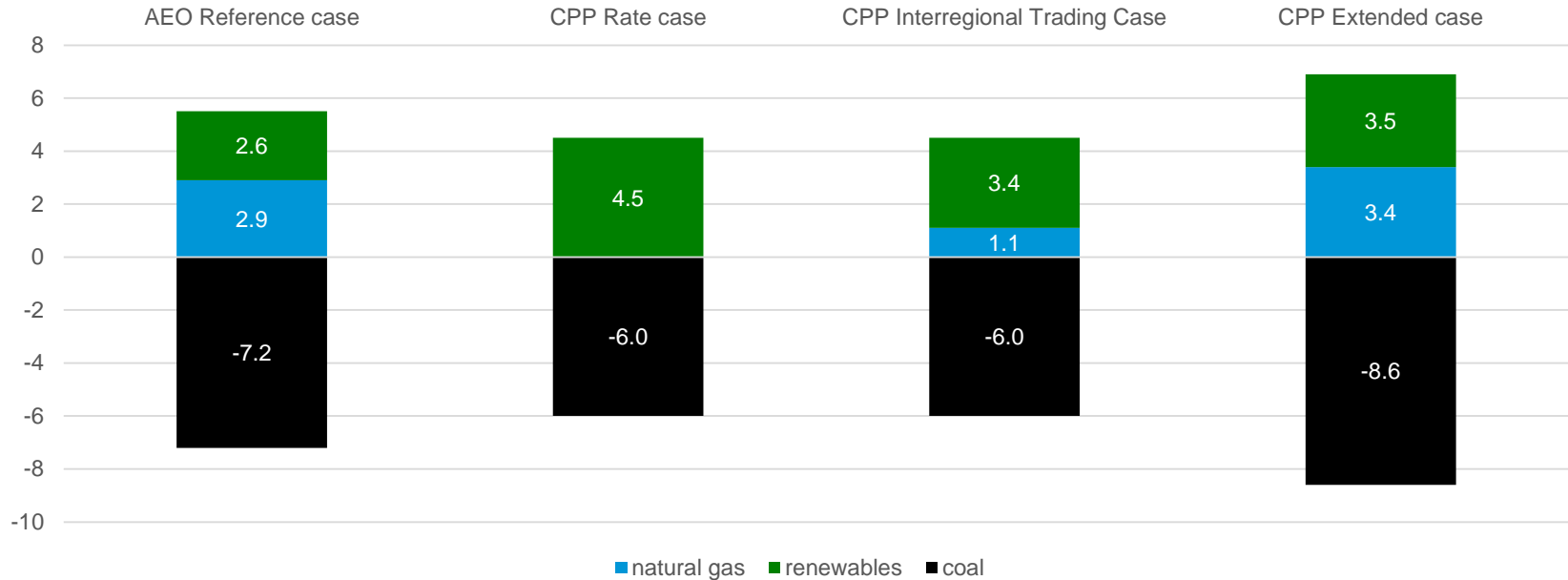
total electricity use
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2016

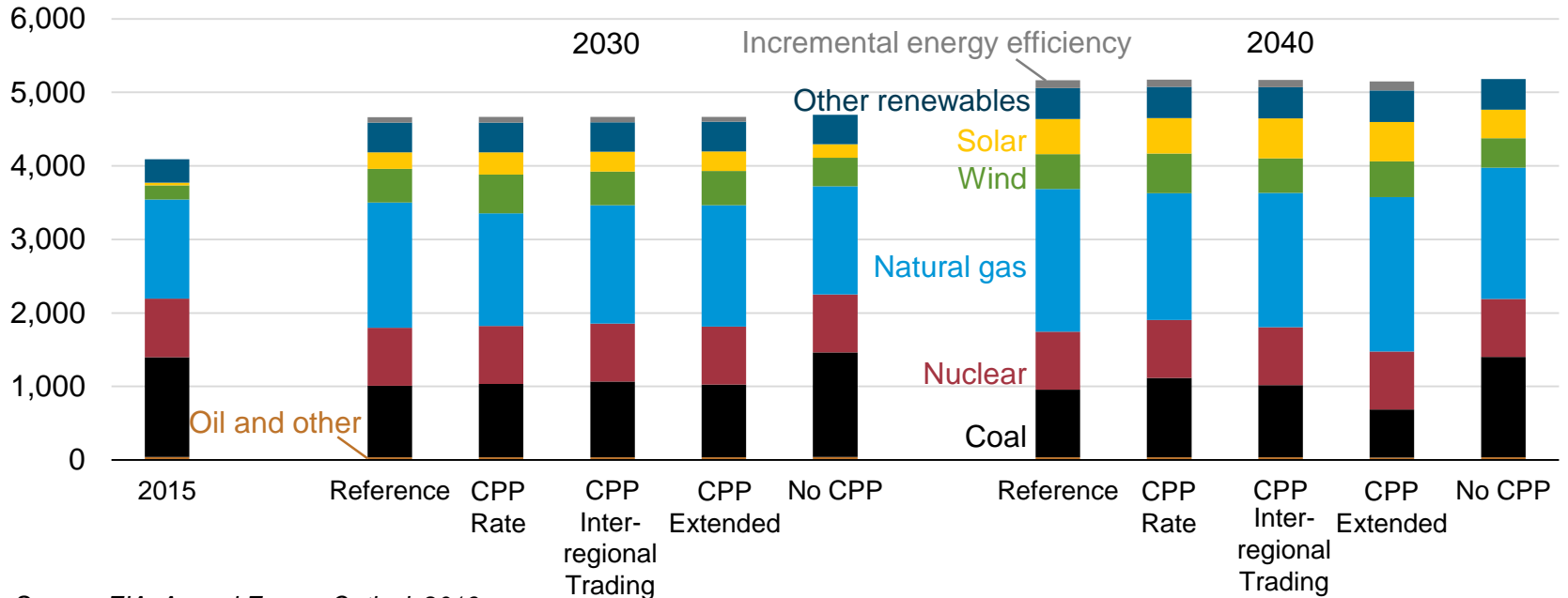
CPP reduces coal- and increases renewable and gas-fired generation; mass-based standards result in more gas and less renewables vs. rate-based targets

Cumulative difference from No Clean Power Plan case, 2016-40
trillion kilowatthours



CPP reduces coal- and increases renewable and gas-fired generation; mass-based standards result in more gas and less renewables vs. rate-based (*cont.*)

net electricity generation
billion kilowatthours

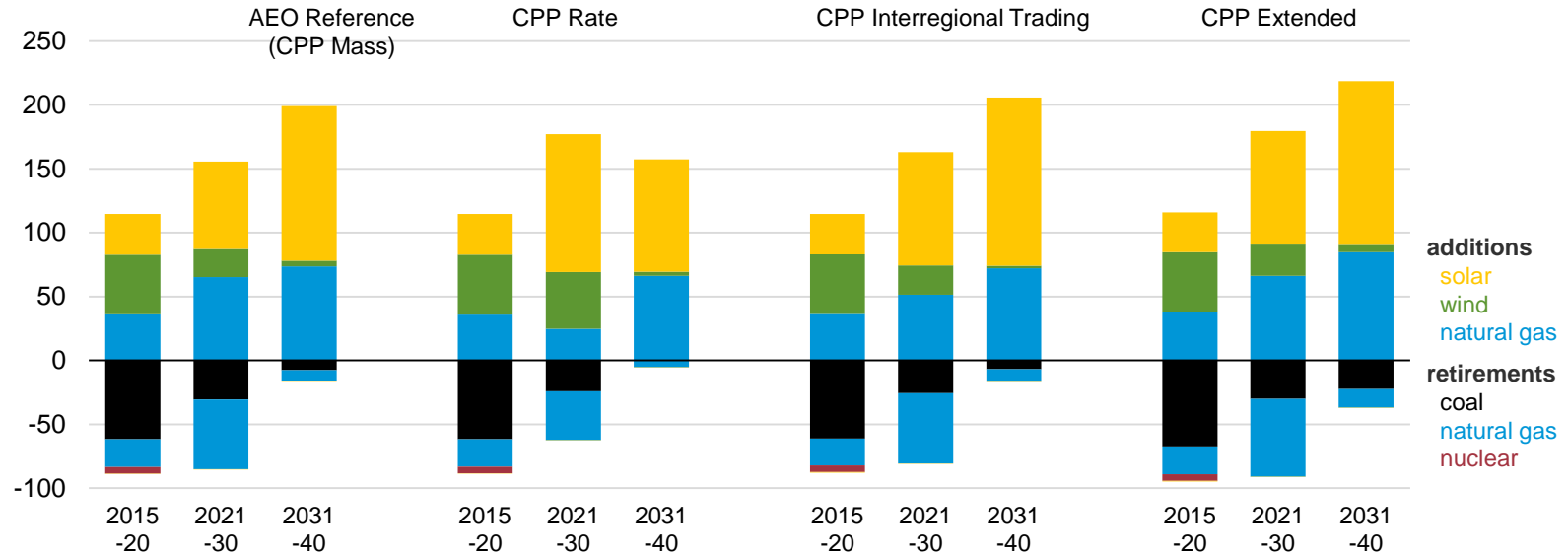


Source: EIA, Annual Energy Outlook 2016

Low- and zero-emitting generating capacity grows more rapidly under rate- vs. mass-based programs; little change in coal retirements

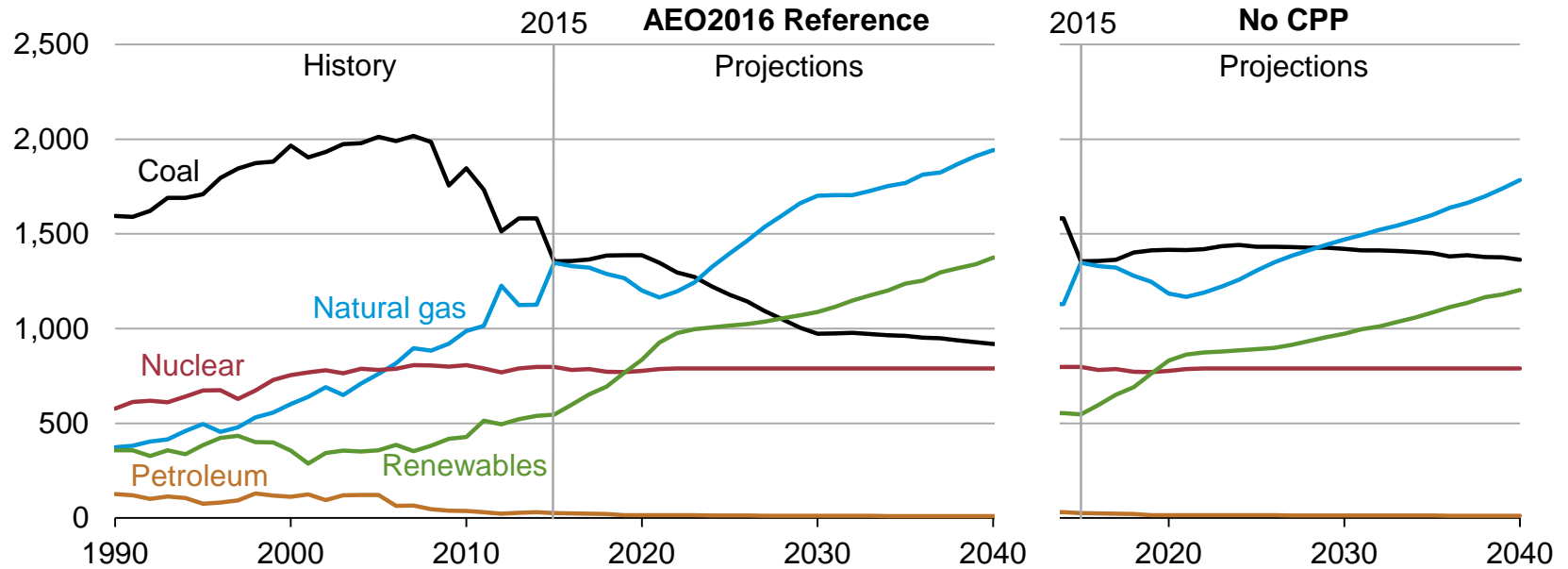
Cumulative additions and retirements of electric generating capacity, 2015-40

gigawatts



Gas generation falls through 2021; both gas and renewable generation surpass coal by 2030 in the Reference case, only gas does in No CPP case

net electricity generation
billion kilowatthours

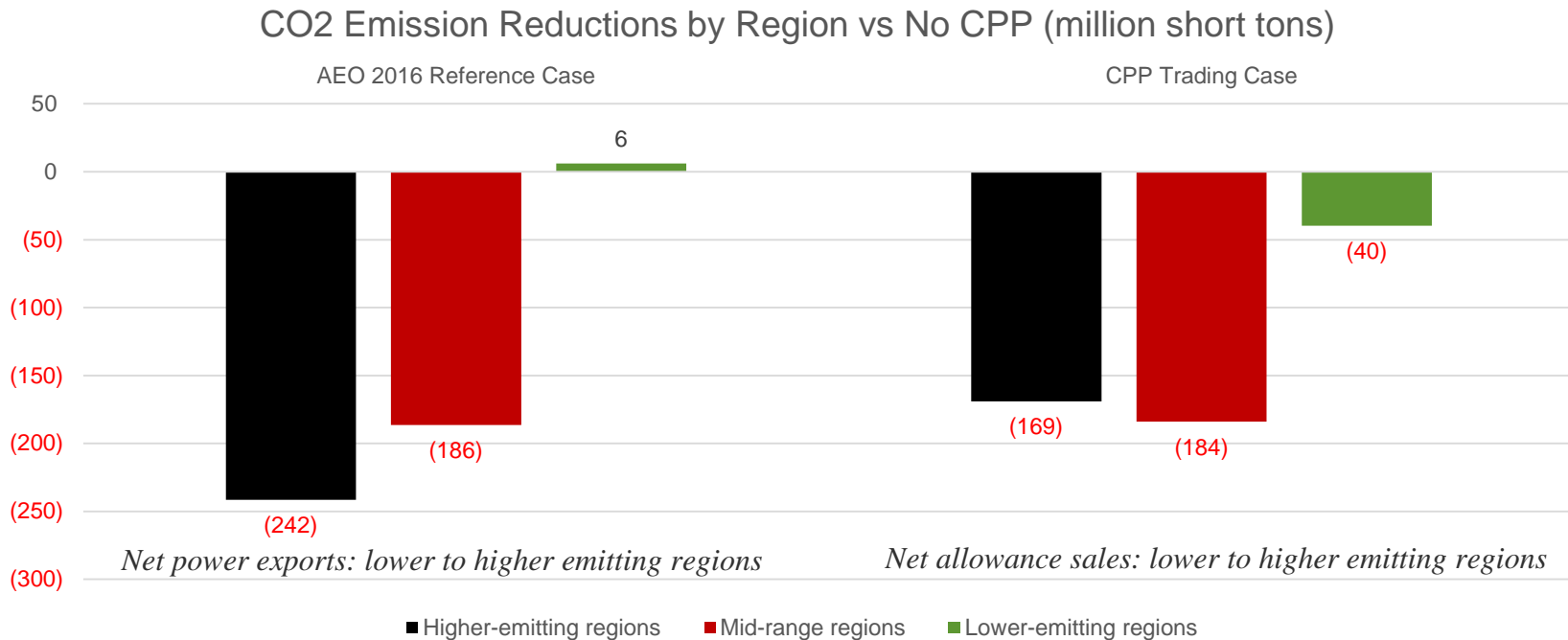


Source: EIA, Annual Energy Outlook 2016

Regional implications of Clean Power Plan (CPP) in AEO2016- Reference Case vs. Alternatives

- Coal-dependent regions have greater reduction requirements and larger shifts in generation mix
 - while lower-emitting regions are generally expected to increase power imports and in mass-based programs, make additional allowance sales.
- Some regions have apparent advantages relative to others, including higher renewable resource quality
- These interregional differences affect calculation of regional cost impacts but are unlikely to be significant at a national level

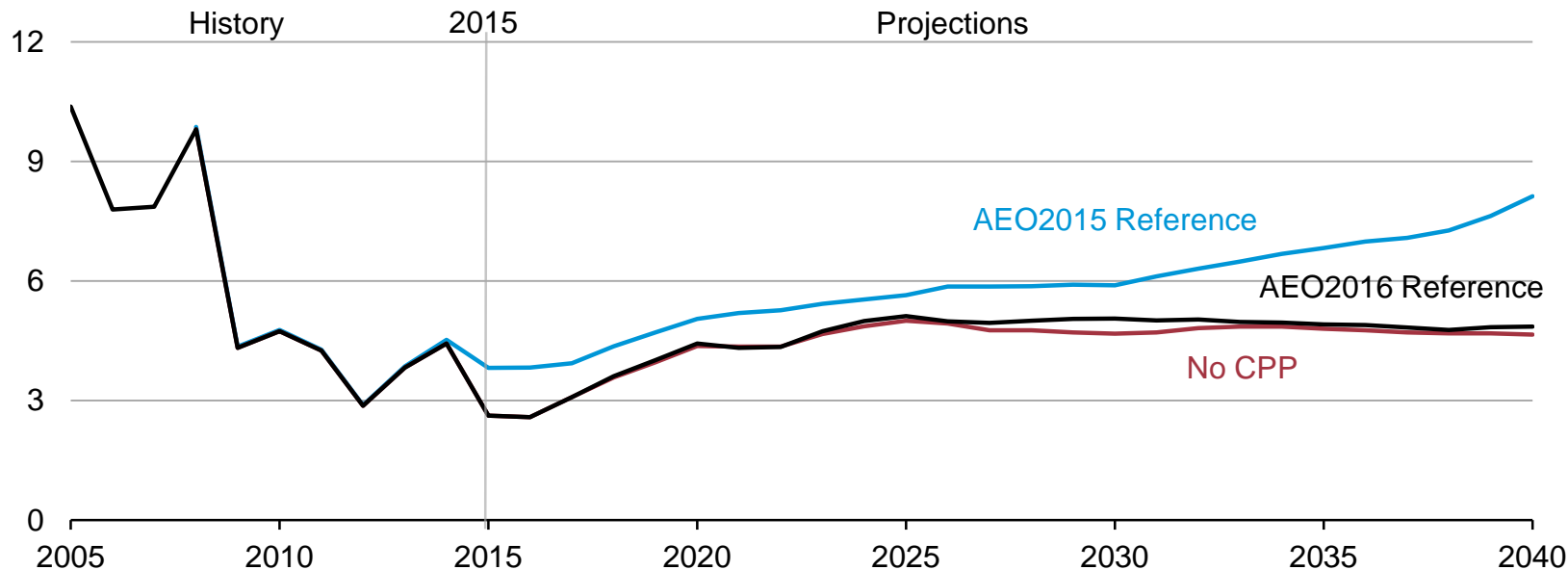
Flexibility under Clean Power Plan shifts emission reductions between lower and higher emitting regions



Impacts on Fuel

Natural gas prices are projected to remain below \$5 per million Btu through most of the projection period with or without CPP

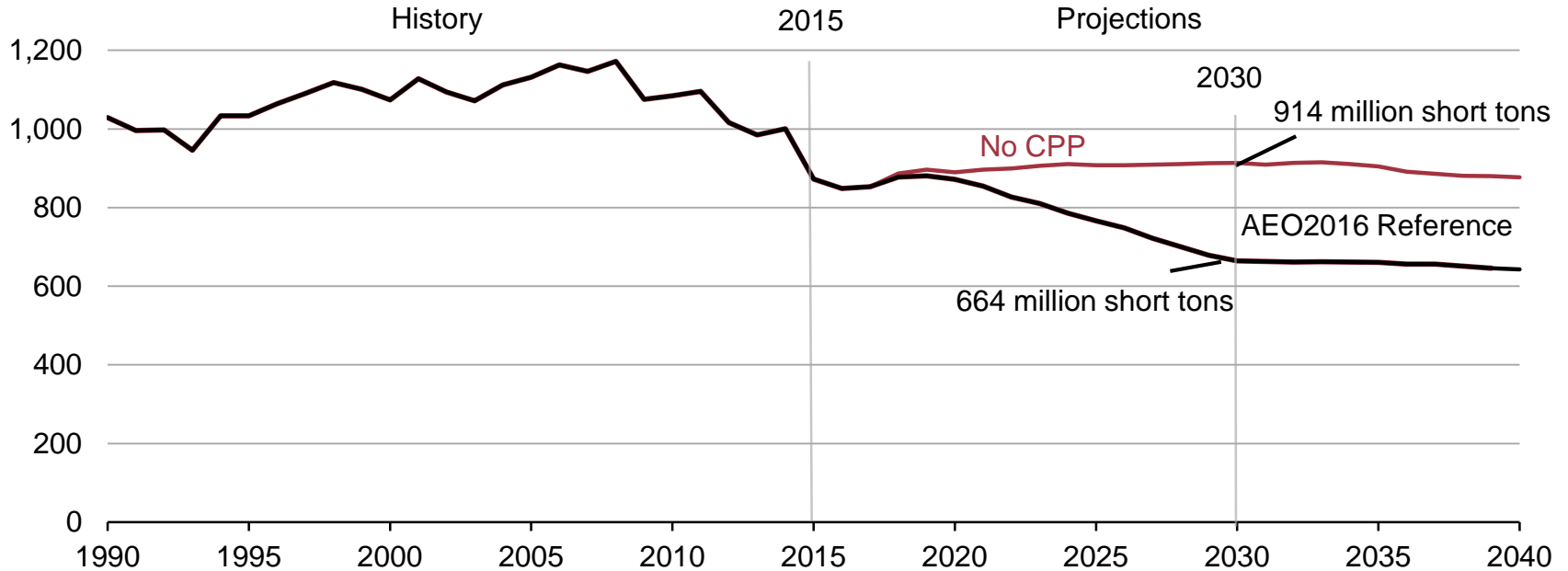
average Henry Hub spot prices for natural gas
2015 dollars per million Btu



Source: EIA, Annual Energy Outlook 2016

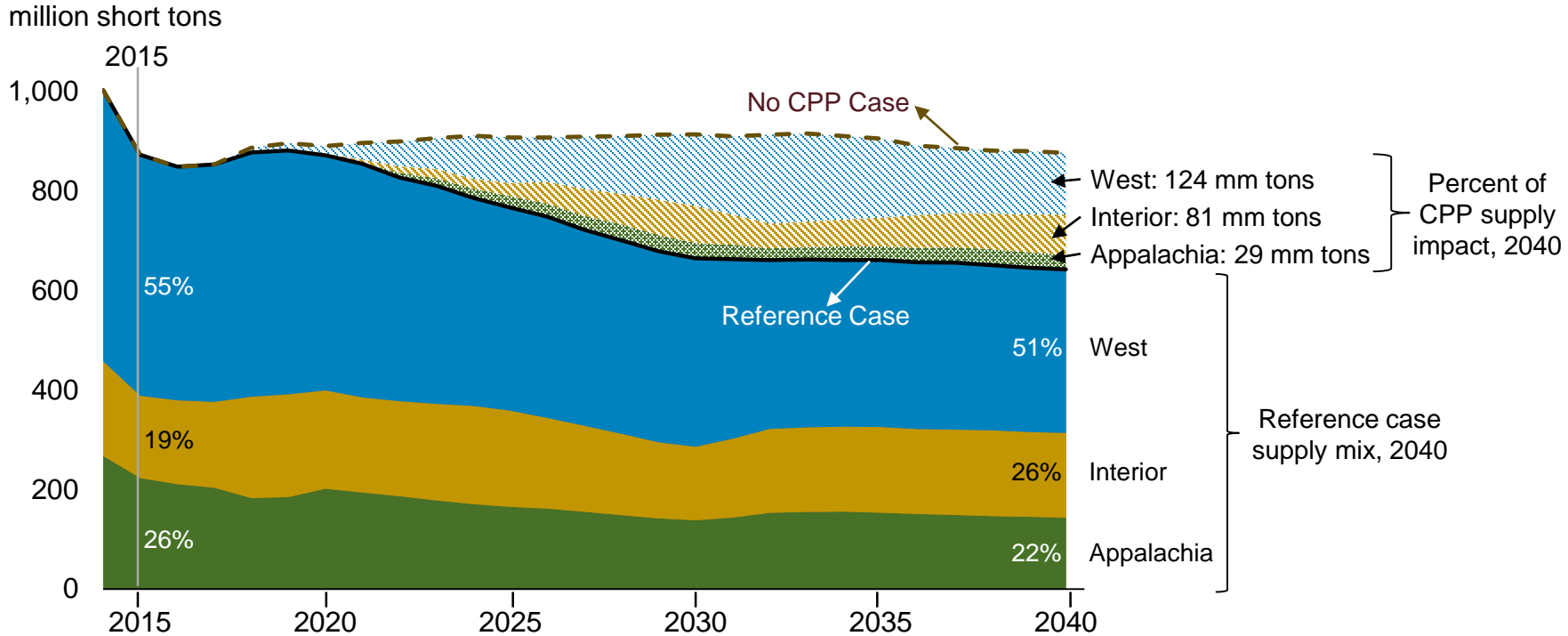
Reference case U.S. coal production in 2030 is 27% below the level in the No CPP case

U.S. coal production
million short tons



Source: EIA, Annual Energy Outlook 2016

All coal supply regions are challenged when the CPP is implemented



Source: EIA, Annual Energy Outlook 2016

Summary of key results: Clean Power Plan (CPP) in AEO2016- Reference Case vs. Alternatives

- CPP under a range of alternative implementation paths is projected to continue CO₂ reductions, down 16% from 2005 levels in 2015, to ~35% by 2030
- CPP escalates changes already underway in generation mix, with gas eclipsing coal in mid-2020's/renewables exceeding coal by late 2020's
- Retail electricity prices rise on average between 2.8-4.3% from 2022-2040, depending upon implementation decisions made by states
- Increases in energy efficiency, as well as price-related response result in 2030 electricity sales reductions of ~2% vs. No CPP case

For more information

U.S. Energy Information Administration home page | www.eia.gov

Annual Energy Outlook | www.eia.gov/forecasts/aeo

Short-Term Energy Outlook | www.eia.gov/forecasts/steo

International Energy Outlook | www.eia.gov/forecasts/ieo

Today In Energy | www.eia.gov/todayinenergy

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

State Energy Portal | www.eia.gov/state