Clean Power Plan
Meeting the Challenge

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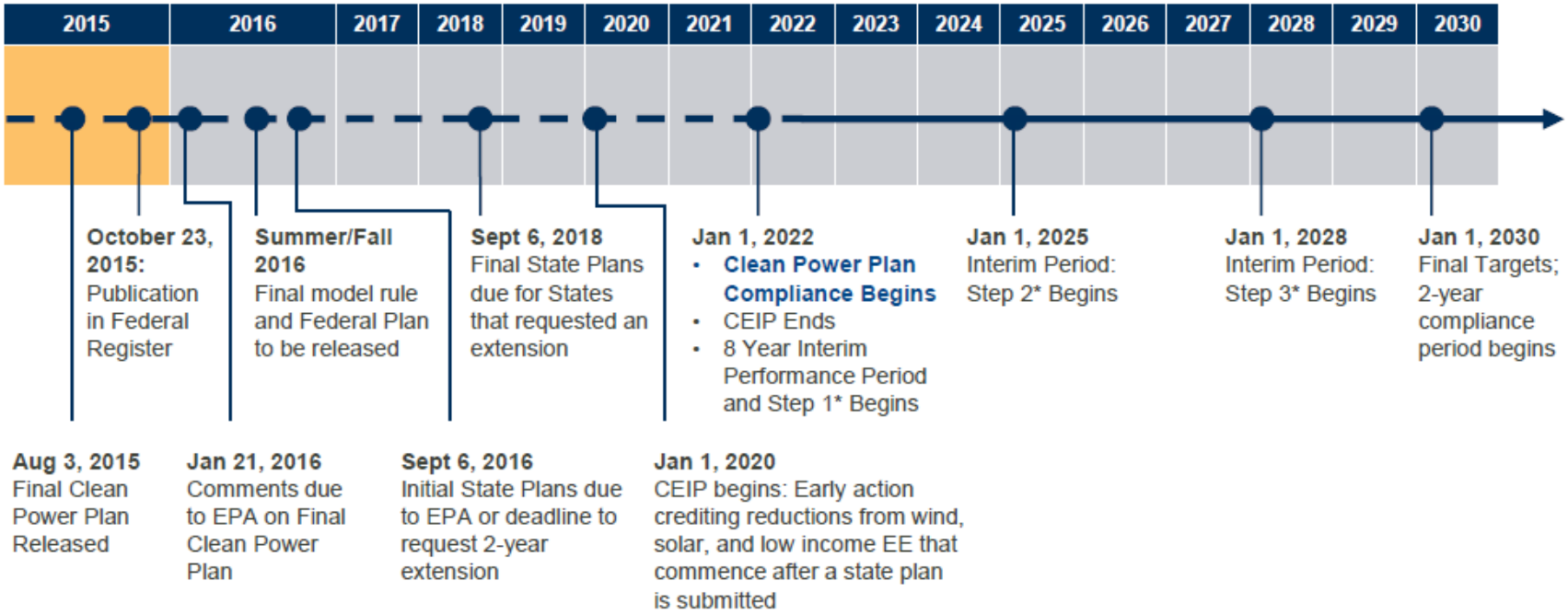
Dominion®

Clean Power Plan Compliance Timeline

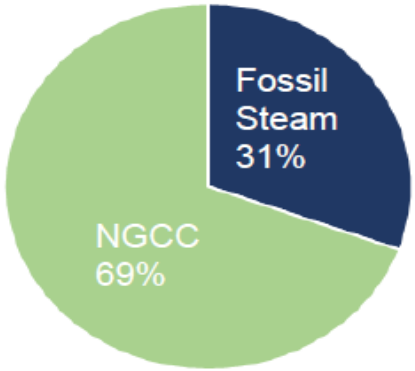


Option 1: Nationwide Dual Emissions Standards

Subcategory	Interim Standards	Final Standards
Fossil Steam Units	1,534 lb/MWh	1,305 lb/MWh
NGCC	832 lb/MWh	771 lb/MWh

Option 2: Rate - State "Blended" Fossil Standards

VA

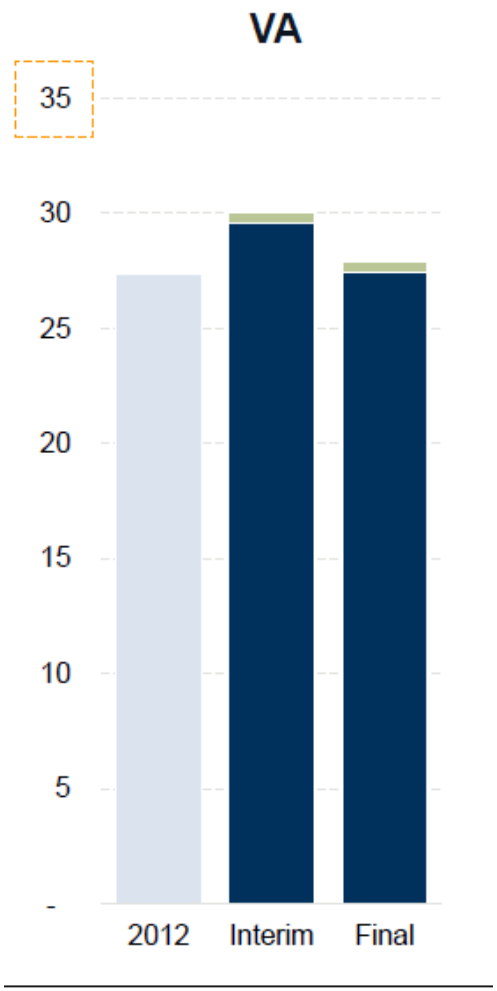


*2012 State Generation**

Category	Interim Standards	Final Standards
All Affected EGUs	1,047 lb/MWh	934 lb/MWh

Options 3 & 4: Mass – Existing Sources Only & including New Sources

VA	2012 Baseline	Interim Targets	Final Targets
Existing Sources	27.37	29.61	27.47
New Source Complement	–	0.45	0.40

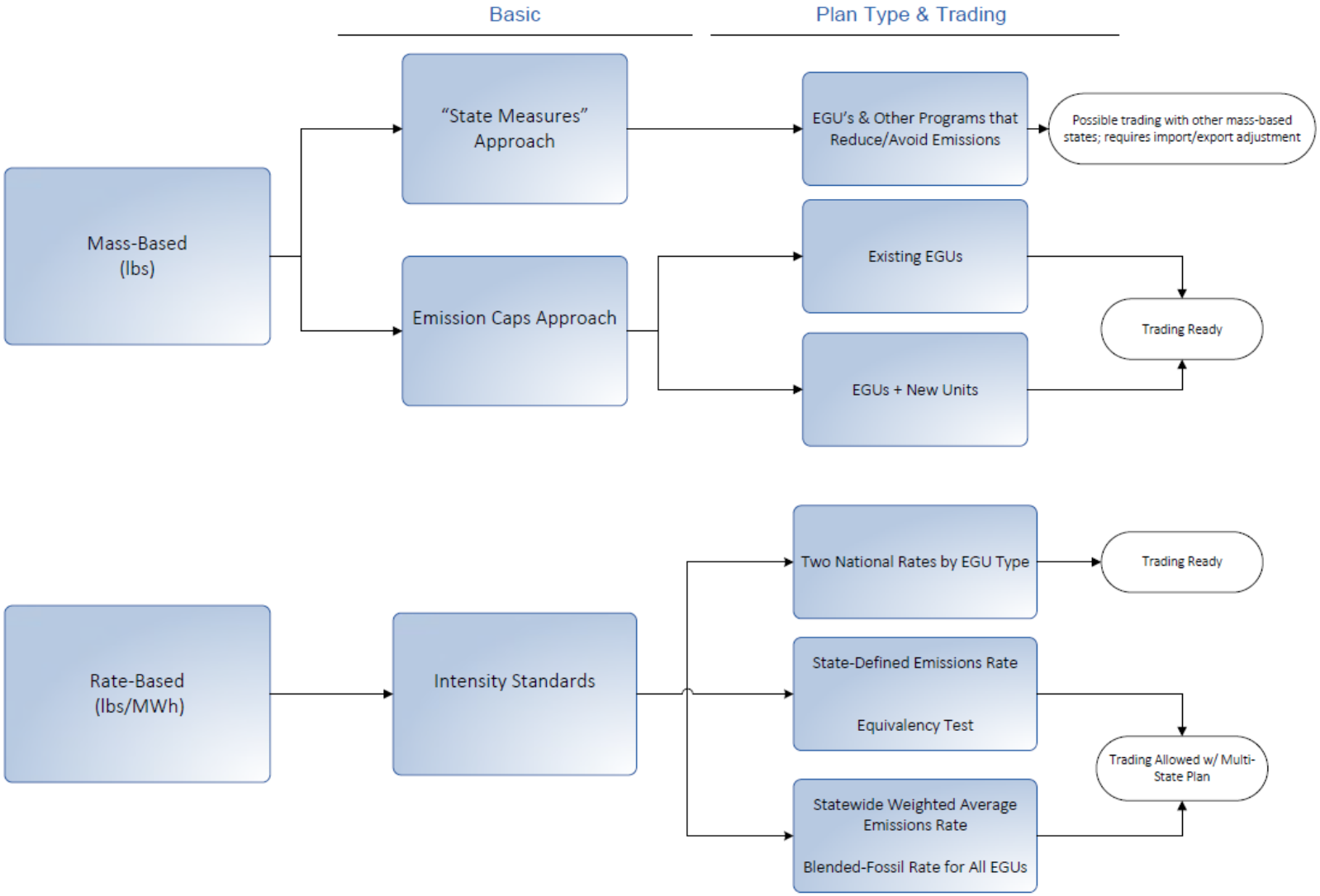


Final CPP – Six Compliance Options

- Rate-Based (Intensity) Compliance # CO2 / MWh
  1. State average emissions performance rate (VA = 934 #/MWh)
  2. Subcategorized national performance rates (dual rate)
     - 771 #/MWh gas CC units
     - 1305 #/MWh steam units (coal, gas boiler, heavy oil)
  3. Unique emission performance rates (not to exceed state limit)

- Mass-Based Compliance Ton Cap
  1. Emissions Cap: existing units only
     - Leakage
  2. Emission Cap: all units
     - Includes new CCs
     - Apprx 1.4 % increase in total cap (not per year but total entire period)
  3. State measured approach (Unique approach)

State Plan Options



State Plan Design Components

- Rate base or mass base compliance regime
- Alternate Interim reduction goals
- Allocation of emission reduction credits in rate based plan
- Allocation of allowances in mass based plan
- ERC tracking system required for rate-based plan
- Address “leakage” from new units in mass based plan
- Credit or allowance set-asides for renewable energy and energy efficiency programs
- Participation in the Clean Energy Incentive Program – early credits or allowances awarded 2021-2022
- Biomass – eligible for compliance; “qualifying” biomass?
- Accept allowances or credits from out-of-state sources
- Establish Evaluation, Measurement & Verification (EM&V) plans with annual reports

Dominion Considerations

- Key Considerations for State Engagement and Comments to EPA
  - Load growth
  - Construction of new NGCC
  - Potential retirement of existing nuclear and construction of new nuclear
  - Rate- and mass-based trading markets
  - Open for comment/uncertain:
    - Leakage
    - Allocation approaches
    - ERC crediting
    - Mount Storm

ERC Creation – Overview

Under the dual-rate structure in the proposed state model rule for rate-based trading, ERCs can be created by three categories of activities:

1 Incremental Zero-Emitting Energy and Energy Efficiency

- Renewable & nuclear capacity installed post-2012
- Energy efficiency projects begun post-2012
- Each MWh generated / saved creates one ERC

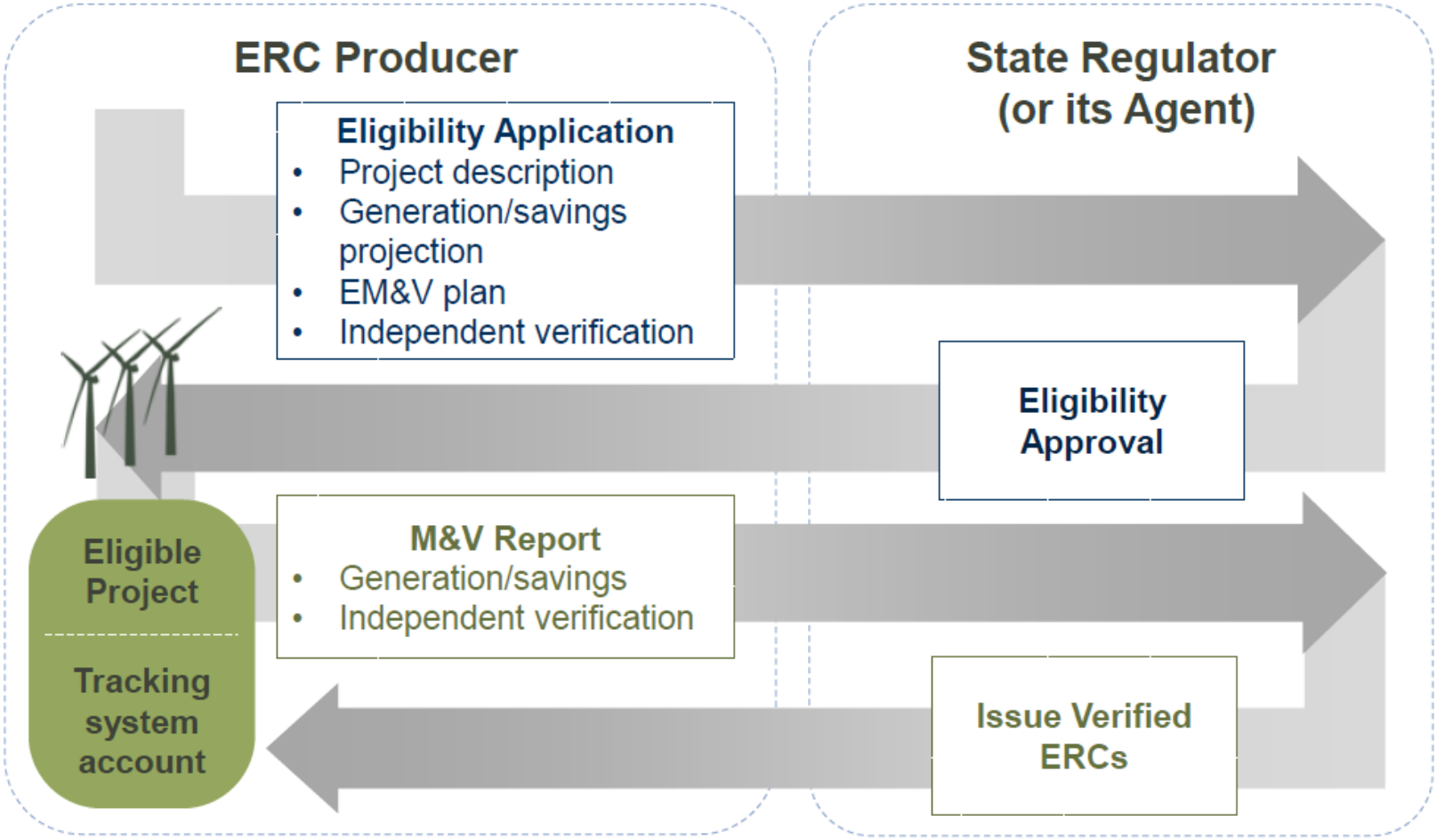
2 Affected EGUs

- Any affected EGU that emits at a rate below its compliance target
- Number of ERCs generated per MWh based on difference between EGU rate and compliance rate

3 Existing NGCC

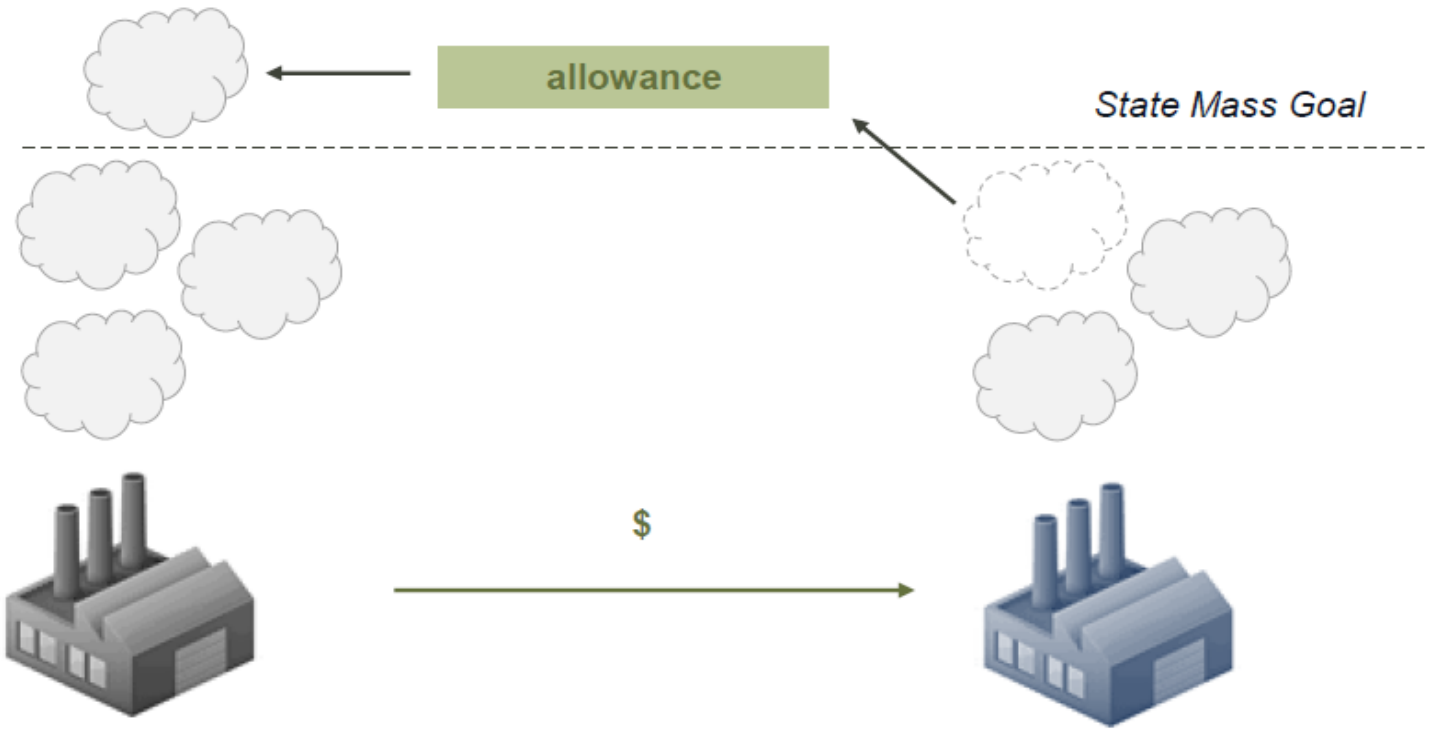
- All NGCCs earn partial "Gas Shift ERCs" for every MWh
- Provide credit for increases in NGCC generation projected to displace coal-fired generation
- GS-ERCs can only be used by fossil steam sources for compliance

ERC Issuance Process: Non-Regulated Sources



Mass-Based Approach

One allowance = one ton of CO_2 emissions



A facility that produces more emissions than it has allowances may purchase allowances from another facility that has extra allowances

CPP- Virginia Best Compliance Options

- Rate-Based (Intensity) Compliance # CO2 / MWh

Subcategorized national performance rates (dual rate)

- Allows for growth within Virginia
- Trading Ready
- Can earn Gas Shift ERCs
- Beneficial to Renewable Generators and Energy Efficiency
- Helps preserve option of new nuclear
- Stakeholders can plan
- Implementation: EM&V and unit tracking

- Mass-Based Compliance Ton Cap

Emissions Cap: existing units only

- Allows for growth within Virginia
- Trading Ready
- Can earn Gas Shift Allowances (assuming set aside)
- Implementation: Less EM&V but Set Asides and Leakage

A rate based approach is better for economic growth, better for promoting renewables and energy efficiency, and better for customers and VA's economy.

Summary

- CPP rule details will not be final until Summer 2016.
  - Model Trading Rules
    - Leakage (nuclear retirements)
    - Set asides (particularly EE and nuclear)
    - GS ERCs and GS Allowances (Calculations)
  - Renewable definition (especially biomass)
  - Trading ability between states
  - CEIP (Clean Energy Incentive Program) Rules
- CPP implementation will be uncertain until the <u>final</u> State Plan is filed.
- Critical items in VA State Plan:
  - Path chosen: Mass or Intensity plus sub category
  - If Mass, “leakage” prevention, set asides percentages
- The path chosen by other states (Intensity, Mass): Trading implications

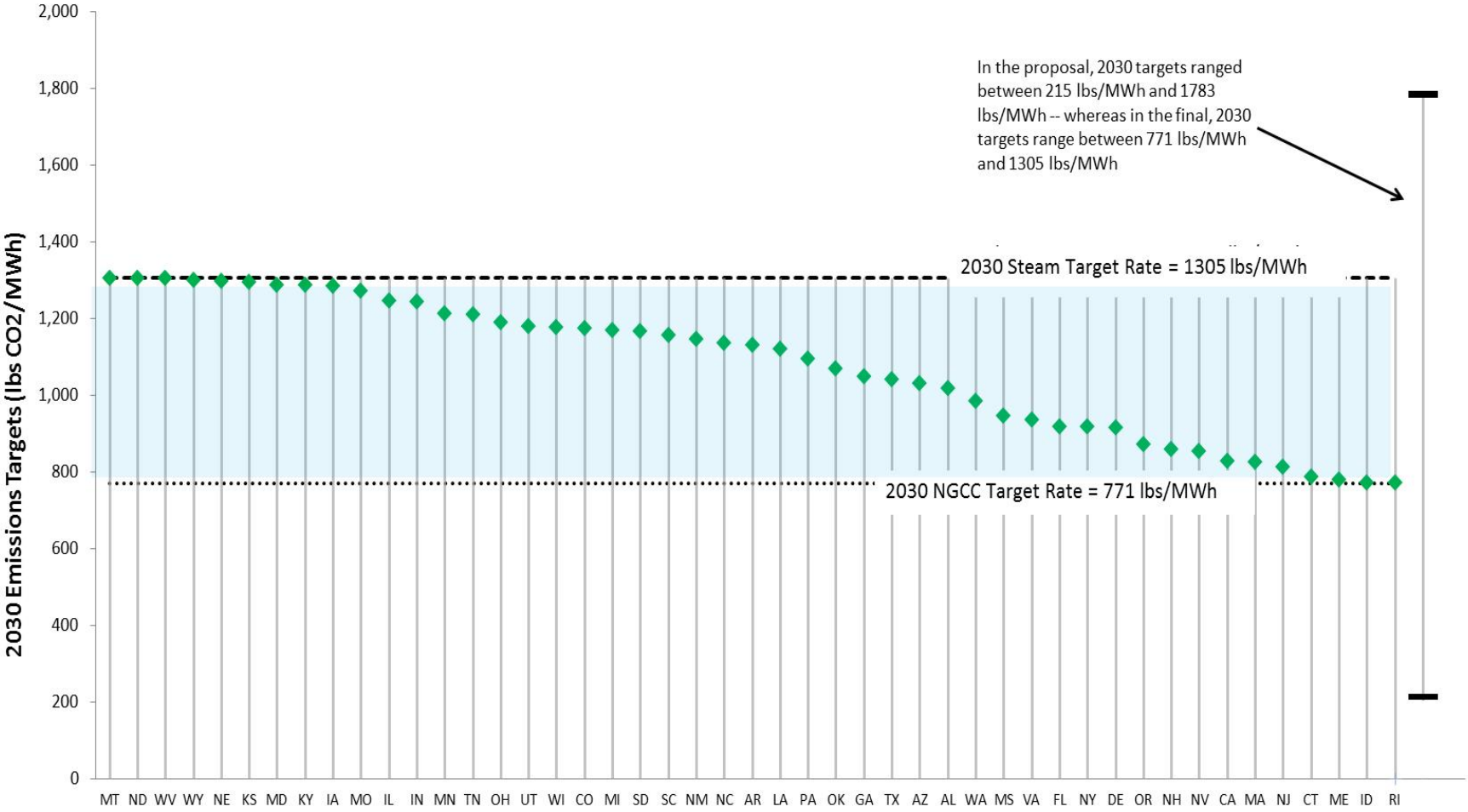
STATE PLANS AND TRADING IN EPA'S CLEAN POWER PLAN

Kevin Steinberger
November 2015

State Plans

- States have a range of flexible options to design plans:
  1. The dual-rate approach [trading-ready]:
     - States write plans that enforce the two national emission rate limits on coal and gas plants. Each plant meets the applicable rate limit through reducing its own emissions and investing in emission reducing actions at other locations in the power system.
  2. State-specific emission rate limits:
     - Limits are a blend of the national emission rate limits for coal and gas plants, weighted to reflect the mix of electricity generated from the two types of plants in each state at the starting point in 2012.

Final Power Plant Limits by State in 2030



State Plans, continued

3. Mass-based limits [trading-ready]:
   - Limits on how many tons of pollution a plant may emit each year, rather than the amount of pollution per unit of electricity generated;
   - These limits convert state-specific emission rate limits to an equivalent amount of tons per year;
   - States can either choose to include both existing new and fossil-fueled plants, or only existing plants while accounting for leakage.
4. State measures plans:
   - States can adopt state laws like RPS's to place obligations on entities other than fossil-fueled power plants.

- Other requirements:
  - Plans must demonstrate that they are enforceable, achievable, with adequate monitoring and reporting, that consider system reliability, and show that the state has engaged stakeholders and low-income communities.

Trading in Rate-based Plans

$$Effective\ Emissions\ Rate\left(\frac{lbs}{MWh}\right) = \frac{lbs\ CO2\ emissions}{MWh\ generated + ERCs\ purchased}$$

- Emission Rate Credits (ERCs) represent 1 MWh of zero-emitting generation or savings
- Blended rate: For ERCs to be tradable, states have to agree to a common blended rate
  - ERCs can be contracted from any project that "benefits the state"
  - There is must be a demonstration of deliverability (e.g. PPA) to a rate-based state in order for a project in a mass-based state to generate ERCs
- Dual-rate: ERCs are tradable within the trading zone (default: national trading)

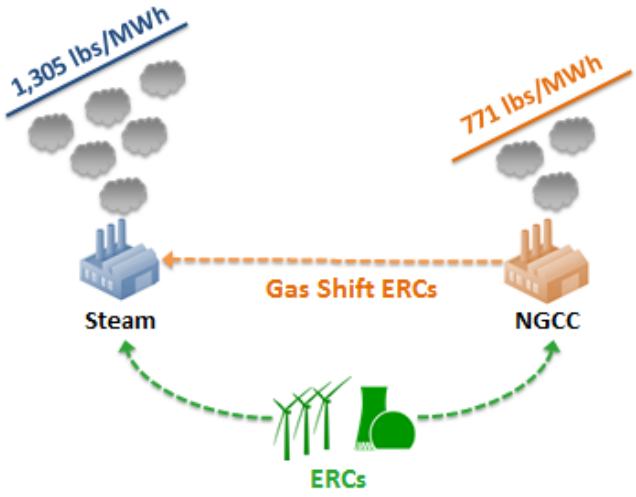


Figure source: Georgetown Climate Center

Trading in Mass-based Plans

- Power plants must hold an allowance (a permit) for each ton of CO_2 emitted
- States have a total number of allowances corresponding to their emissions budget
  - States can distribute allowances in a number of ways (e.g. auction, output-based, historical)
- Power plants can trade allowances with each other within a state, or within a multi-state jurisdiction – a change in geographic scope does not change the nature of an allowance ("a ton is a ton")

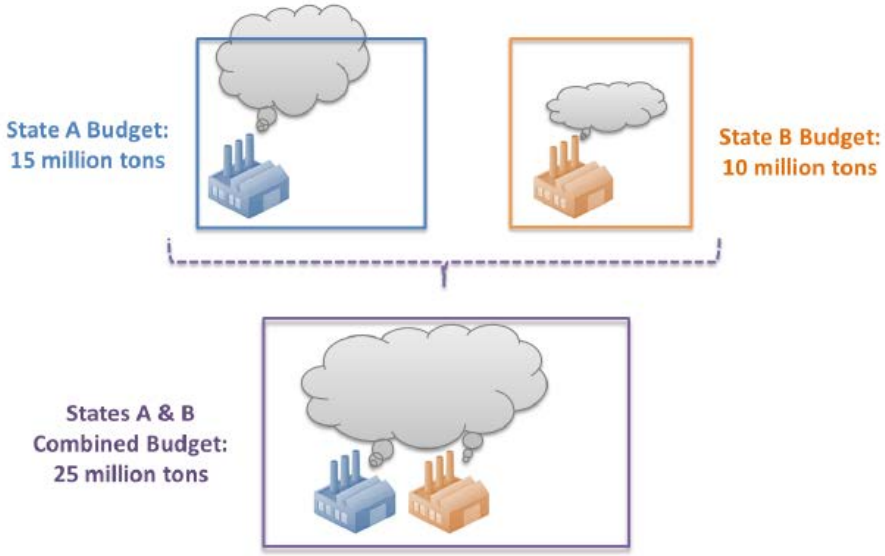


Figure source: Georgetown Climate Center

More Details: Multi-State Trading

Mechanisms to facilitate linkage and trading of market-based instruments across state borders:

Three basic formats:

1. Multi-State Mass- Based: As under the Regional Greenhouse Gas Initiative (RGGI), a group of states can agree to allow power plants to trade emissions allowances with each other across state lines. States can also aggregate their tonnage limits into one combined budget, but this is not a prerequisite for allowance trading.
2. Multi-State Rate- Based: A group of states with emission rate targets can allow power plants to trade emission reduction credits (ERCs) across state lines, if the states blend their enforceable emission limits into one weighted average rate.
3. Multi-State Performance Standard Approach: States that adopt the two-rate approach (separate performance targets for coal steam units and NGCC units), can allow power plants to trade with others located in any other two-rate state.

- For the Mass-Based and Dual-Rate approach, states can submit "trading ready" plans individually or in groups.
- States with approved multi-state plans can allow their plants to only trade credits or allowances with plants in states with approved plans of the same type.
- Allows power plants states to participate in a larger markets and reduce costs, without states having to develop formal regional plans with other states.

THE REGIONAL GREENHOUSE GAS INITIATIVE
An Initiative of the Northeast and Mid-Atlantic States of the U.S.

Regional Greenhouse Gas Initiative: Lessons Learned

Secretary Ben Grumbles
Maryland Department of the Environment
November 16, 2015 – Solar Focus 2015

www.rggi.org

RGGI in Brief

- Northeast and Mid-Atlantic states cap and reduce carbon dioxide emissions from the power sector
  - Power plants 25 MW or greater to hold one CO_2 allowance for each ton of CO_2 emitted
  - Three-year control periods starting with 2009-2011, currently in third control period (2015-2017)

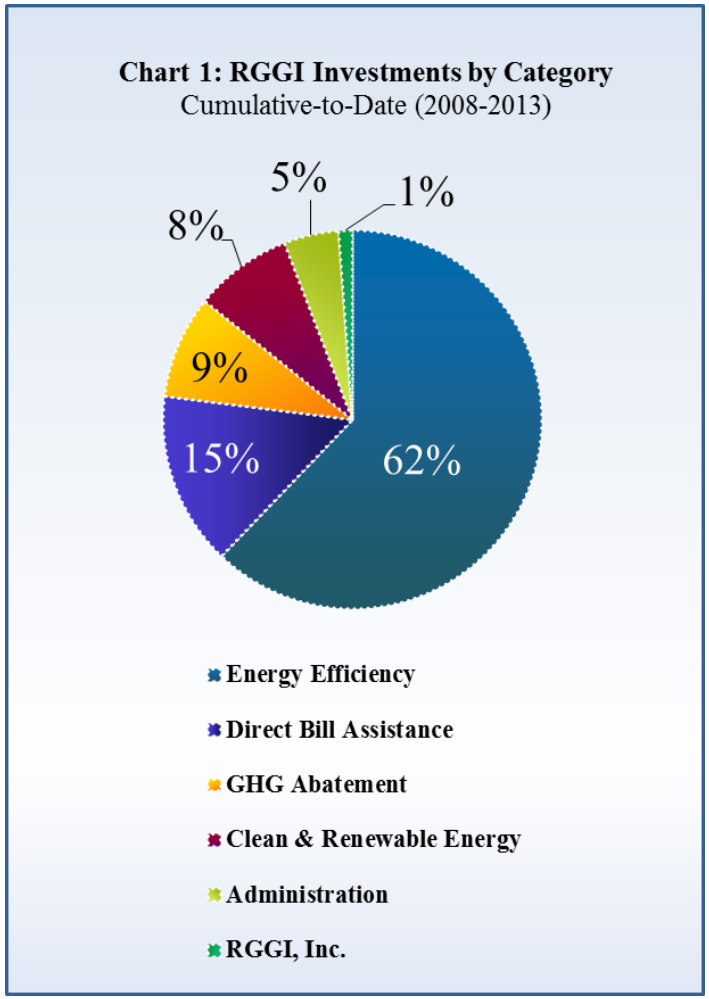
- CO_2 Cap: 88.7 million short tons in 2015, and declines 2.5 percent each year until 2020
  - Cost containment reserve (CCR) of 10 million allowances

RGGI in Brief

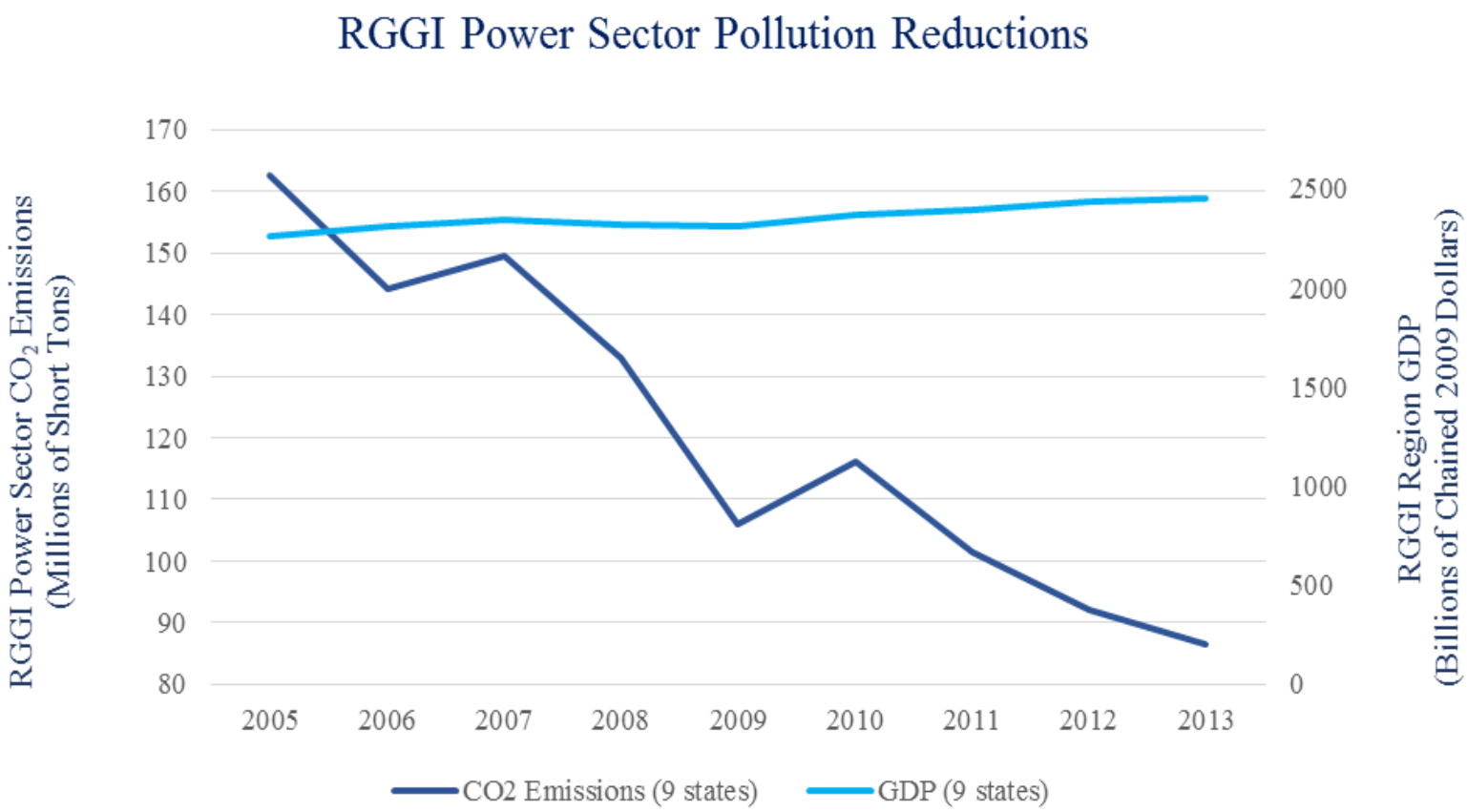
- Quarterly regional CO_2 allowance auctions
  - CO_2 allowances are issued by each state
  - Compliance occurs at the state level
  - One tradable CO_2 allowance market - CO_2 allowances are fungible across the multi-state region
  - CO_2 allowances issued by any participating state can be used for compliance in any of the participating states
- Auction proceeds strategically invested by the states
- Centralized allowance tracking and emissions tracking platform (RGGI COATS)
- RGGI requires an Independent market monitor of auction and results

RGGI's Efficient Market-Based System

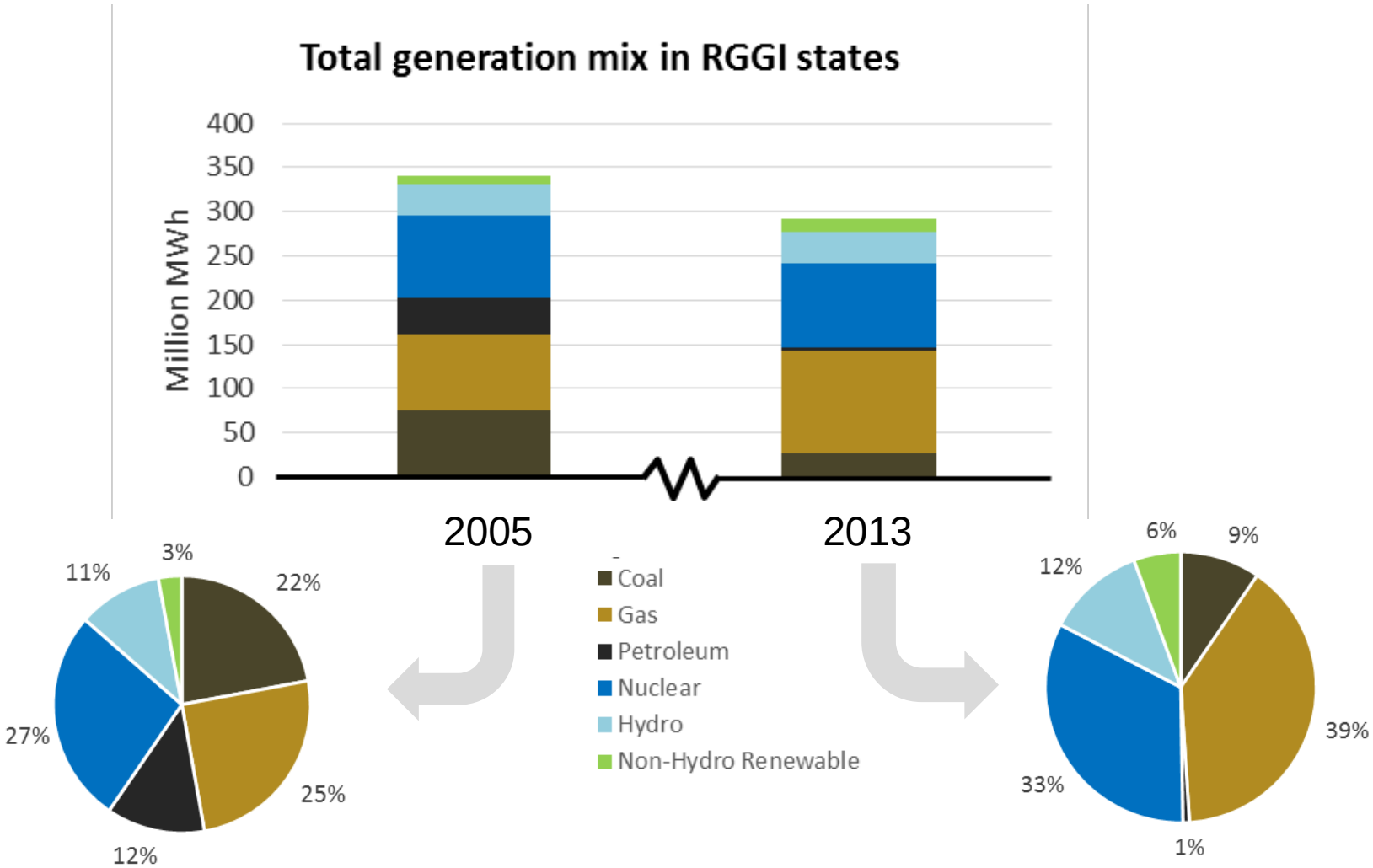
- RGGI states have distributed approximately 90% of allowances by auction
- More than $2 billion in auction proceeds through 29 auctions
- Invested more than $1 billion of auction proceeds in a range of energy efficiency, clean and renewable energy, direct bill assistance, GHG abatement programs



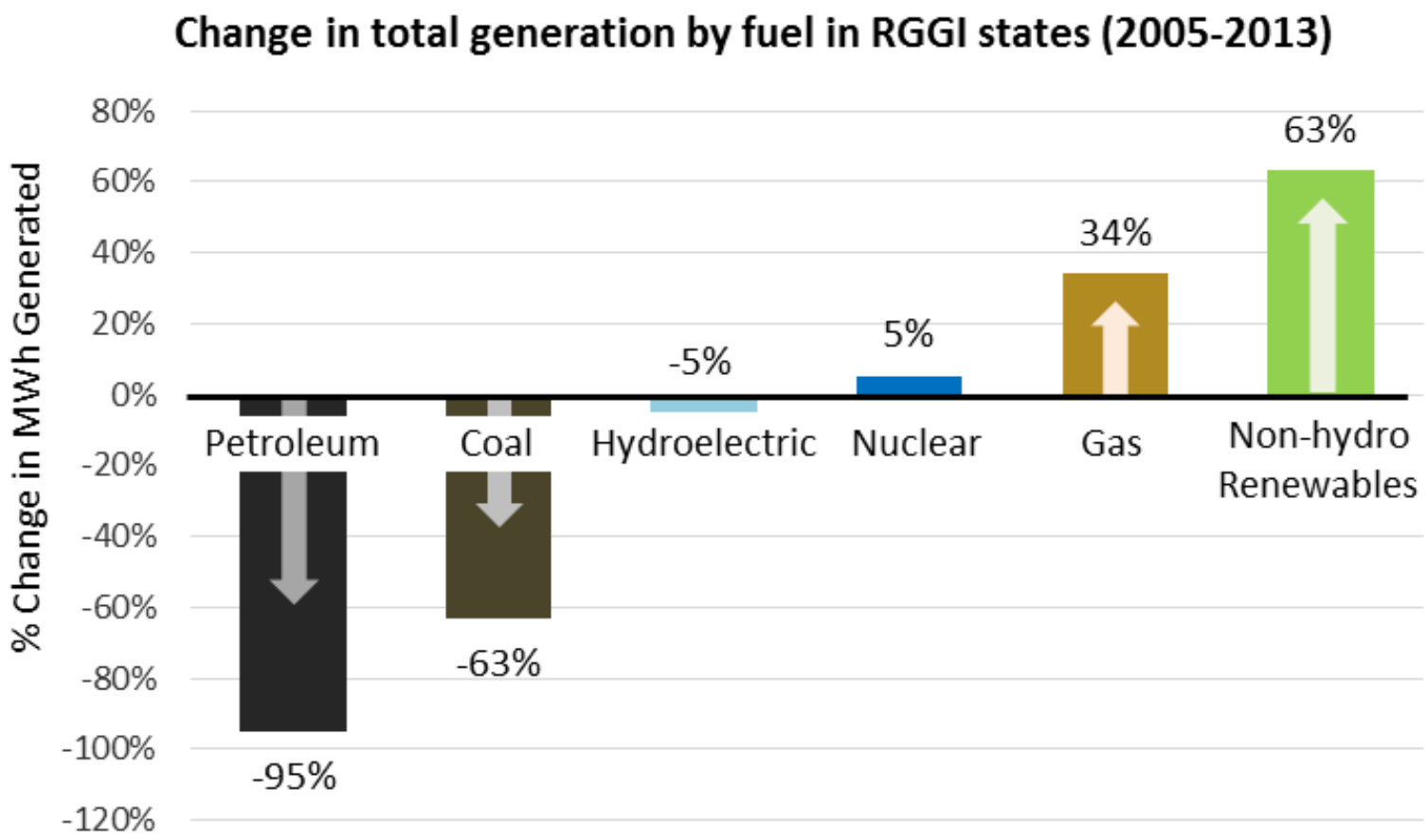
RGGI Experience: Environmental Benefits



RGGI Experience: Total Generation Mix



RGGI Experience: Total Generation Change



RGGI Experience: Maryland

- Maryland Solar Story:
- 2007 - <.1MW of Solar on grid in Maryland
- Through RGGI, Maryland solar on grid increased to over 340 MW today

Lessons Learned:
Why Market-Based, Multi-State Cap?

- Proven, cost-effective model
- Closely aligns with the regional nature of the electricity grid
- Simple, transparent, and verifiable tracking and compliance system
- Fosters regional cooperation and active stakeholder engagement

SOLAR FOCUS: OPPORTUNITIES FOR ADVANCED ENERGY IN THE CLEAN POWER PLAN

November 16, 2015

Malcolm Woolf

Senior Vice President, Policy and Government Affairs, AEE

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

AEE's Leadership Council

AES we are the energy
CLEAResult
Competitive Power Ventures, Inc.
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General Catalyst Partners
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Johnson Controls
Landis+Gyr
Microsoft
OPOWER
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SunEdison
SUNPOWER
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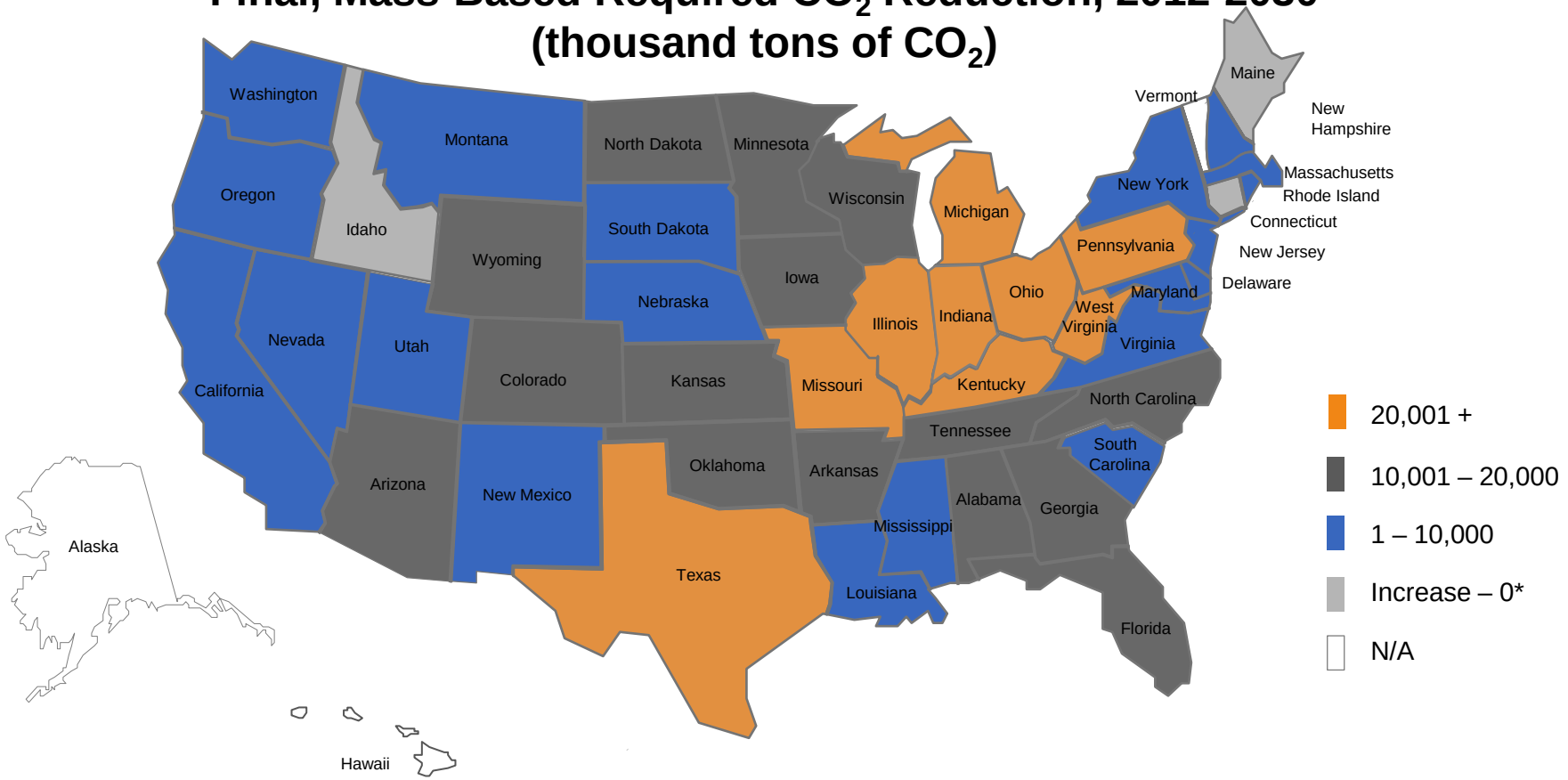
Clean Power Plan is a $20B Market Opportunity for Advanced Energy

Final, Mass-Based Required CO_2 Reduction, 2012-2030 (thousand tons of CO_2)

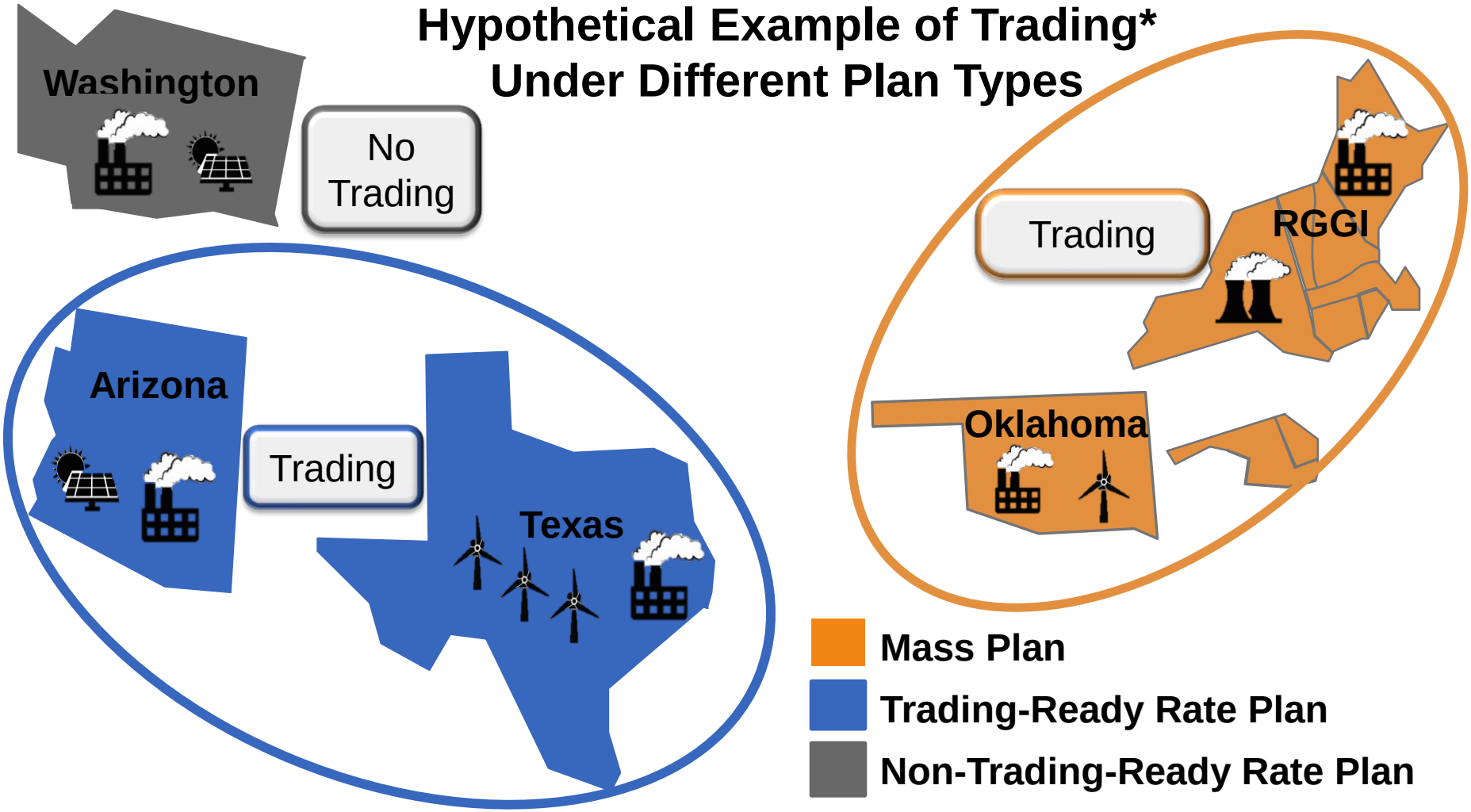


*Because the emission targets were set as rate-based lbs CO_2/MWh, three states are allowed a net increase in total tons CO_2 emissions under the Final CPP.

Source: http://www.epa.gov/airquality/cpp/tsd-cpp-emission-performance-rate-goal-computation-appendix-1-5.xlsx
Analysis by Advanced Energy Economy

Trading can further expand market opportunities, but depends on plan type

Hypothetical Example of Trading* Under Different Plan Types

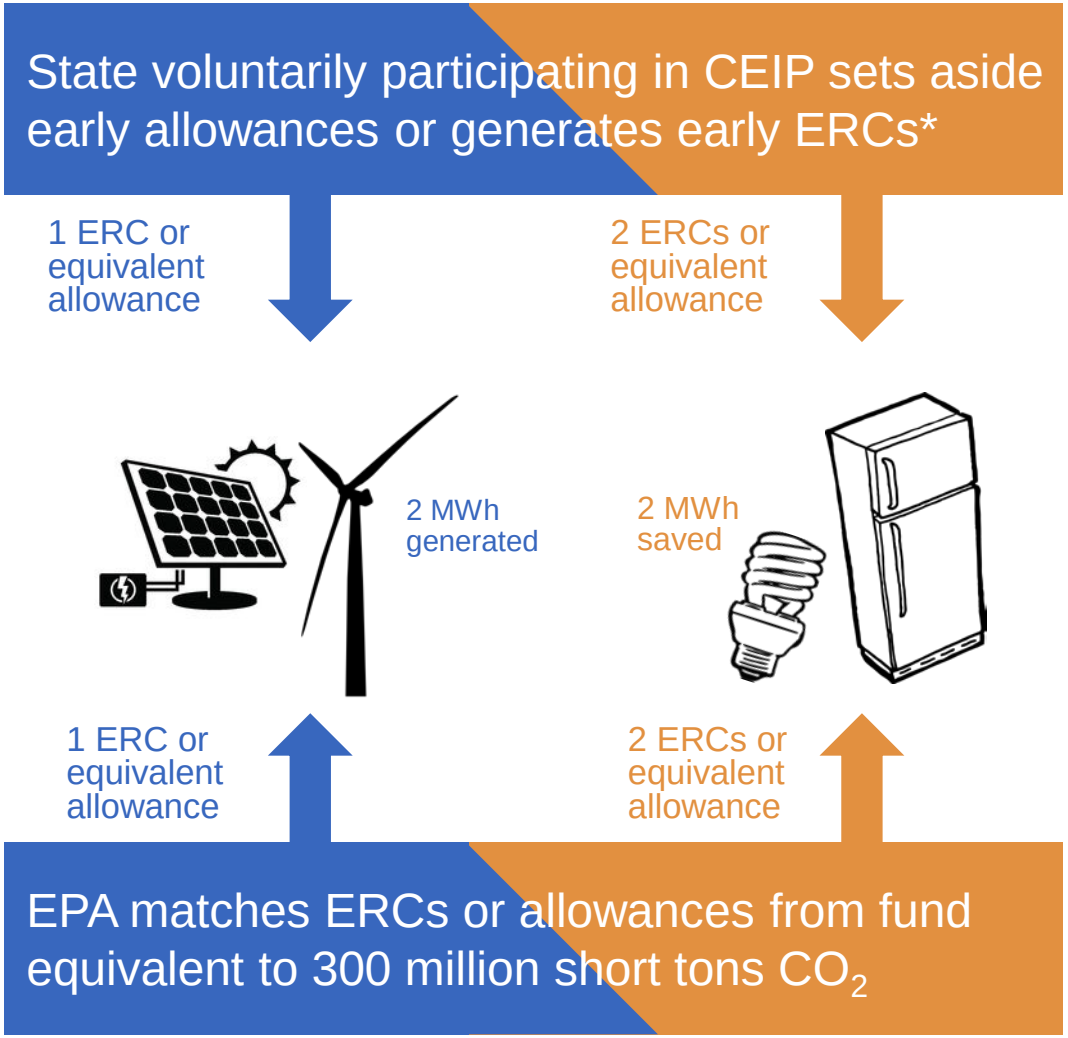


*Trading here refers to inter-state trading. Intra-state trading is still possible under non-trading-ready, rate-based plans.

Despite limits, Clean Energy Incentive Program could encourage early deployment

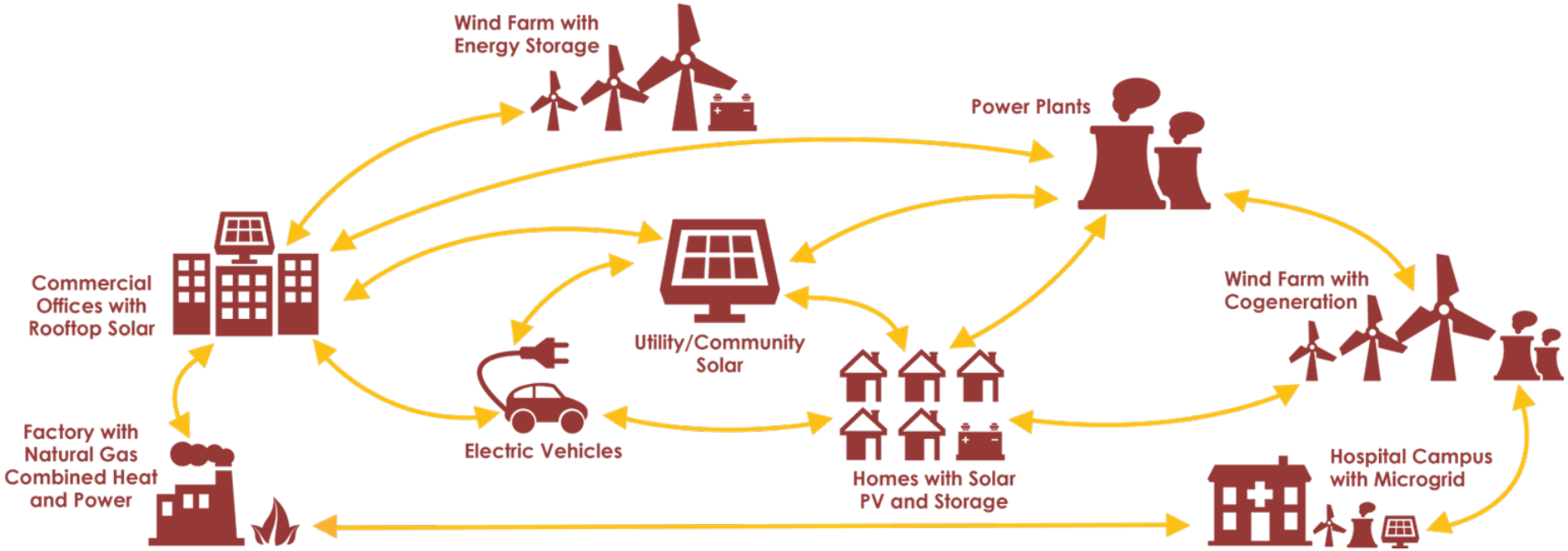
<u>Eligible projects:</u>

- Are metered wind/solar & EE in low income communities
- Are located in or benefit a state participating in CEIP
- Commenced construction (RE) or operation (EE) after final plan submission or Sept. 6, 2018
- Generated MWh or saved MWh in 2020 and/or 2021



CPP requires planning today to decarbonize electricity system that is only now emerging

- Greater customer engagement
- New products and services
- Greater focus on value vs. cost
- High DER penetration
- Two-Way Energy Flows
- Digitalization of the Grid



Source: Navigant, 2015

Further Questions?

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