

EPA Clean Power Plan: Implications for District Energy

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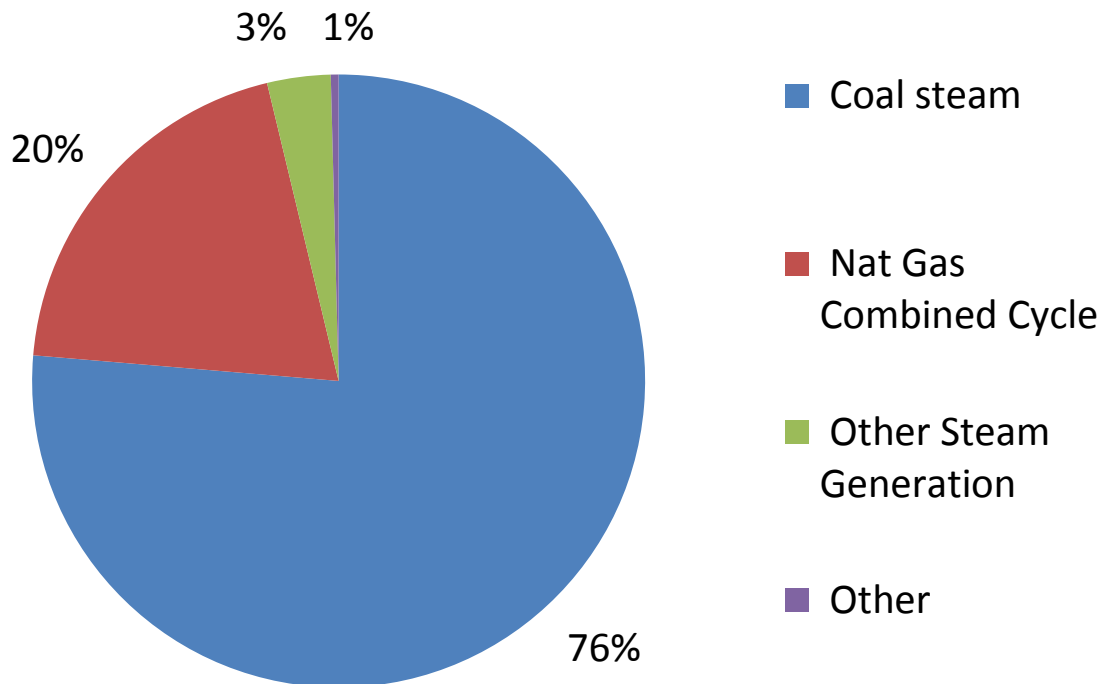
Purpose of Presentation

- Basics of the proposed rule
- Top 10 reasons states should include CHP in their Clean Power Plan
- Doing the math: 5 flavors of CHP

Basics of the Proposed Rule

What is an Affected Unit?

- Affected Electric Generating Units (EGUs) are fossil fuel plants designed to annually **sell to the grid** more than the following amounts of power:
 - More than 219,000 MWh; **and**
 - More one-third of the potential electric output.

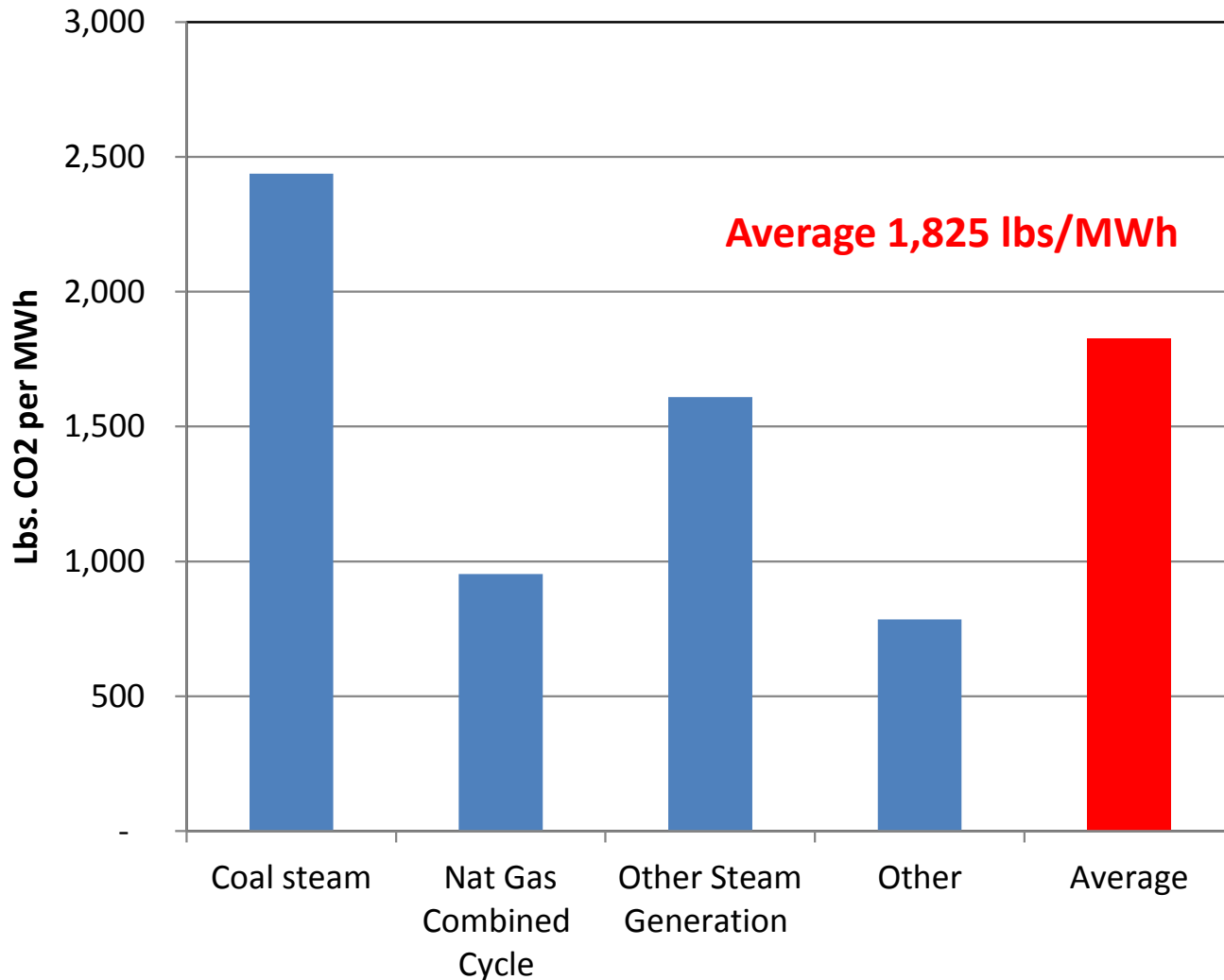


Emissions of Affected Units

- 1,100 Affected EGUs
- Total 2012 CO₂ emissions: *2.2 billion tons*

Basics of the Proposed Rule

Emission Rates of Affected Units



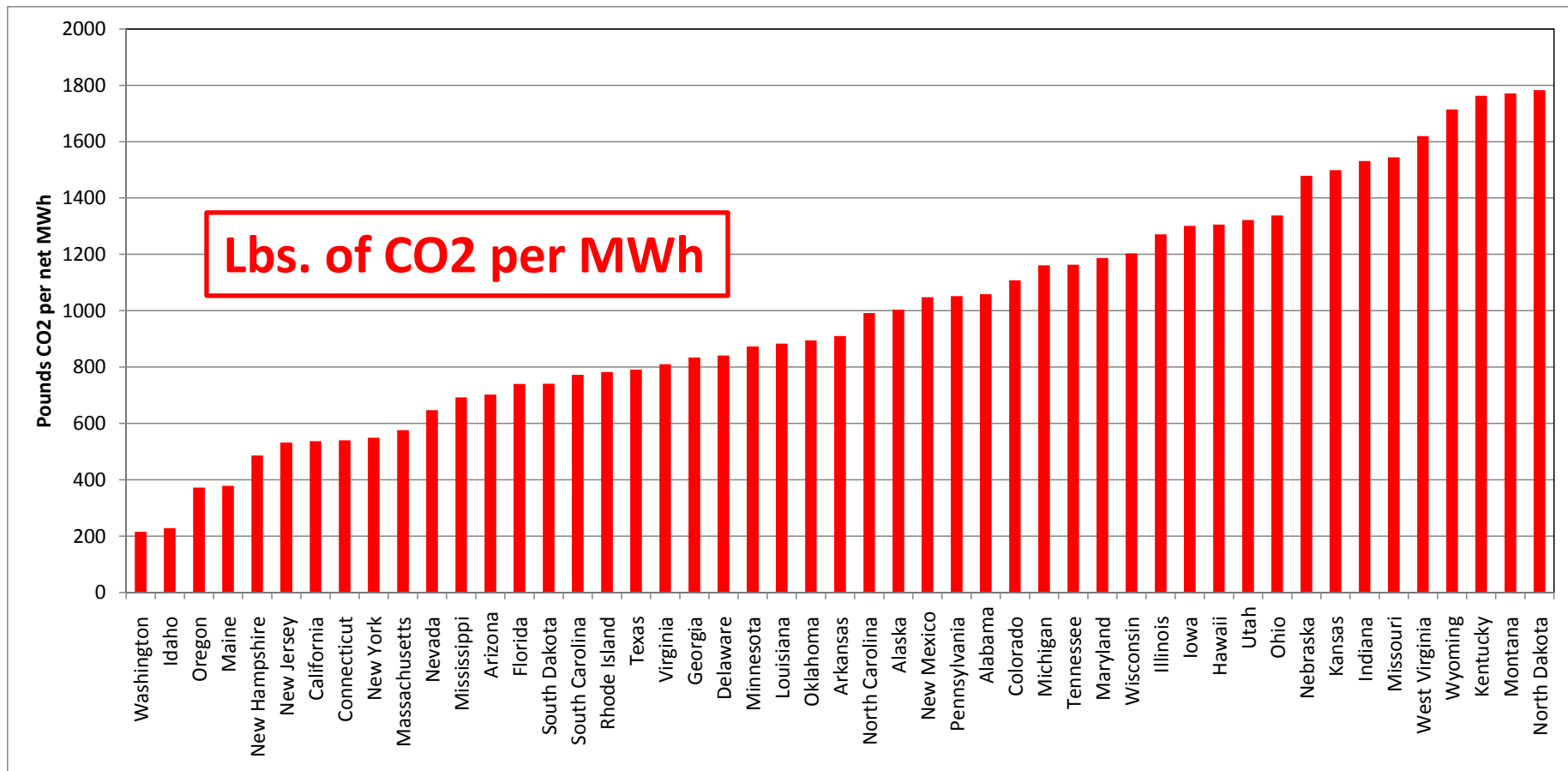
Basics of the Proposed Rule

State Reduction Goals

- Reduction goals set for each state based on EPA analysis of four “***building blocks***”:
 1. heat rate improvements at coal-fired EGUs
 2. redispatch from steam generators using coal, oil or natural gas to existing natural gas combined-cycle units
 3. reductions in EGU emissions due to increased low- or zero-carbon generation
 4. reductions in EGU emissions due to end-use energy efficiency

Basics of the Proposed Rule

State reduction goals vary widely



Basics of the Proposed Rule

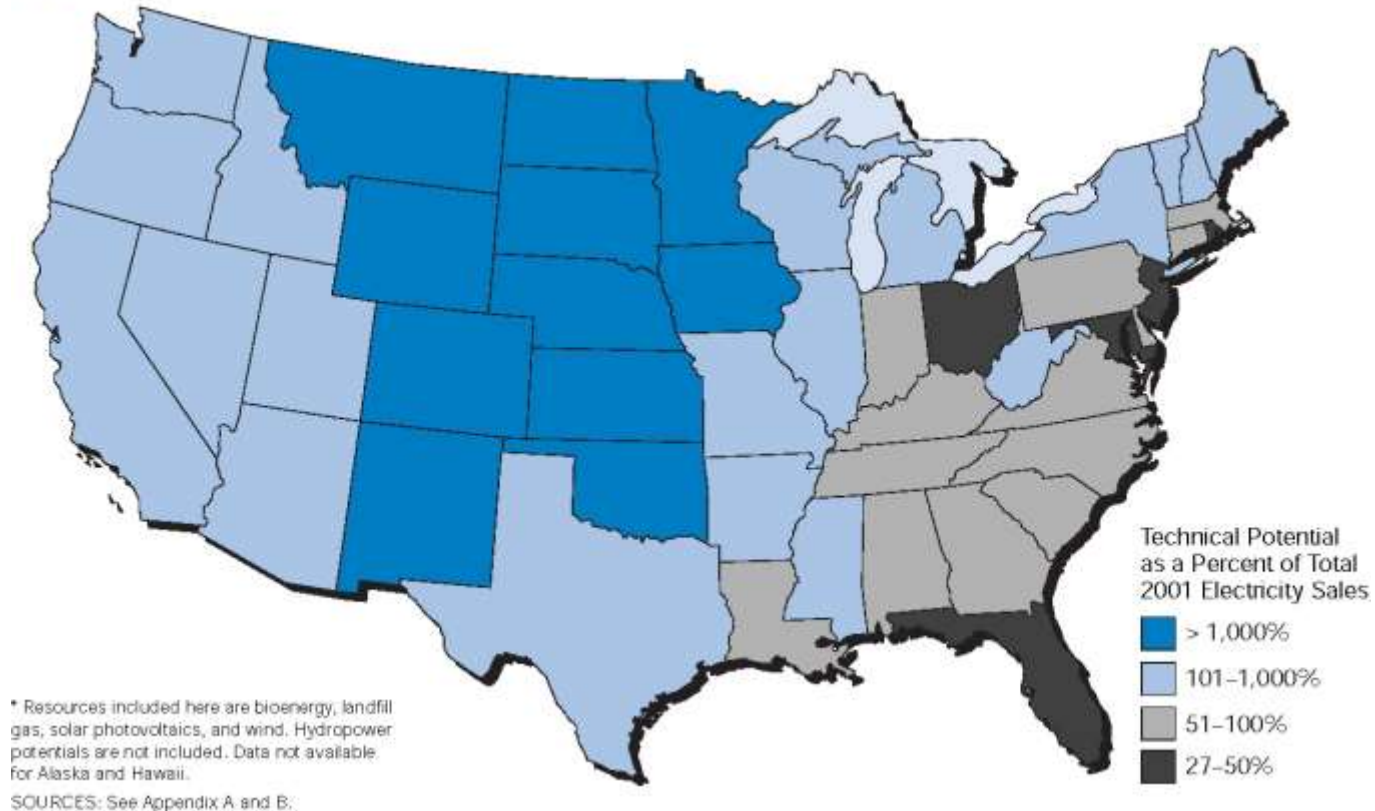
State Clean Power Plans

- States have wide latitude on how to achieve the reductions; not limited to the “building blocks”
- EPA proposes a “portfolio approach” in which reductions are achieved through measures beyond the fence-line of the affected EGUs
- EPA specifically addresses CHP as a reduction strategy
- State compliance measured in lbs CO₂ per MWh
 - Can reduce lbs of CO₂ and/or
 - Produce more MWh of usable energy
- Key question for beyond the fence-line measures:
 - How to demonstrate that the measure reduces output and emissions at Affected EGUs?

Top 10 Reasons States Should Include CHP in Their Clean Power Plans

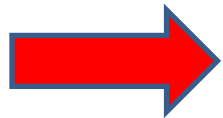
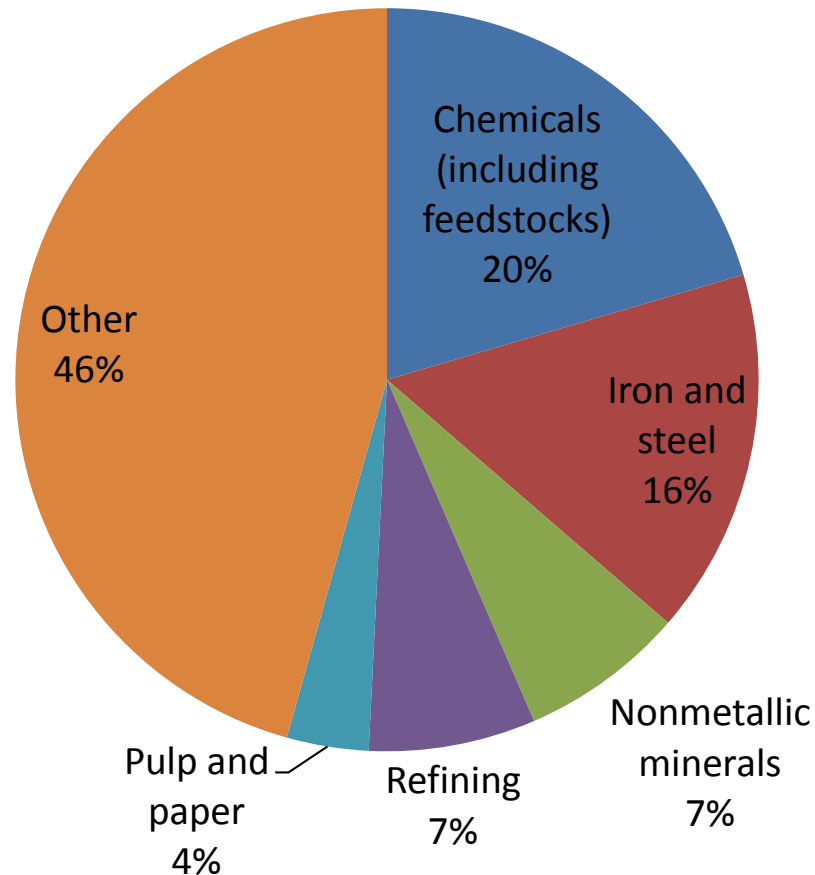
#10: Not all states are created equal when it comes to renewable energy

Figure 1 Renewable Energy* Potential



CHP can be implemented in every state

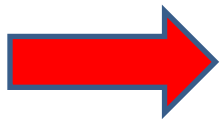
#9. CHP helps industries compete in a global economy



CHP helps reduce operating costs

#8. CHP helps reduce peak-load stresses on power grids

Average line losses in U.S. ~ 6%




District energy and CHP reduce line losses by:

- Generating power close to load centers
- Shifting power demand to off-peak with thermal storage
- Supplying cooling with heat-driven chillers

#7. CHP and DE enhance energy security & resiliency

Maintaining essential services during extreme weather events or other power grid disruptions is a key concern

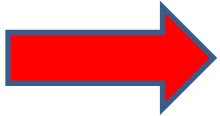
- 
- Local microgrids enable continued availability of power, heating and cooling
 - Provide a refuge for local community
 - Protect critical facilities



#6. Integrated resource planning can be an effective tool for facilitating CHP

Sound policy requires consideration of the potential benefits of CHP that currently do not have a market value:

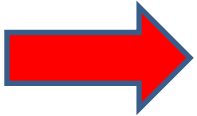
- GHG reduction
- Grid resiliency
- Reduced transmission/distribution losses



- State IRP provides a context for considering these benefits

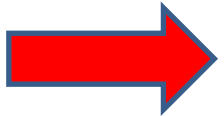
#5. Energy efficiency portfolio standards can include CHP

- More than 20 states have EERS
- Most focused on end-use efficiency
- Seven state EERS include CHP and/or power grid efficiency
- EERS can be adapted to encourage implementation of CHP to meet Clean Power Plan goals




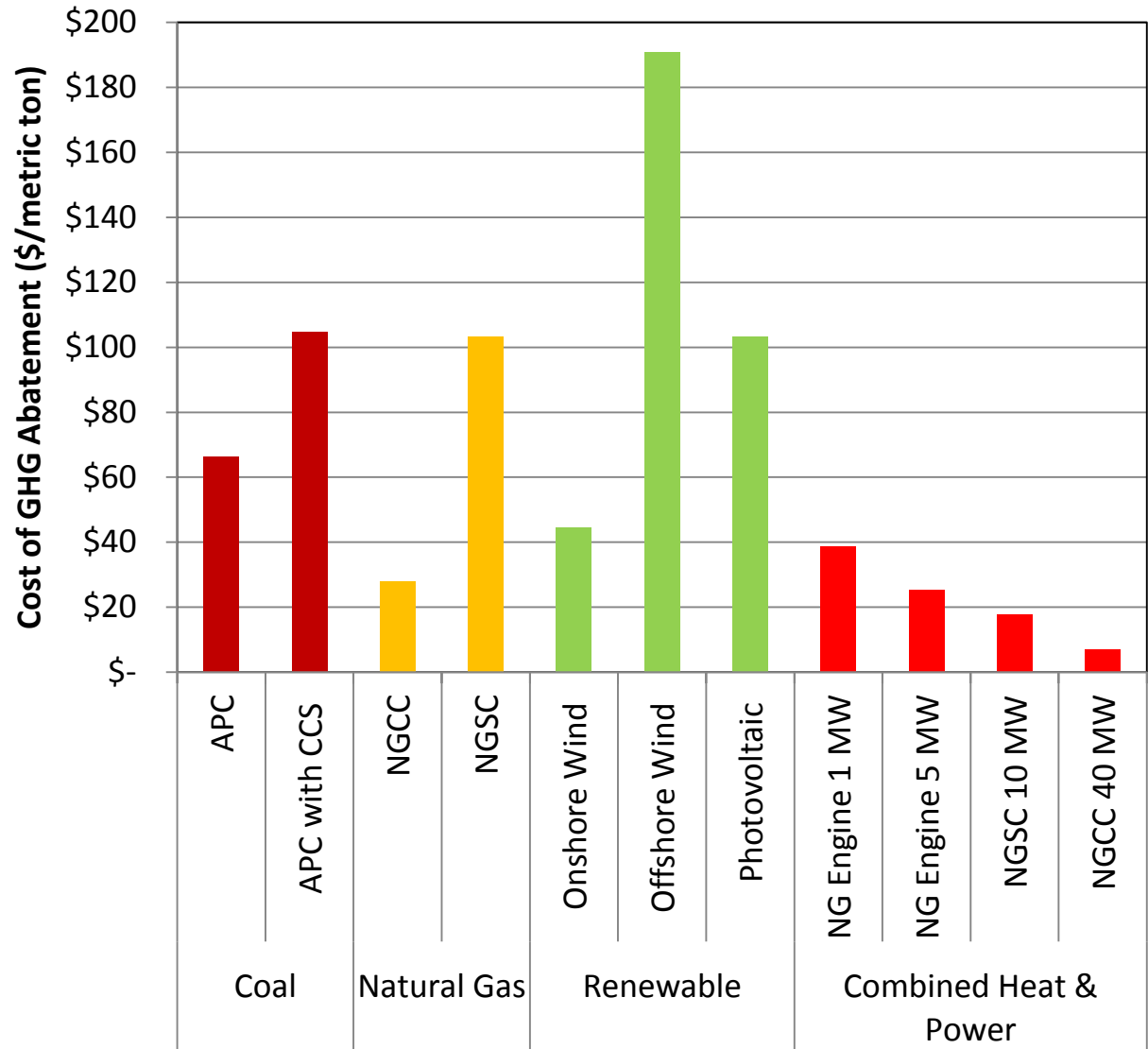
#4. Renewable or alternative portfolio standards can include CHP

- 41 states plus the District of Columbia have some type of portfolio standard
 - 4 states have a mandatory alternative portfolio standard (APS) including CHP
 - 8 states have a mandatory RPS with CHP qualifying under a separate tier
 - 4 states have a mandatory RPS with CHP qualifying under the general standard
- RPS or APS can be modified or created to encourage CHP



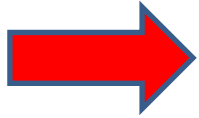
#3. On a level playing field, there is significant cost-effective CHP potential in every state

 CHP reduces CO2 at low cost



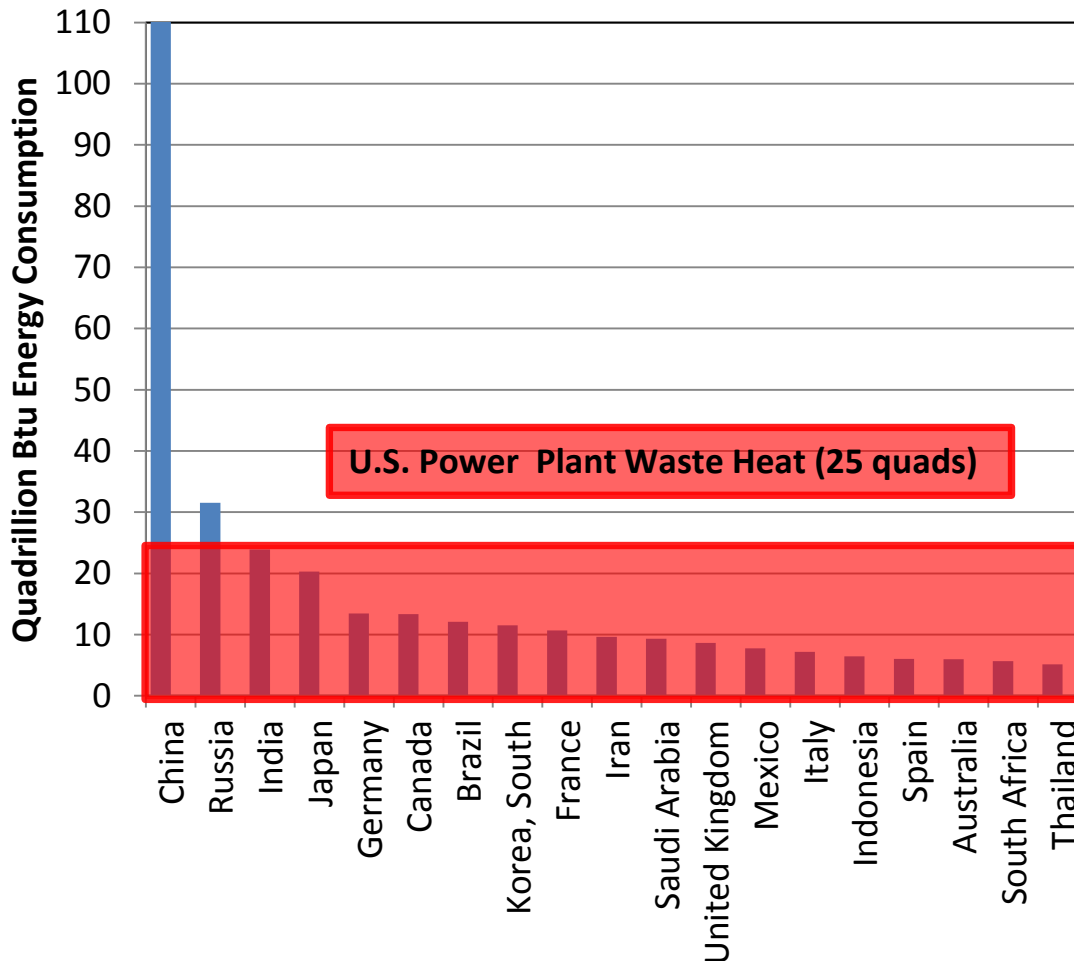
#2. District energy greatly expands CHP potential by distributing waste heat to buildings and industry

CHP potential is constrained if opportunities are limited to heat and power loads at a single site



- District energy (DE) systems represent a substantial “heat sink” for further implementation of CHP
- DE systems exist in all 50 U.S. states
- DE provides economies of scale for larger, more efficient and cost-effective CHP
- DE can link thermal customers with power plants retrofitted for CHP (which would improve plant heat rate)
- District hot water systems are highly efficient in conveying waste heat long distances

#1. The amount of energy wasted in U.S. power plants is staggering

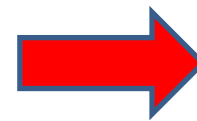


U.S. power sector:

- 32.5% efficient
- Rejects around 25 quads of waste heat annually

This waste heat:

- Equals 25% of total U.S. energy
- Exceeds the total national energy of every country in the world except China and Russia



**Reducing this waste
requires CHP**

Five Flavors of CHP

- In comments submitted to the EPA, IDEA recommended that five categories of CHP should be creditable in state Clean Power Plans
- Calculating the credit requires reference to several other rules:

Proposed Rule	Section of Clean Air Act	Shorthand Title	Federal Register Publication	Status as of Jan. 8, 2014 *
Proposed Rule, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units	111(d)	Existing Unit Rule (Clean Power Plan)	79 Fed. Reg. 34,830, June 18, 2014	Existing
Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Units	111(b)	New Unit Rule	79 Fed. Reg. 1430, Jan. 8, 2014	New
Carbon Pollution Standards for Modified and Reconstructed Stationary Sources: Electric Utility Generating Units, Proposed Rule	111(b)	Modified Unit Rule	79 Fed. Reg. 34,960, June 18, 2014	Modified **

* In operation or under construction as of that date.

** "Modified" means a plant that undergoes a physical or operational change that increases the source's maximum achievable hourly rate of emissions.

Five Flavors of CHP

1. CHP Retrofit of Affected EGU

- Conversion to CHP would provide useful thermal energy that had been previously wasted.
- Would likely trigger regulation under Section 111(b) as a “new, modified or reconstructed” source.
- Increased energy efficiency and associated reductions in emissions in comparison with the Section 111(b) requirements should be creditable in state plans.

2. Modification of Existing Affected Unit That is Already CHP

- Plant may increase annual output or switch to a lower-carbon fuel (such as switching from coal to natural gas or from coal or gas to renewable fuels such as biomass).
- Resulting emission reductions should be creditable in state plans.

3. Increased Output in Existing CHP Plant That is Not Affected EGU

- Most existing CHP plants do not meet the threshold for regulation under Section 111(d).
- Increased output from such plants should be creditable in state plans because the increased generation will substitute for output from Affected Units.

Five Flavors of CHP

4. New CHP Plant that is Affected Under New Unit Rule

- If a new CHP plant has a lower emissions rate than required under Section 111(b), the reduction in emissions rate below the Section 111(b) requirement should be creditable in state plans under Section 111(d).
- Such highly efficient new CHP plants can be expected to displace generation, and thus emissions, from less efficient plants that are affected EGUs under 111(d).

5. New CHP Not Meeting Any Affected Unit Criteria

- These new systems should be treated as energy efficiency measures under 111(d).
- Credit the emission reductions from replacement of generation from Affected Units.

Further Information

“Five Flavors of CHP: Recipes for state clean power compliance plans” District Energy Magazine, First Quarter 2015 (this provides detailed guidance on CHP crediting calculation methodology)

“Comments of the International District Energy Association on Proposed Rule, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units,” International District Energy Association, Dec. 1, 2014

“Smart Tools in a 111(d) Toolbox: Combined Heat and Power and District Energy,” International District Energy Association

Thanks for your attention!

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