

Perspectives on Emission Trading under EPA's Clean Power Plan

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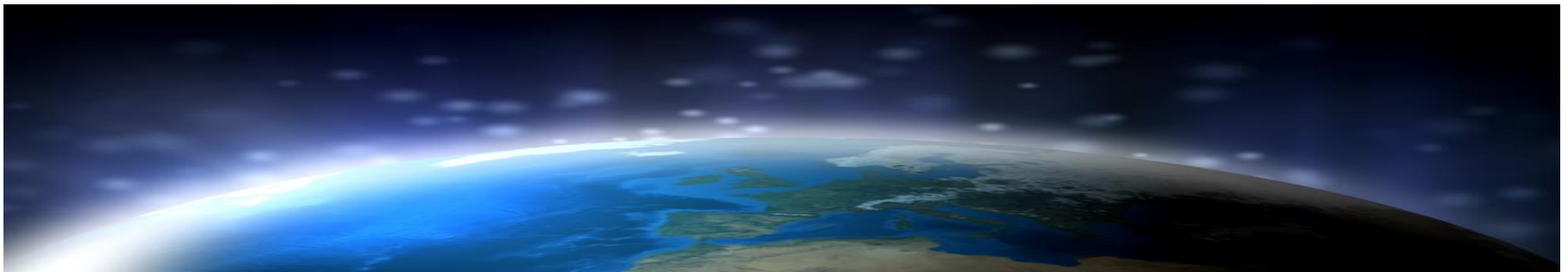
**IEA-IETA-EPRI Annual Workshop on
Greenhouse Gas Emission Trading**

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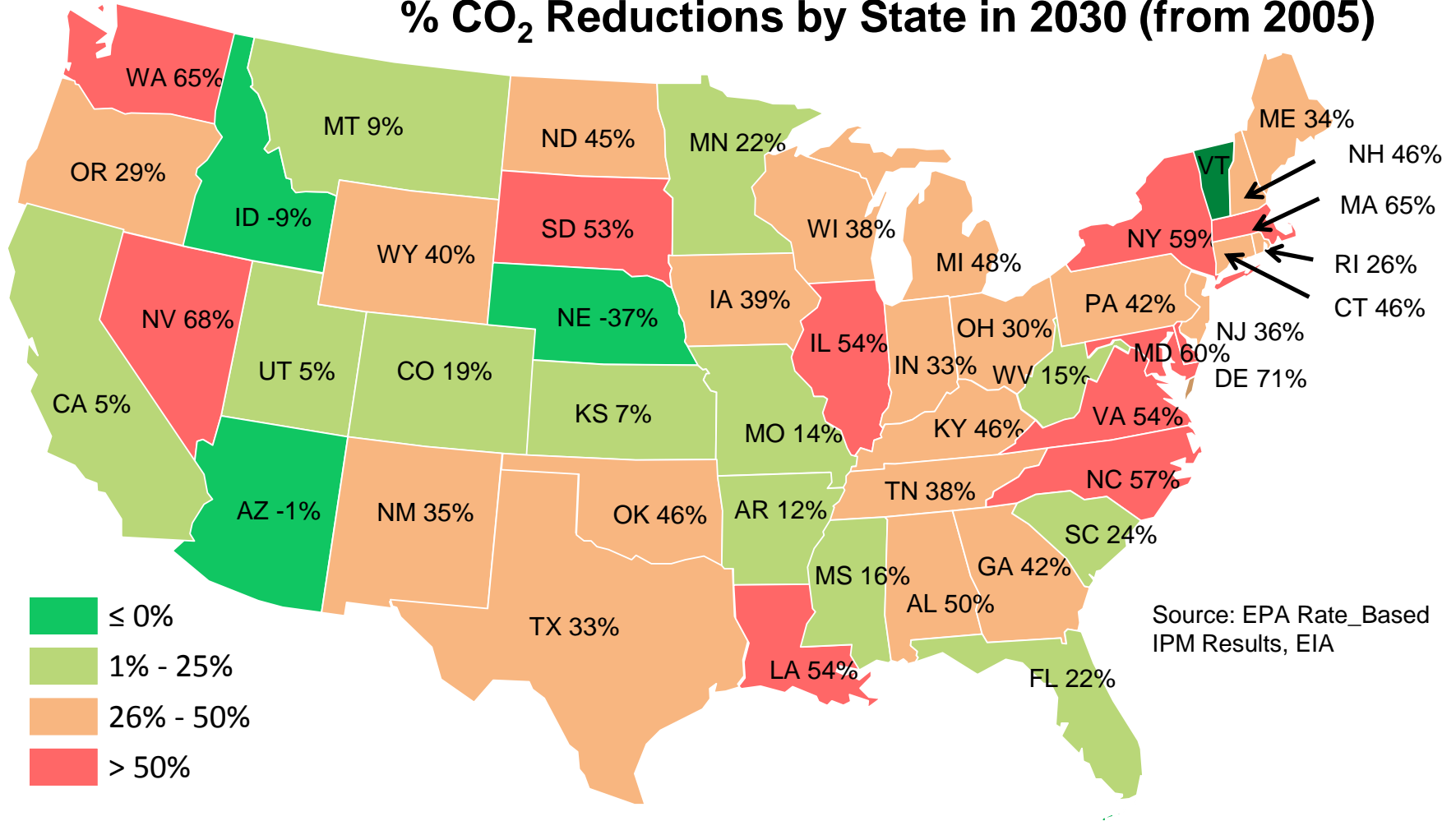
Key Takeaways

- Final Clean Power Plan opens the door to emission trading
 - Mass option is familiar
 - Rate option examples provided
 - “Trade Ready” approach allows trade between states without a common cap
 - Proposed Federal plan options include trading for states that do not develop state-specific plans
- Benefits of trade could be significant (preliminary)
- Final Clean Power Plan is not final
 - Federal plans and trading examples open to comment



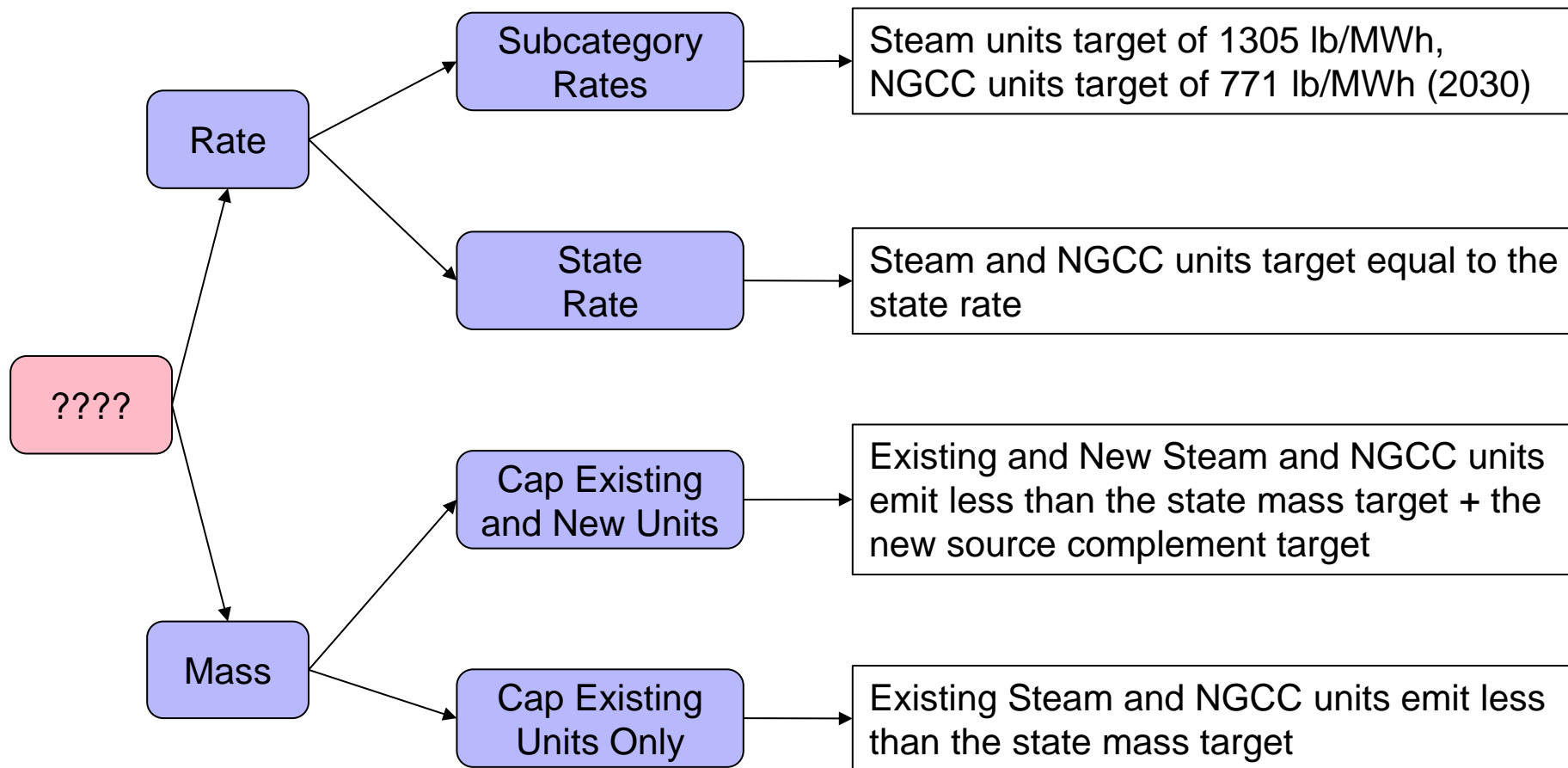
EPA's FINAL Proposal Has Varying State Reduction Targets

% CO₂ Reductions by State in 2030 (from 2005)

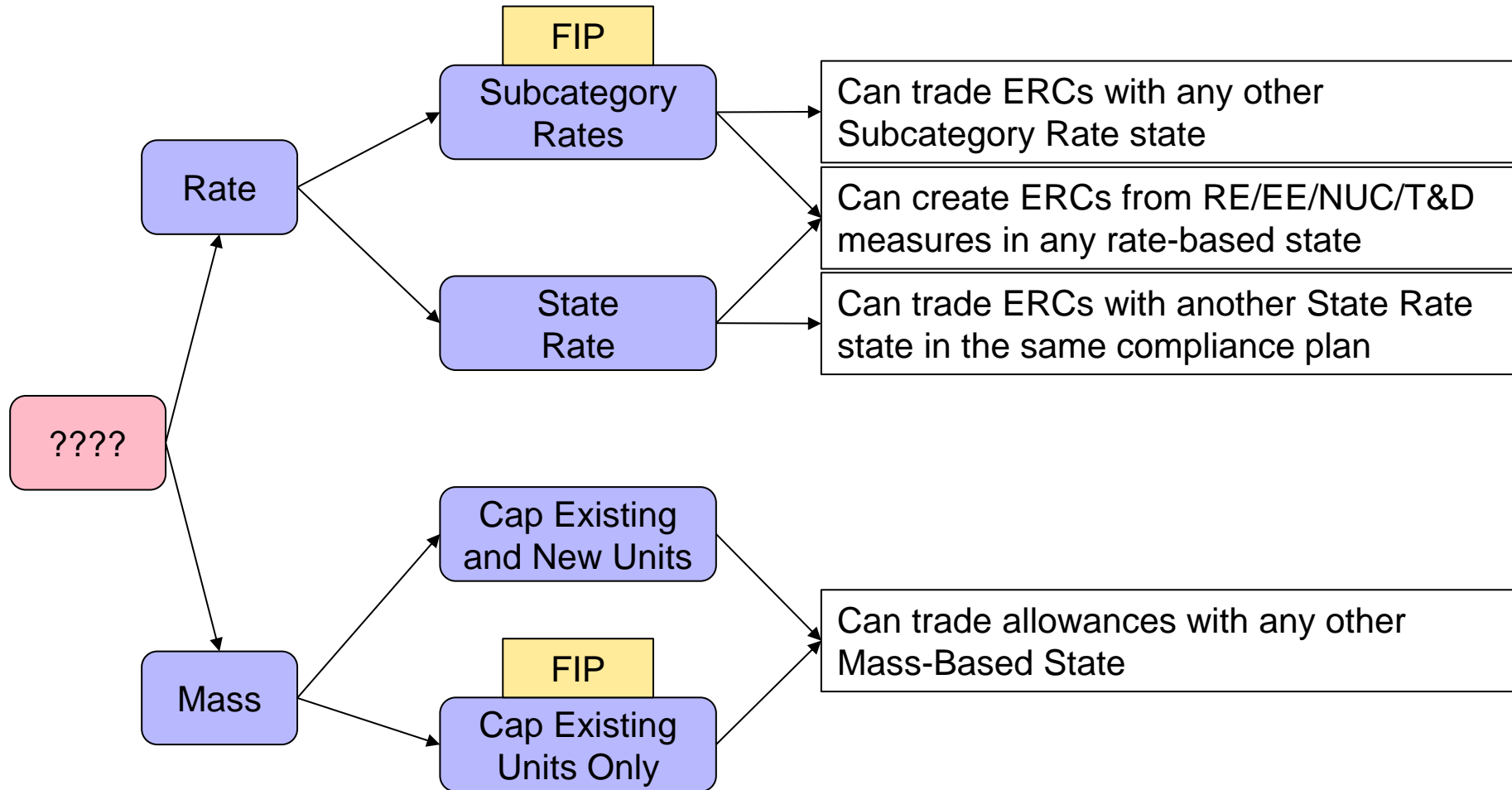


Wide range implies different costs => trade

Four Main Compliance Pathways



Trading Opportunities Under the Four Main Compliance Pathways



How to Comply: Mass

- Mass compliance means each units' annual emissions must be under its total allowance for the year
- Compliance options include
 - Reduce generation from the unit, until total emissions are less than total allowances
 - Convert to gas, retrofit to CCS, or other unit level improvements to reduce emissions from the unit
 - Purchase additional allowances from other units in-state, or from out of state [only from mass-based states]
- Allowances are denominated in short tons CO₂
- The mass-FIP suggests that allowances be allocated according to average historical generation from 2010-2012

How to Comply: Rate

- Rate compliance means each unit's **adjusted emissions rate** must be at or under the standard

$$\text{Adjusted Emissions Rate (AER)} = \frac{\text{Unit Emissions (lbs)}}{\text{Unit MWh} + \text{ERC MWh}}$$

Where ERC = **Emission Rate Credits** (in MWh)

- E.g. Suppose a coal unit produces 1 MWh with 2000lb CO₂.

$$\text{Before Compliance AER} = \frac{2000\text{lbs}}{1 \text{ MWh} + 0\text{ERCs}} = 2000 > 1305$$

- What are the options for getting the adjusted emissions rate down to the 1305lb/MWh target?
 - Lower the unit's emissions directly; OR
 - Purchase or create ERCs

How to Comply: Rate

- Option 1: Lower unit emissions to 1305 lb/MWh or less
 - i.e. convert to gas or retrofit to CCS. Assume retrofit to 50% CCS.

$$AER = \frac{1000lbs}{1 MWh + 0 ERCs} = 1000 < 1305$$

- In this case, the unit is now over-complying and will generate Emission Reduction Credits (ERCs) that it can sell
 - Option 2: Purchase or create ERCs
 - e.g. Build renewables, or buy ERCs from renewable generators
- $$AER = \frac{2000lbs}{1 MWh + 0.535ERCs} = 1305$$
- In this case, need to generate 0.535MWh from a new renewable or new nuclear unit for each 1MWh generated from the coal unit
 - Options 3+....: Combinations of (1) and (2)

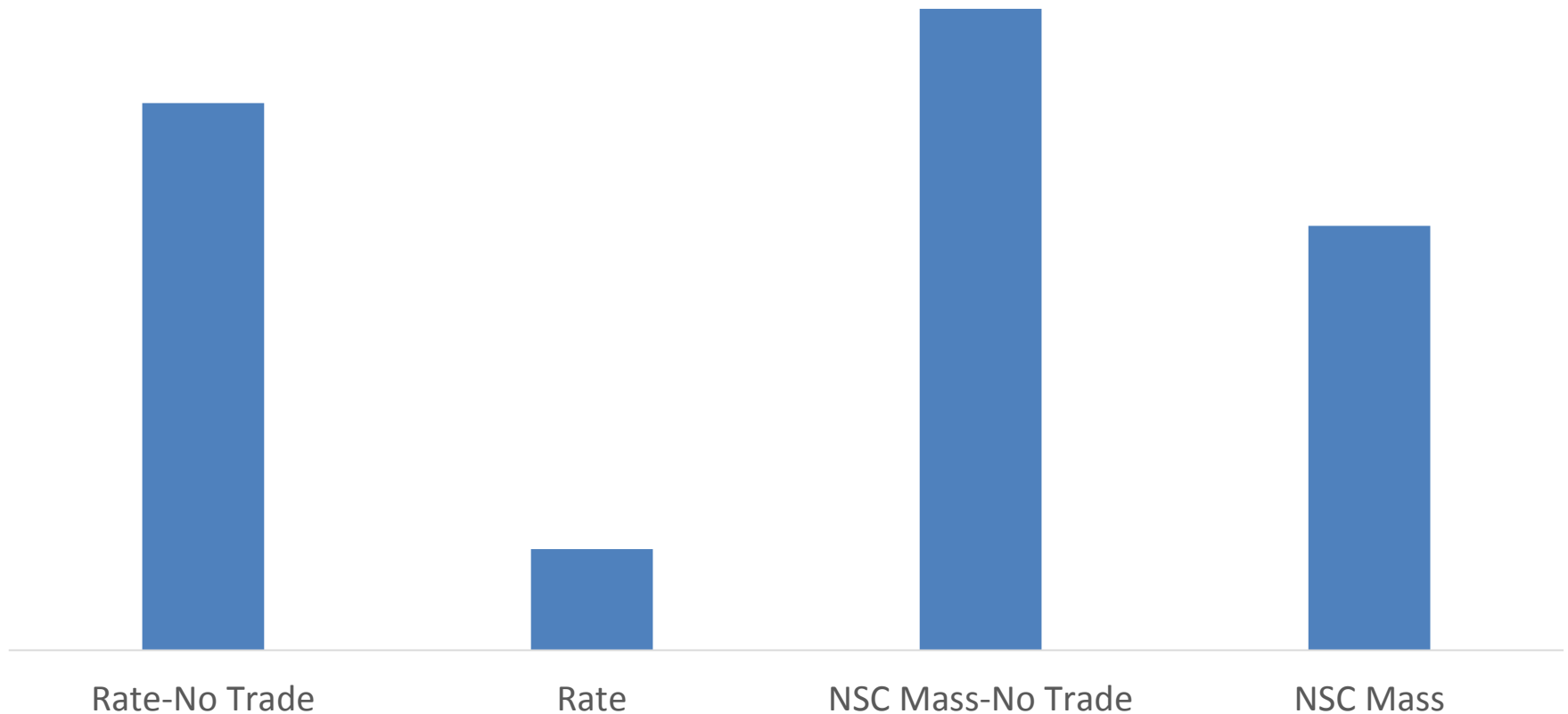
Types of ERCs that State X can Create

	Z-ERC	F-ERC	GS-ERC
Description	Created by new zero CO ₂ measures such as RE/EE/NUC/T&D. 1 ERC per MWh.	Created by affected EGUs over-complying vs. target rate.	Created by existing NGCCs generating more than their 2012 baseline, per EPA formula
Geographic Restrictions	Can be created by State X for measures taken in any other rate-based state*	Can be created by State X by over-complying existing EGUs located in State X.	Can be created by State X by existing NGCCs only in State X and ONLY if State X does Subcategory Rate
Usage Restrictions	Can only be used in State X unless inter-state trading allowed	Can only be used in State X unless inter-state trading allowed	Can only be used by steam units in State X [unless inter-state trading allowed???

* May also be created by *new renewable generation* in mass-based states, Canada, or Mexico, provided the power from the units is sold to any rate-based state.

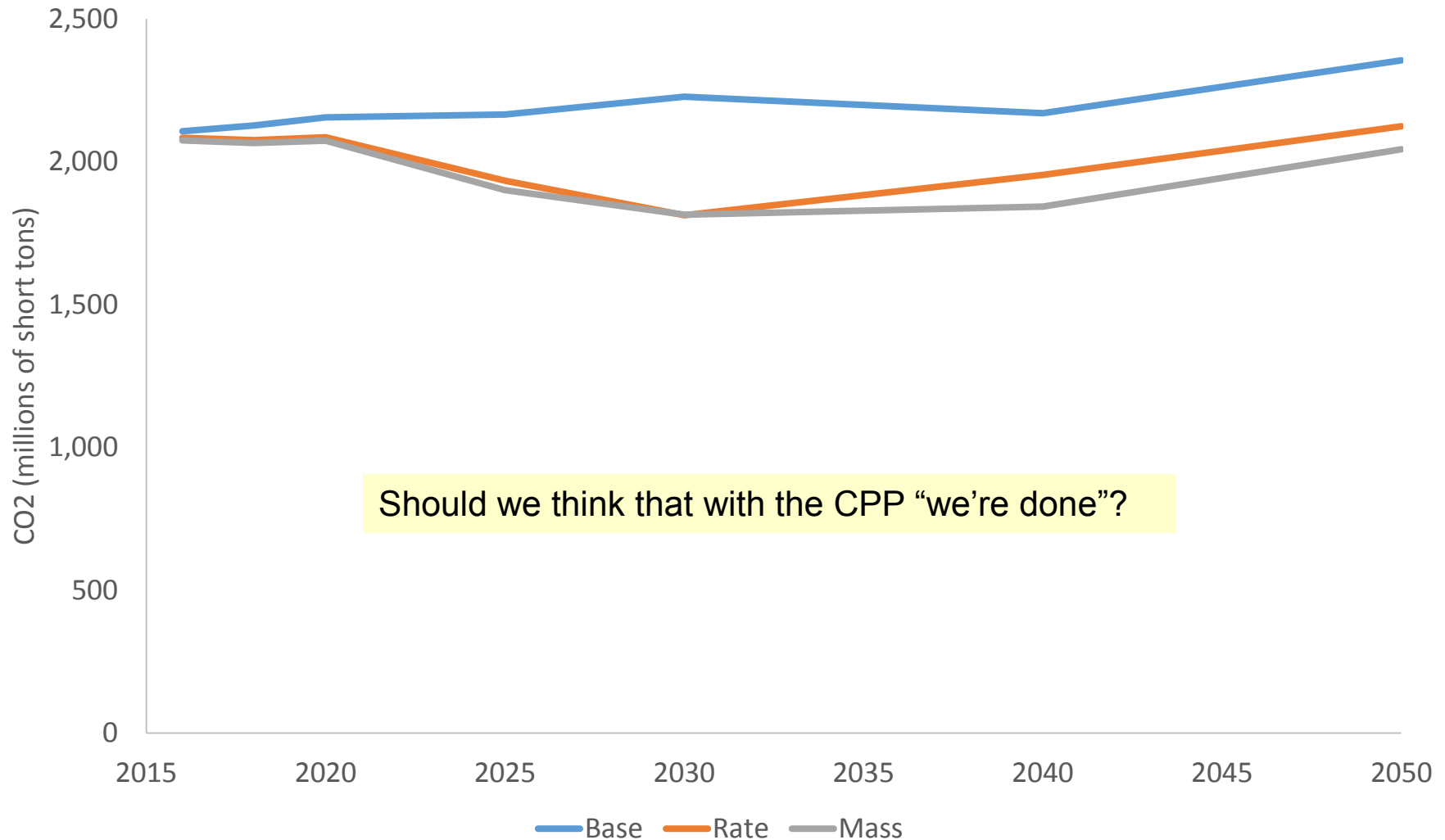
PRELIMINARY/Illustrative -- State Choices for Rate vs Mass Pathways and Ability to Trade Greatly Impact Costs

US48 Total Compliance Cost (PV 2015 to 2050)



EPA's Simulation of CPP's Shows CO₂ Dropping by 2030, but Recovery in Emissions in Later Years

CO₂ by CPP Compliance Pathway (EPA/IPM Estimates)



Final Clean Power Plan is Not Final: Opportunity to Inform Trading Provisions

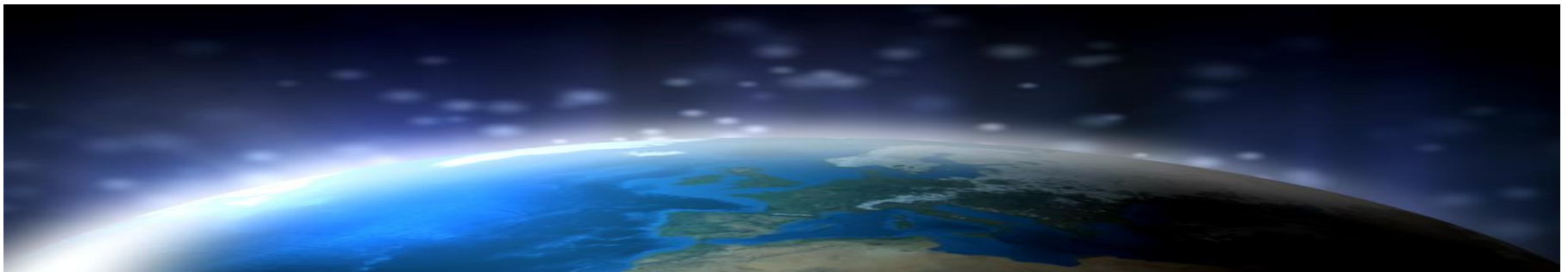
- 90-day Comment Period – starting in October?
- Plan for final rule by summer 2016
- EPA would promulgate a federal plan in any state that does not submit an *approvable* plan and then implement the plan on power companies.
- EPA is proposing and seeking comment on:
 1. A rate-based federal plan for each state *based on model rule*
 2. A mass-based federal plan for each state *based on model rule*



EPA intends to finalize a single Federal plan type (rate or mass) based on comments

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Together...Shaping the Future of Electricity

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