



**THE CLEAN POWER PLAN
IMPLEMENTATION: WHAT THIS MEANS
FOR RENEWABLE TECHNOLOGIES**

Iowa State University
February 29, 2016

About AEE

- AEE is a national organization of businesses making the energy we use secure, clean, and affordable
- AEE and its state and regional partner organizations, which are active in 26 states across the country, represent more than 1,000 companies and organizations that span the advanced energy industry and its value chains.
- Technology areas represented include energy efficiency, demand response, natural gas, wind, solar, smart grid, nuclear power, and advanced transportation systems.



AEE is an association of businesses working to make energy secure, clean, and affordable

AEE's Leadership Council



CLEARResult



Advanced Energy Economy Business Council



Outline

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- Energy Sector Landscape pre-CPP

2

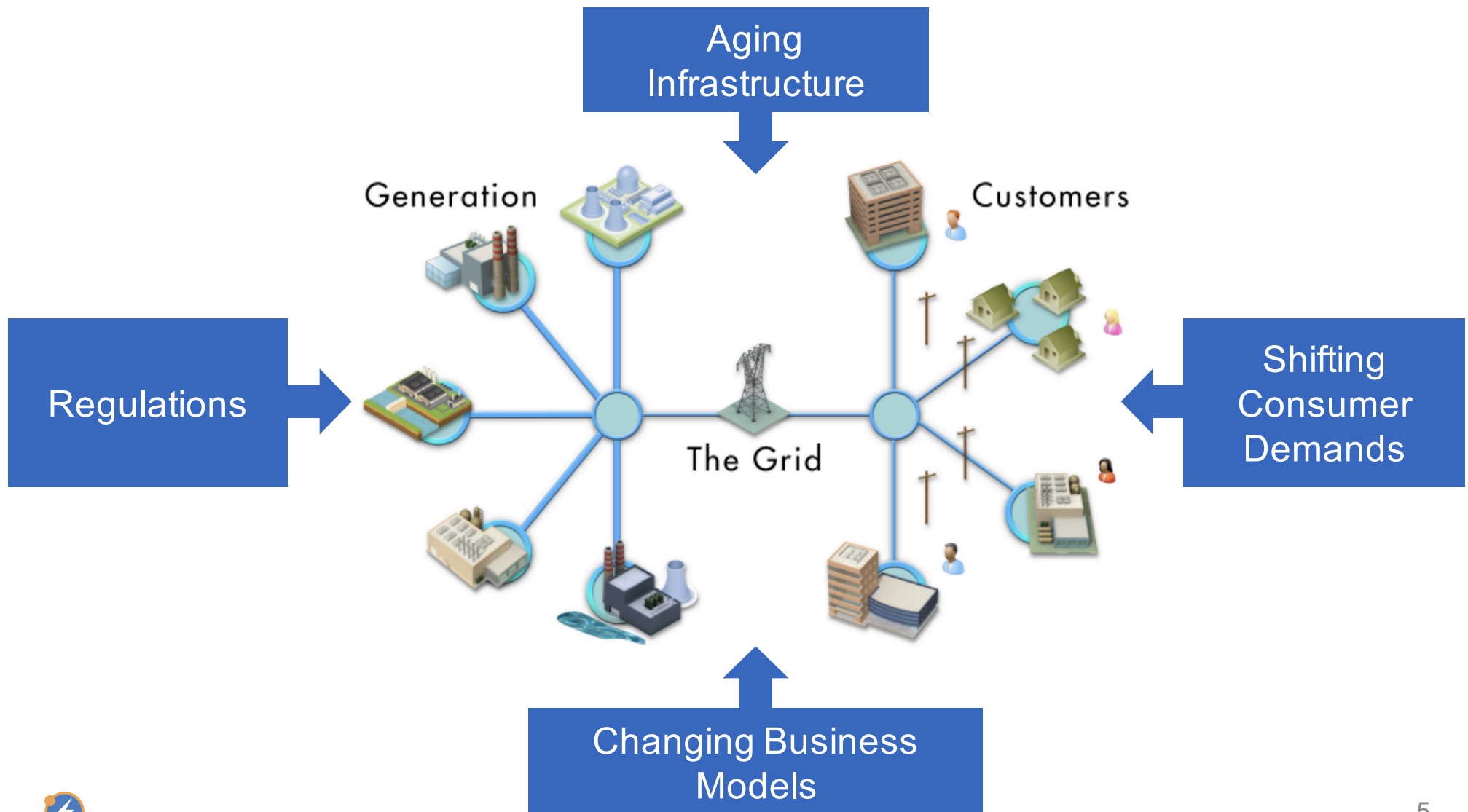
- Compliance Options for States

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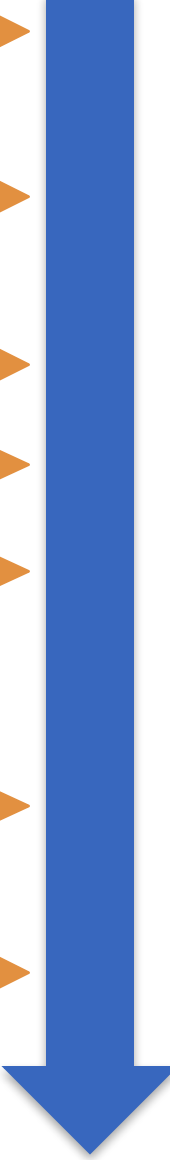
- Legal and Policy Implications



The energy system has been changing in the face of many pressures over the past decade



Since 2007 EPA has been developing carbon regs for all sectors - power sector is up now

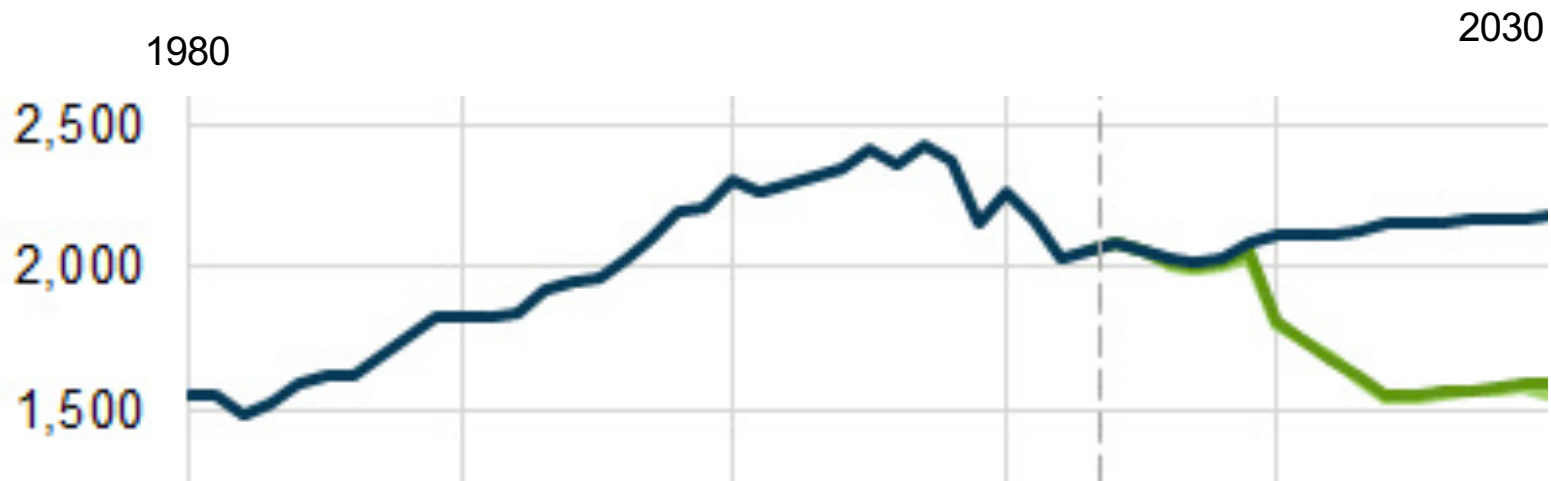
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- 2007 ▶ Supreme Court (SC)'s *Mass. v. EPA* finds CO₂ is pollutant, and President Bush directs EPA to create mobile source standards
 - 2009 ▶ EPA finds that 6 GHGs threaten public health & welfare and proposes first* light-duty vehicle standards
 - 2010 ▶ EPA finalizes first light-duty vehicle standards
 - 2011 ▶ SC's *AEP v. CT* affirms EPA's CO₂ role
 - 2012 ▶ EPA proposes standards for new power plants; DC Circuit Court (DCC) upholds endangerment finding, light-duty vehicle standards, and tailoring rule
 - 2014 ▶ SC's *UARG v. EPA* nixes tailoring but affirms EPA's CO₂ role; EPA proposes existing power plants rule (CPP)
 - 2015 ▶ EPA finalizes CPP and new plant rule while proposing CPP Federal Plan, heavy-duty vehicle, & oil/gas methane standards



* Note: The timeline only includes the first mobile standard for brevity, but EPA has been rolled out two additional mobile standards since the first.

The Clean Power Plan creates major change and associated market opportunities

- EPA aims to return power plant carbon emissions back to 1980 levels



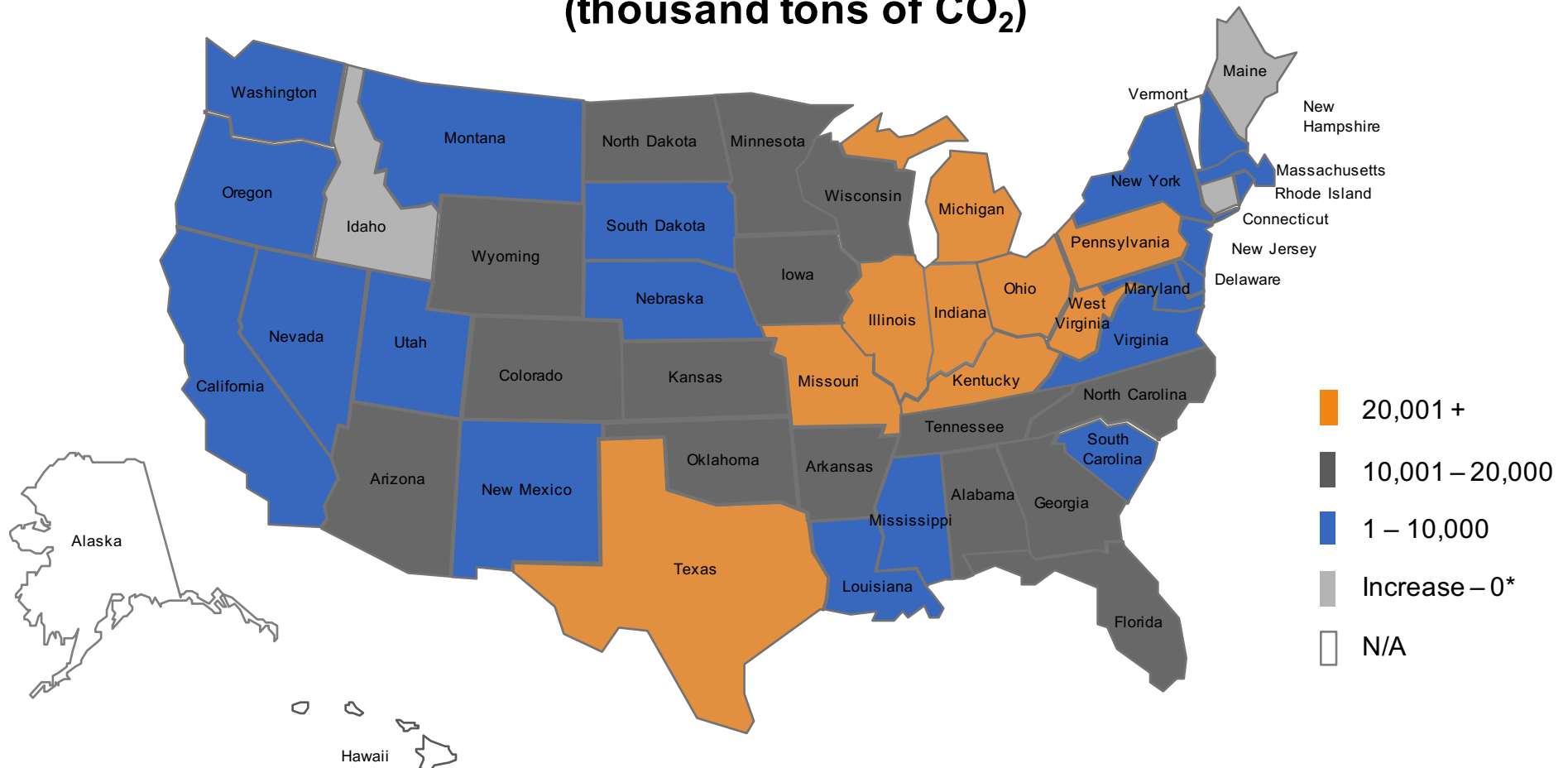
SOURCE: EIA 2015

- Our estimates indicate that EPA's final rule could support \$20B/year in advanced energy markets.



Total mass cuts give the best sense of change required - TX and PJM top the list

**Quantity of CO₂ Reduction Required, 2012-2030
(thousand tons of CO₂)**



*Because the emission targets were set as rate-based lbs CO₂/MWh, three states are allowed a net increase in total tons CO₂ emissions under the Final CPP.

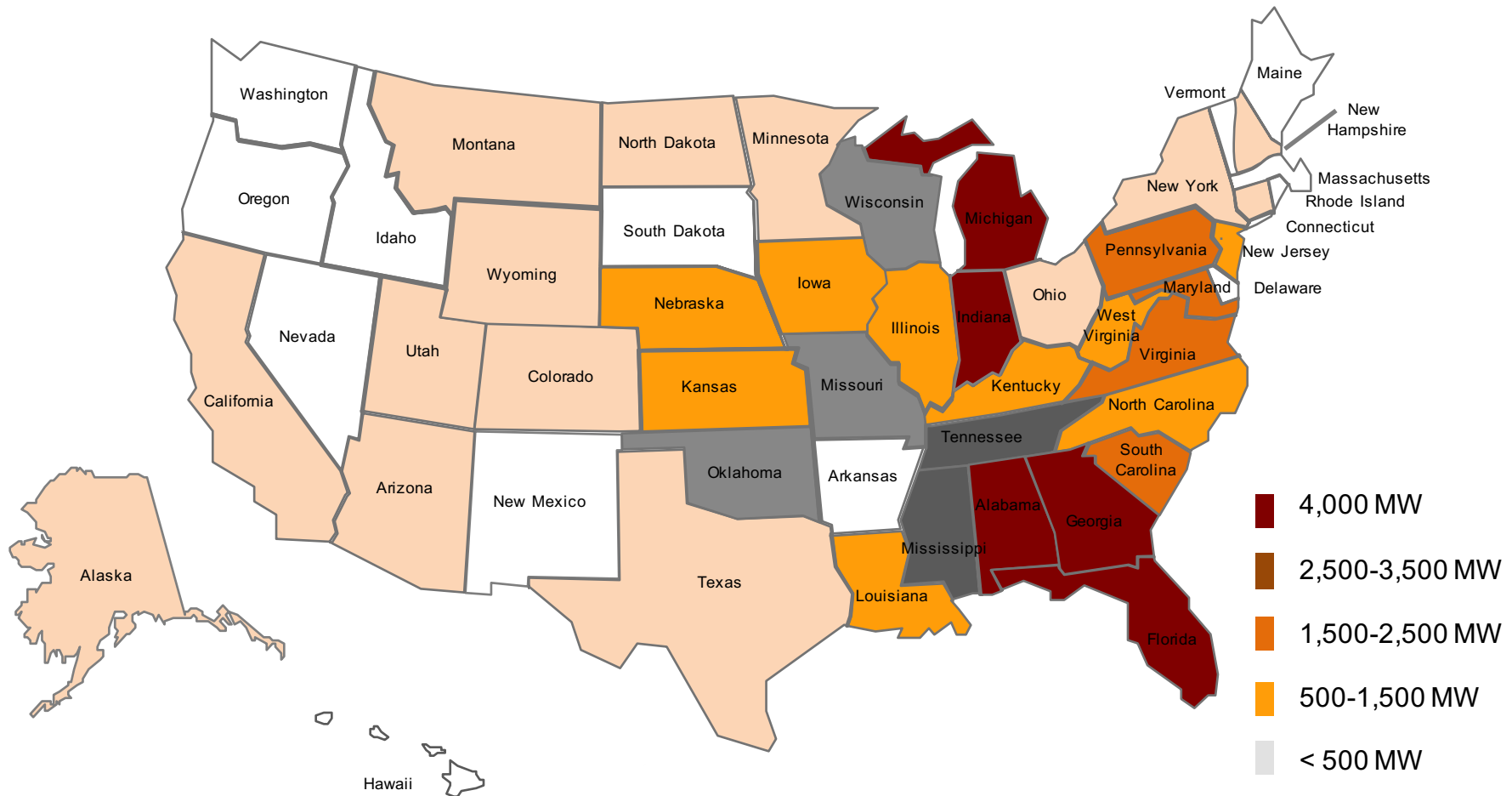
Source: <http://www.epa.gov/airquality/cpp/tsd-cpp-emission-performance-rate-goal-computation-appendix-1-5.xlsx>

Analysis by Advanced Energy Economy



Another market indicator is where Coal is ripe for retirement

Coal Ripe for Retirement



Source: http://www.ucsusa.org/clean_energy/smart-energy-solutions/decrease-coal/economic-analysis-us-coal-plants.html#tables

The Clean Power Plan is divided into two parts

Front End – Targets and Timelines

- Best System of Emissions Reduction sets rate (lbs CO₂/MWh) and mass (short tons CO₂) goals for interim (2022-2029) and final (2030-) periods
- EPA projects national emissions fall 32% from 2005 to 2030 (not enforceable)

Back End – Rules for State Compliance Plans

- States submit initial plans in 2016 and final in 2018
- States have many options from plan types to measures
- EGUs are ultimately the responsible parties



Here we calculate Iowa's final 2030 rate

Example Year
2030

Example State
IA



X 96%

1,304
lbs CO₂/MWh

+



X 4%

770
lbs CO₂/MWh

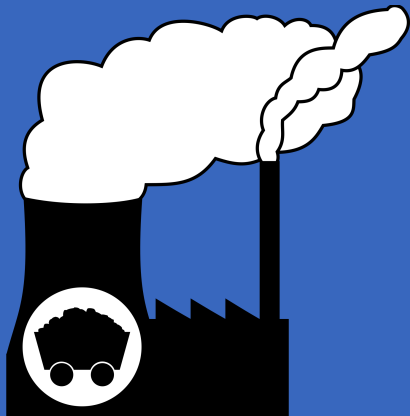
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1,283 lbs CO₂/MWh



EPA provides two basic approaches to compliance: rate and mass

Rate



$$\text{Target} = \frac{\text{CO}_2 \text{ emitted (lbs)}}{\text{ERCs} + \text{Generation (MWh)}}$$

*EGUs can purchase Emission Rate Credits (ERCs).**

Mass



$$\text{Target} = \text{CO}_2 \text{ emitted (lbs)}$$

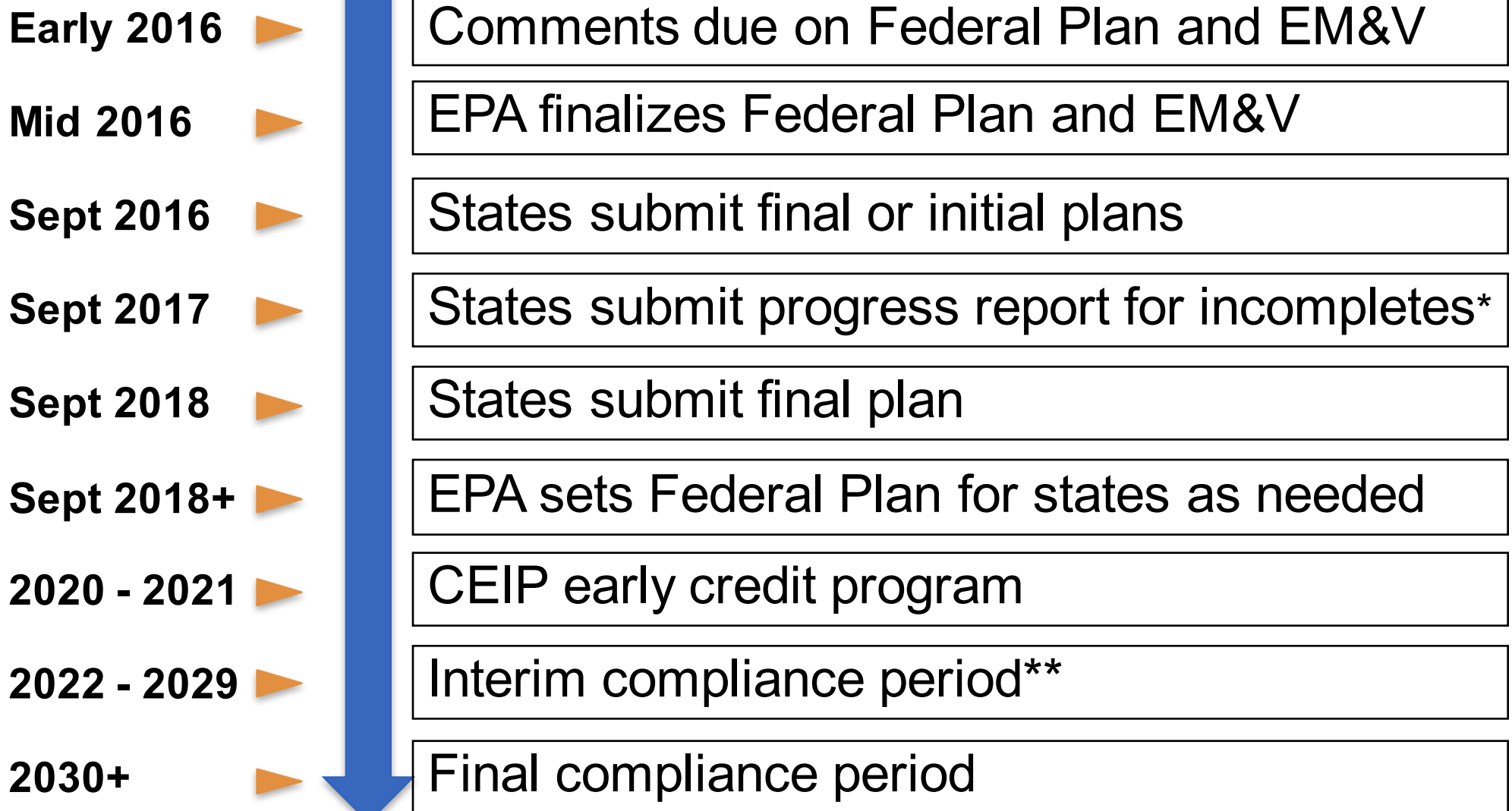
*EGUs can purchase Allowances to ensure actual emissions are covered by allowances.***

**Availability of ERCs or allowances depends on state plan design.*

***Total allowances across EGUs must not exceed state's CPP mass target.*



State plans start arriving in 2016 with finals due in 2018 – now uncertainty with the stay



*States do not have to submit progress reports if final plans are submitted in 2016.

**There are three interim step periods, each last a period of 2 or 3 years: 2022 – 2024, 2025 – 2027 and 2028 – 2029.




A number of technologies can be used for compliance—hurdles exist in planning


OTHER OPTIONS

Carbon capture and sequestration

Demand response*

BSER


Other grid-connected renewables
(offshore wind, DG, biomass, wave and tidal power) 


Renewables
(onshore wind, utility-scale solar PV and CSP, geothermal, hydro) 

Coal-to-existing NGCC switching 

Zero-emitting fuel cells

Energy storage** 

End-use energy efficiency
ESCOs, behavioral programs, appliance replacement, building energy codes, appliance codes 

Heat rate improvements 

CHP, WHP, and cogeneration

New and incremental nuclear 



T&D efficiency
(VVO, CVR, smart grid)

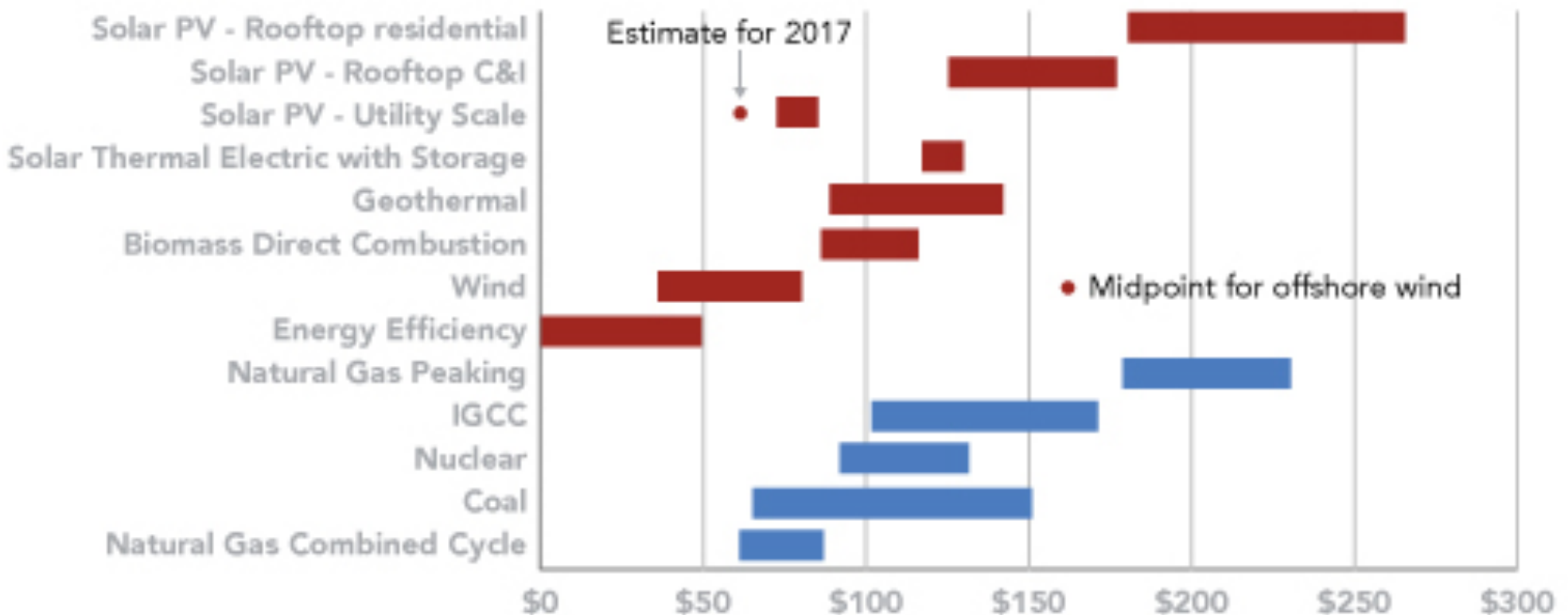
 *Eligible to the extent it reduces net MWh end-use.

**Cannot receive credit but benefits can be recognized.

Advanced energy technologies are a cost competitive way to comply with the CPP

Lazard: Levelized Cost of Energy 2014

Levelized Cost without Incentives (\$/MWh)

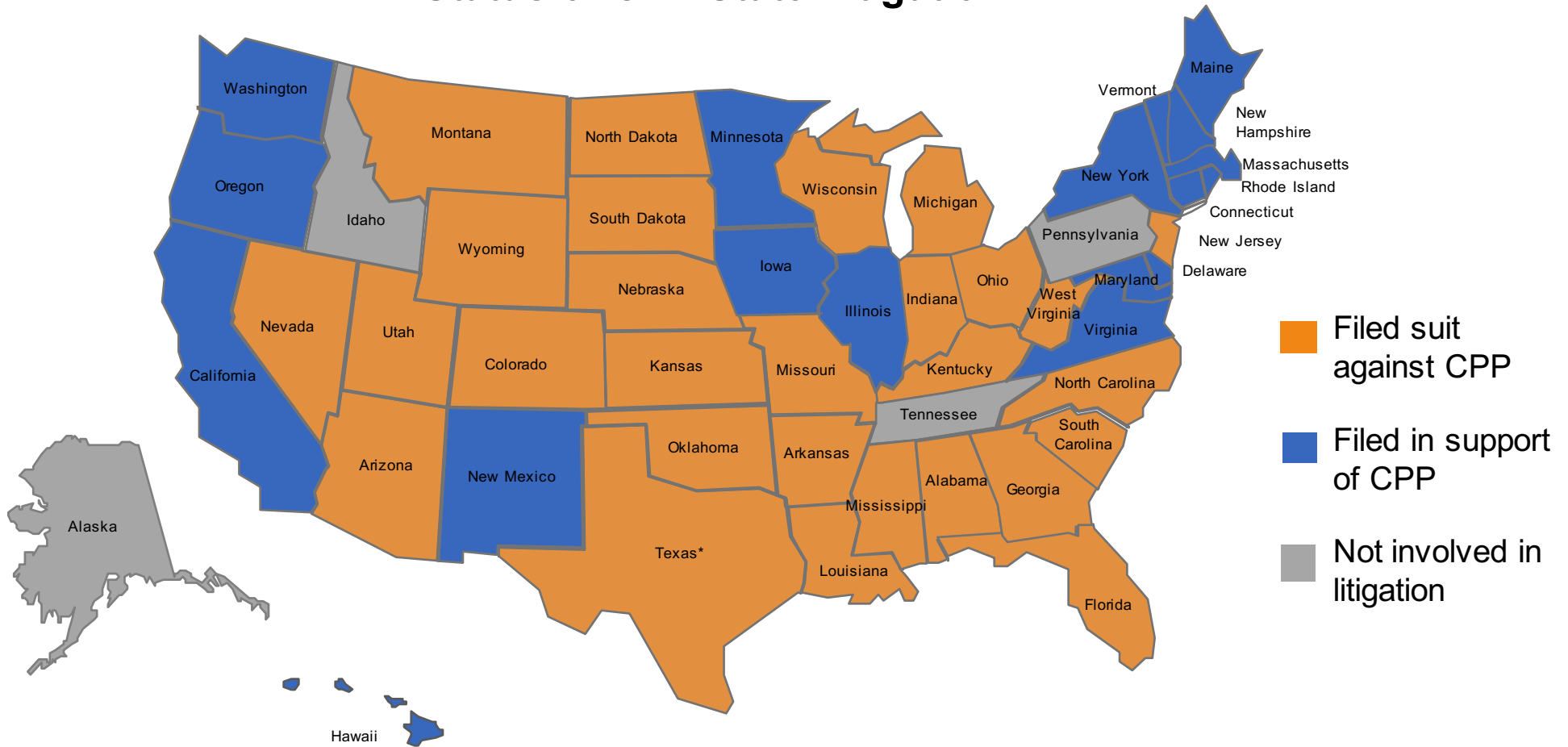


Source: *Lazard's Levelized Cost of Energy Analysis—Version 8.0*. “C&I” = Commercial & Industrial; “IGCC” = Integrated Gasification Combined Cycle. High end of range for *IGCC* and *Coal* includes 90% carbon capture and compression. See original report for additional assumptions.



45 states entered the Clean Power Plan legal battle

Status of CPP State Litigation



The SCOTUS stay was disappointing - Our strategy has to shift, but the CPP is not over

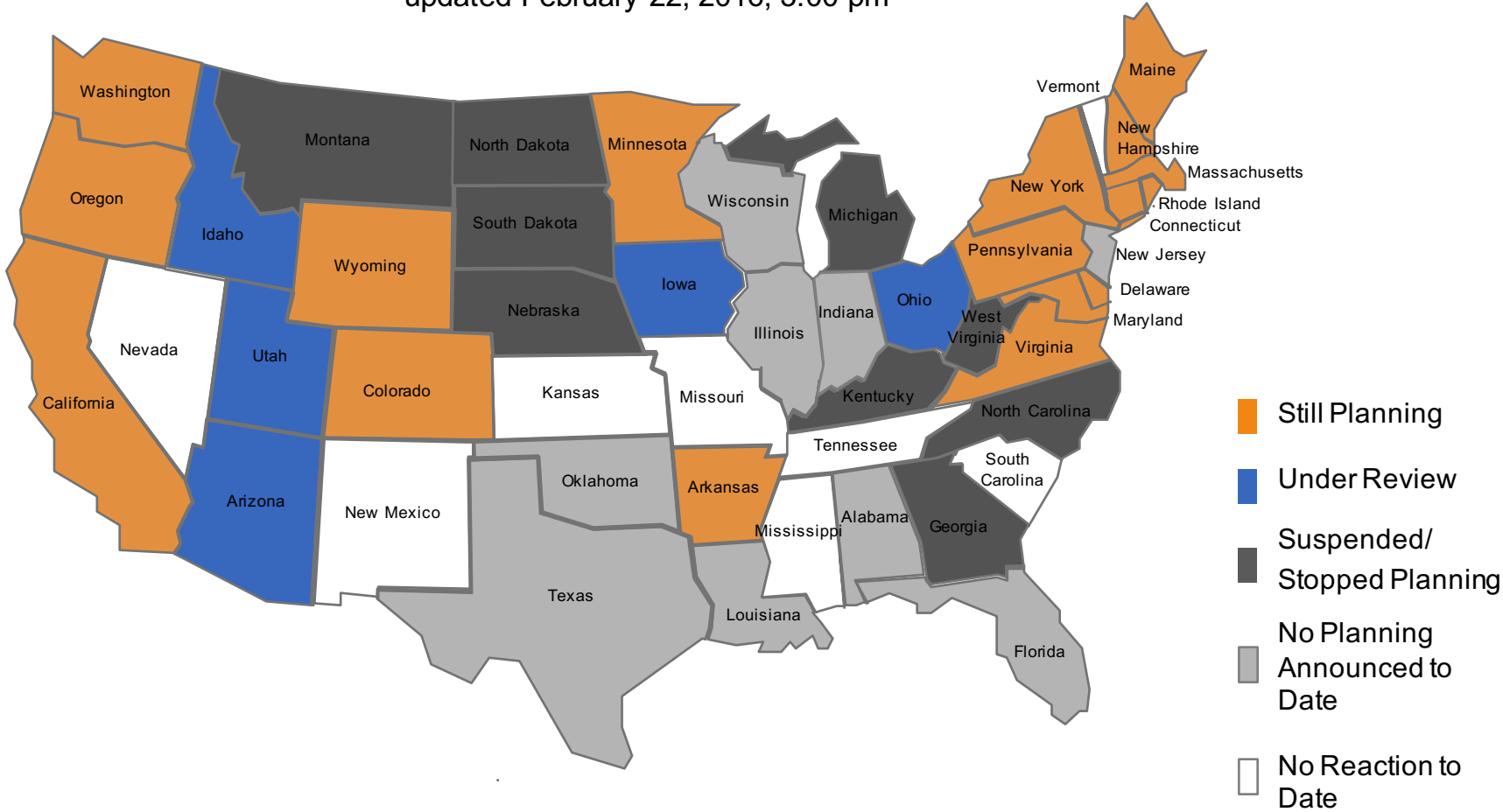
- A stay was always possible (not unusual for EPA regs) but unexpected after clearing DCC
- Technical/practical implications have some limits
 - While there is no enforcement, EPA and states can continue planning
 - 6 years before compliance 4 years before voluntary CEIP crediting
 - There is no change in the compliance dates mandated by the ruling
 - Even if the rule were thrown out, EPA still has the obligation to regulate carbon from the power sector
- But the legal and political implications are big
- The stay also creates policy uncertainty in the markets.



States have a wide range of reactions to the Supreme Court's CPP stay decision

State Reactions

updated February 22, 2016, 3:00 pm



Note: West Virginia is mandated to continue a feasibility study by statute. Vermont does not have standards under the Clean Power Plan.



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