

# Combined Heat and Power as a 111(d) Compliance Pathway

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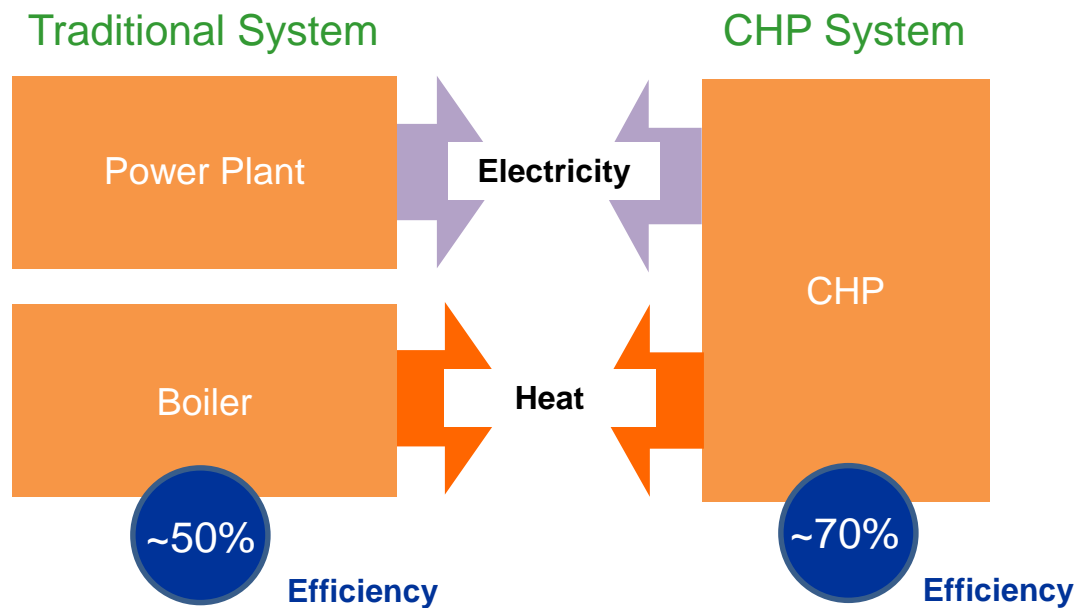


# Agenda

- Review of CHP and its advantages as a compliance option
- Initial thoughts on a CHP pathway as a compliance option



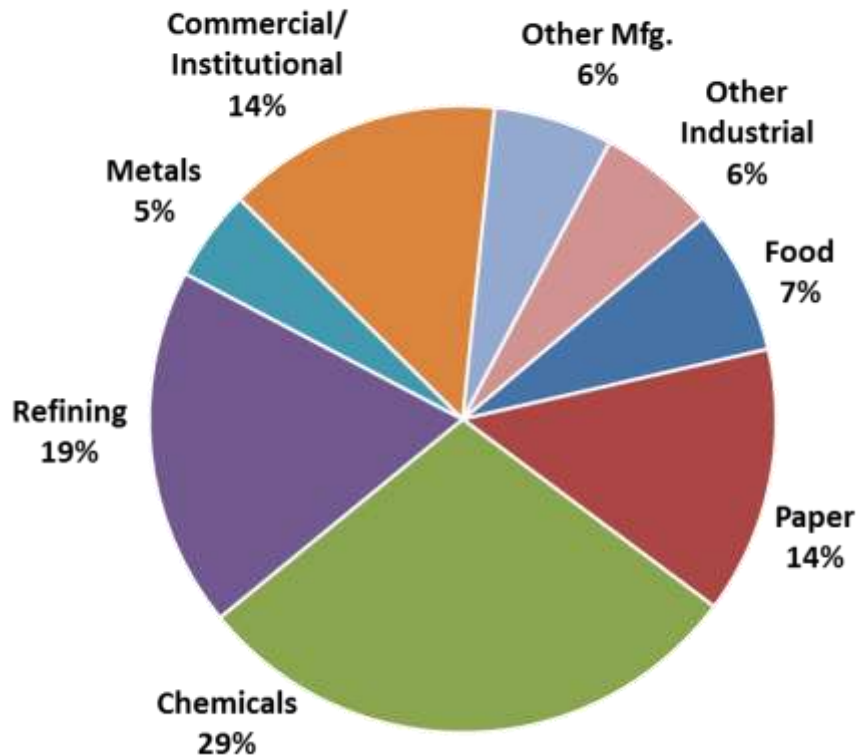
# CHP Increases Efficiency – and Lowers Emissions



**30 to 55% less greenhouse gas emissions**



# CHP Is Already an Important U.S. Energy Resource

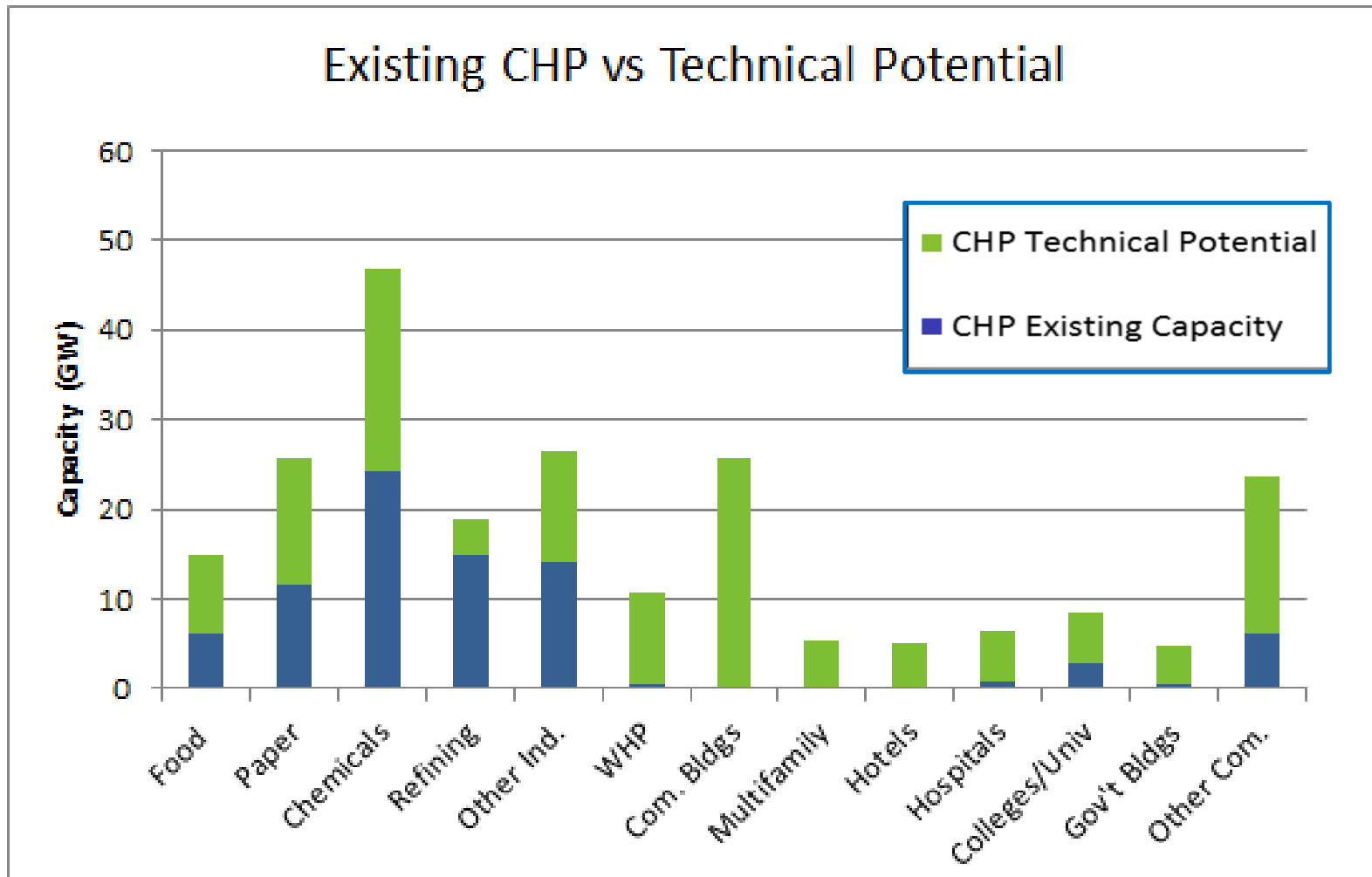


Source: CHP Installation Database, March 2014

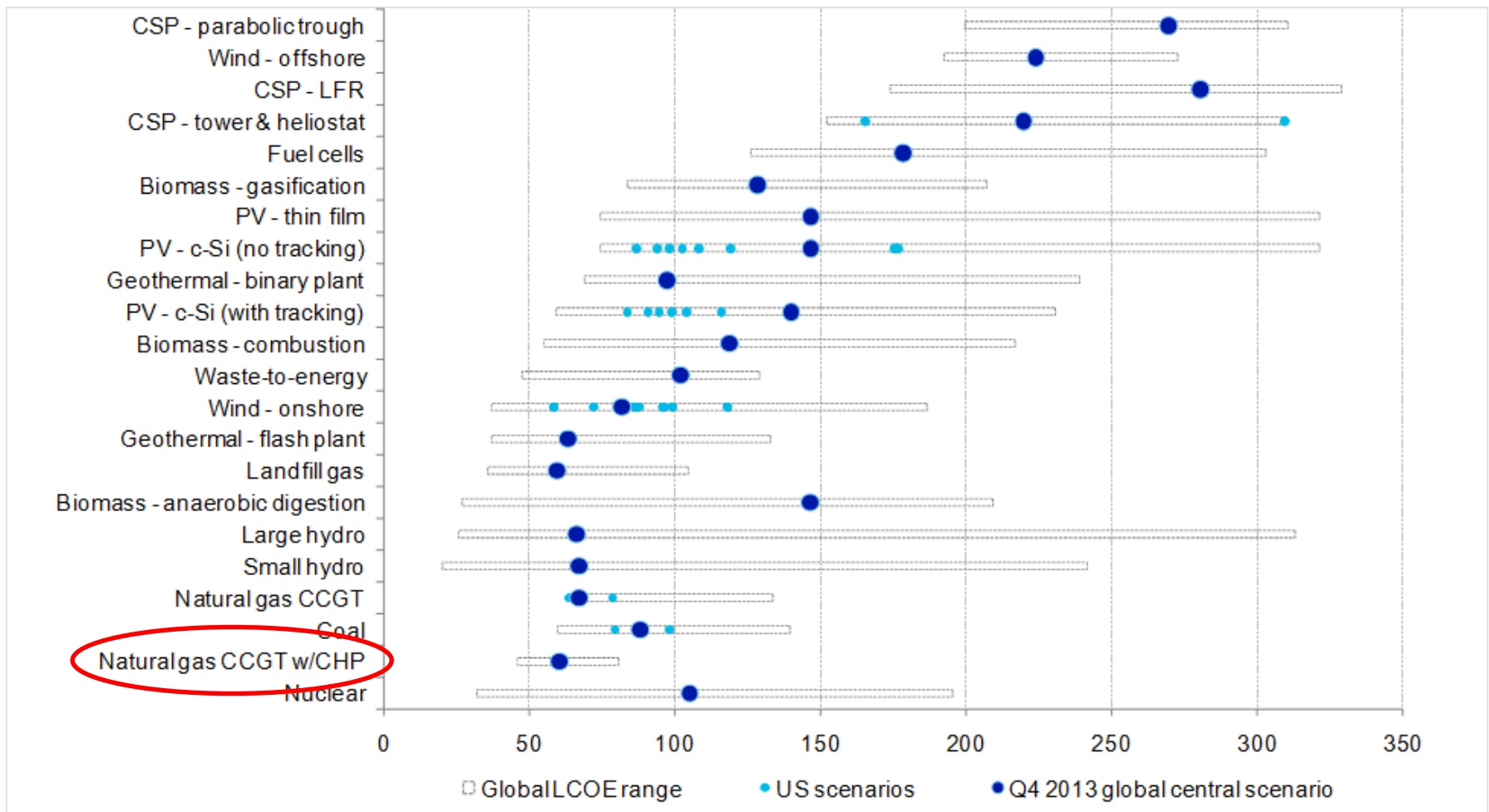
- **83.3 GW** of installed CHP at over 4,220 industrial and commercial facilities
- Avoids more than **1.8 quadrillion Btus** of fuel consumption annually
- Avoids **241 million metric tons of CO<sub>2</sub>** compared to separate production of heat and power



# The Market Is Changing



# CHP Is a Cost-Effective Resource



Source: Bloomberg Sustainable Energy Factbook 2014



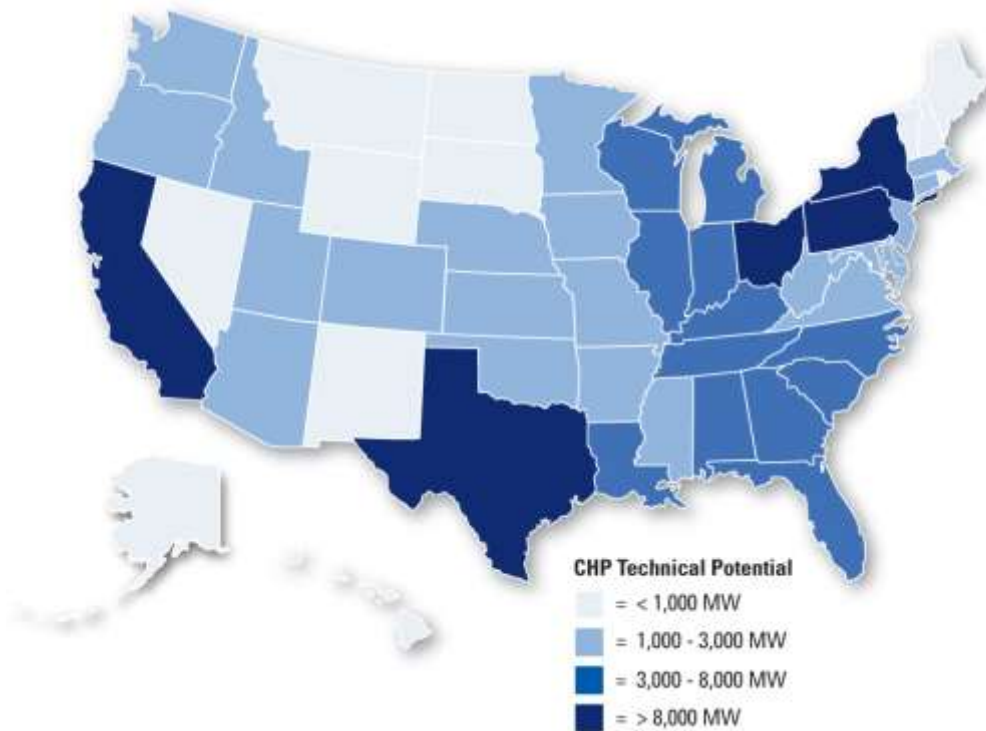
# CHP Saves Energy and Reduces Emissions

Category	10 MW CHP	10 MW PV	10 MW Wind
Annual Capacity Factor	85%	25%	34%
Annual Electricity	74,446 MWh	21,900 MWh	29,784 MWh
Annual Useful Heat	103,417 MWh <sub>t</sub>	None	None
Capital Cost	\$24 million	\$45 million	\$24.4 million
Annual Energy Savings	343,747 MMBtu	225,640 MMBtu	306,871 MMBtu
Annual CO <sub>2</sub> Savings	44,114 Tons	20,254 Tons	27,546 Tons

Based on: 10 MW Gas Turbine CHP - 30% electric efficiency, 70% total efficiency, 15 PPM NOx  
 Electricity displaces National All Fossil Average Generation (eGRID 2010) -  
 9,720 Btu/kWh, 1,745 lbs CO<sub>2</sub>/MWh, 2.3078 lbs NOx/MWH, 6% T&D losses  
 Thermal displaces 80% efficient on-site natural gas boiler with 0.1 lb/MMBtu NOx emissions



# The Remaining Potential for CHP Is Large



Source: ICF Internal Estimates

- Technical Potential of 120+ GW (Industrial 60 GW; Commercial/Institutional 63 GW). (*ICF estimates*)
- 40+ GW with payback less than 10 years. (*AGA*)
- 111(d) could support 20 GW of new CHP nationwide. (*ACEEE*)
- 111(d) could support 10 GW of CHP potential with concentrations in the Midwest and Southeast. (*CCAP*)





# State Policies that Support CHP

- Financing
  - Grants and Loans
  - Incentive Programs
- Regulatory Relief
  - Streamlined Permitting
  - Standby/back-up rates
- Markets
  - Critical Infrastructure
  - Portfolio Standards



# How Does CHP Help Compliance?

## Rate-based approach

- Sets emissions-rate targets (e.g., lbs / kWh)
- CHP systems generate electricity at a lower effective emissions rate
- CHP may be able to directly derive value for its emissions reductions

## Mass-based approach

- Sets emissions targets (e.g., tons of CO<sub>2</sub>)
- Potential for “cap and trade” or portfolio approach
- Careful framework design will be needed for full CHP participation



# General Approach to CHP Pathway

- Build on existing CHP and EE programs
  - States without programs can adopt best practices from other states (Maryland, Massachusetts, Illinois, etc.)
- Create something new for medium/large industrial customers
  - Offer CHP hosts a market-based option
    - Allow CHP to generate emission reduction credits
    - Standard Offers for purchase of emission reduction credits
    - State or regional emission reduction certification processes
    - Layer emission credits with utility program incentives
    - Explore utility/industrial partnerships



# General Criteria for State Plan Approval

## 1. Enforceability

## 2. Performance

- Projected and actual achievement of emissions goals established by EPA

## 3. Measurable

- Quantifiable and verifiable

## 4. Accountability

- A process to report on plan implementation, emissions outcomes, and corrective measures



## Enforceability

- A state plan must contain “enforceable measures”
  - Plan emission limits must be enforceable
  - But, each individual CO<sub>2</sub> reduction strategy is not enforceable by EPA or the state

### For CHP compliance strategy this means:

- Source or state as whole must meet emission rate or state designated share of tonnage limit
- State or power plant owner (whoever assumes responsibility) show chain of contracts with suppliers of credits
  - For “State Commitments” identify state agency responsible
- Established EM&V protocols
- Corrective measures in case CHP MWh and emissions savings are lower than expected



# Performance

- State must show how it will comply with the emission limit
- Must be able to demonstrate how individual measures contribute, and in what amount
- For a CHP Module this means:
  - Forecast emission reductions
  - Require an EM&V plan and mechanism to track progress
  - Periodic showing that CHP module is meeting its share of emission reductions



# Quantifiable & Verifiable

- Emission reductions from plan elements need to be
  - Reliably measured
  - Using a technically sound method
  - In a manner that can be replicated
- For a CHP module this means:
  - Assign responsibility to document the MWh or emission reductions
  - Use established EM&V protocols and output metering to quantify/verify avoided emissions



# Accountability

- A State Plan must identify corrective actions
- For a CHP module this means
  - The State or EGU owner makes up the shortfall using the full range of options available
  - It does not mean the CHP owner has to make up the shortfall in MWh or emissions
  - CHP owners are accountable for agreements made in return for financial support





# Steps to Include CHP in State Compliance Plans

1. Survey existing programs and CHP potential
2. Establish multi-agency teams to coordinate actions/resources
3. Estimate achievable CHP expansion and emission reduction
4. Establish an emission credit certification mechanism
5. Consider financial incentives or other policy supports
6. Consider actions to remove regulatory barriers to CHP
7. Establish an EM&V plan and a tracking/reporting mechanism to assess progress and verify impact
8. Clearly signal that state will count GHG credits from CHP
9. Link EGU owners with potential CHP hosts



# Conclusions

- CHP offers air quality, economic and reliability benefits
- CHP is a cost-effective energy-efficiency resource available in all states
- CHP produces low cost CO<sub>2</sub> reductions
- CHP is included in many existing state efficiency and clean-energy programs
- CHP meets EPA's requirements for an approvable compliance option

