CHP
EPA COMBINED HEAT AND POWER PARTNERSHIP

Introduction to CHP for State Air and Energy Offices

U.S. EPA CHP Partnership Program

May 20, 2015

EPA Combined Heat and Power Partnership

- The EPA CHP Partnership (CHPP) is a **voluntary program** that seeks to reduce the environmental impact of power generation by promoting the use of **highly efficient CHP.**
- Through 2014, **CHP Partners** put into operation 1,877 CHP projects, representing 19,517 MW of capacity.
- The CHPP offers services and tools for Partners to assist with CHP project development, overcome regulatory barriers, and transform markets. We also provide public recognition for CHP projects.

Overview

- Key takeaways
- Introduction to CHP
- Federal support for CHP
- State policies to support CHP
- EPA's CHP Partnership

Key Takeaways

- 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_2 reductions
- CHP is included in many existing state emission reduction programs and policies

What is CHP?

CHP is an *integrated energy system* that:

- Is located at or near a factory or building
- Generates electrical and/or mechanical power
- Recovers waste heat for
  - Heating
  - Cooling, dehumidification
- Can utilize a variety of technologies and fuels
  - E.g., turbines, reciprocating engines, fuel cells
  - Fossil fuels
  - Biomass (wood, wood waste, crop residues, crop plants)
  - Biogas

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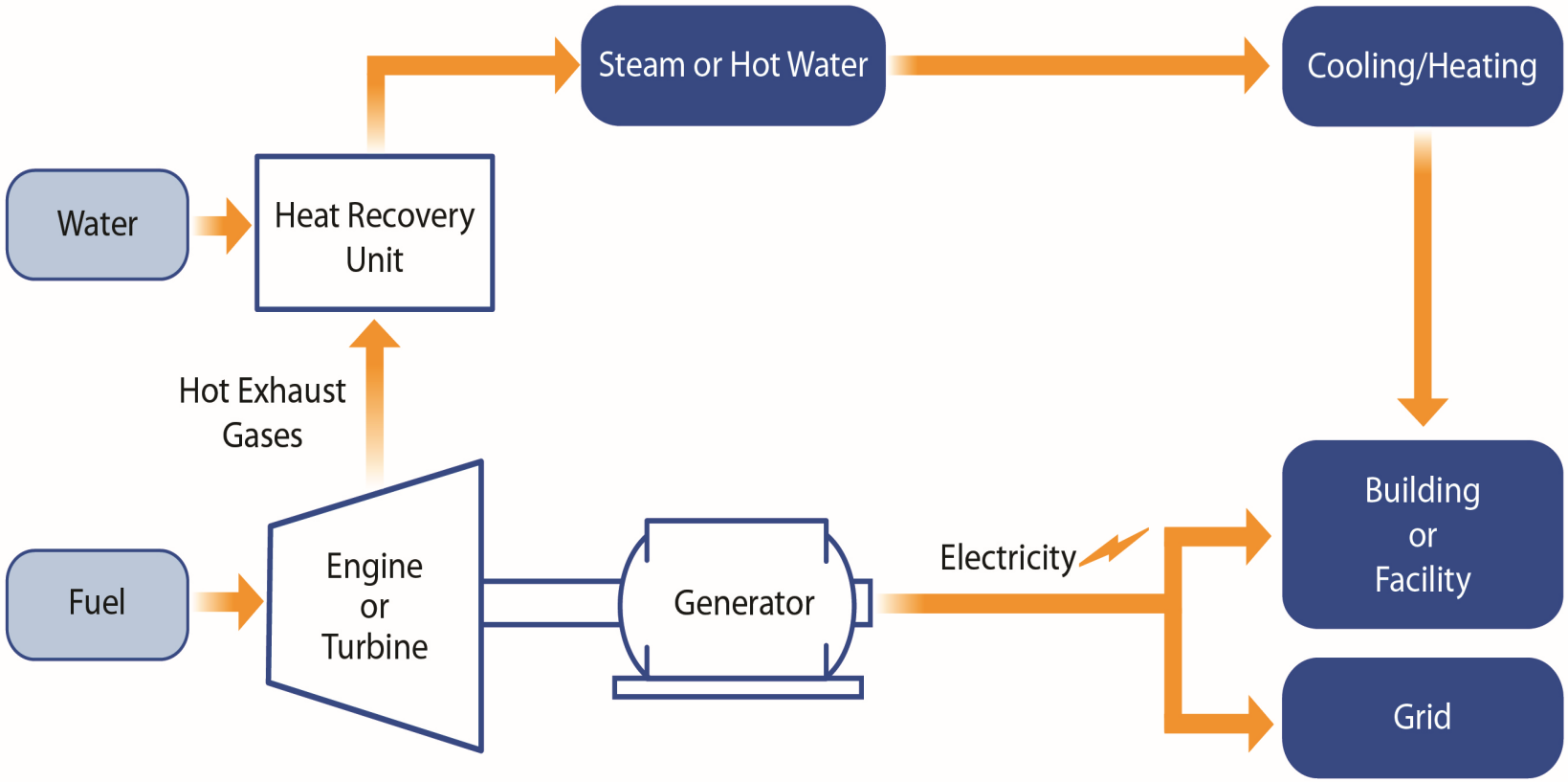
CHP Comes in All Sizes and Configurations

Typical CHP Configuration



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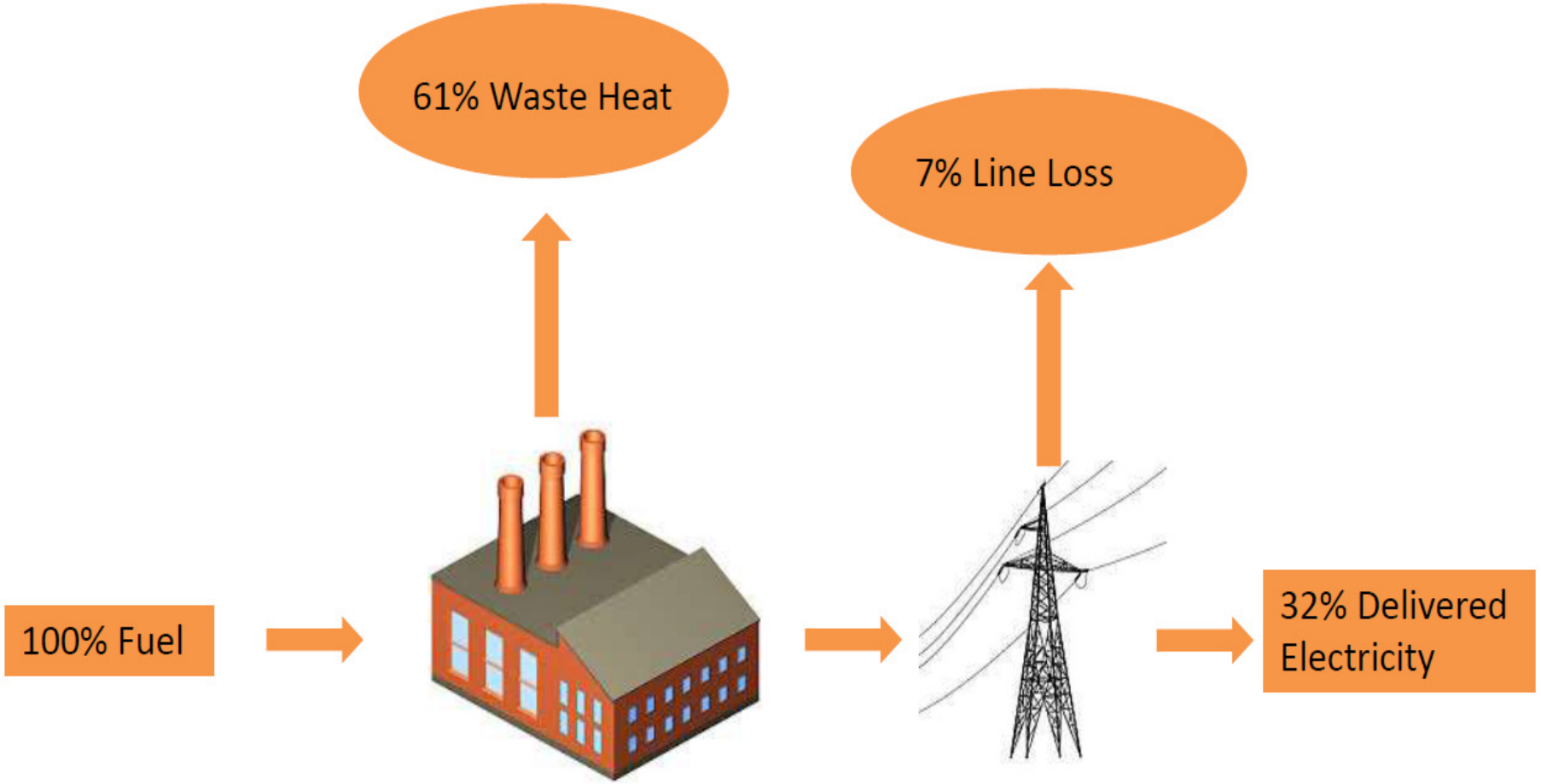
Conventional Power Generation is Inefficient



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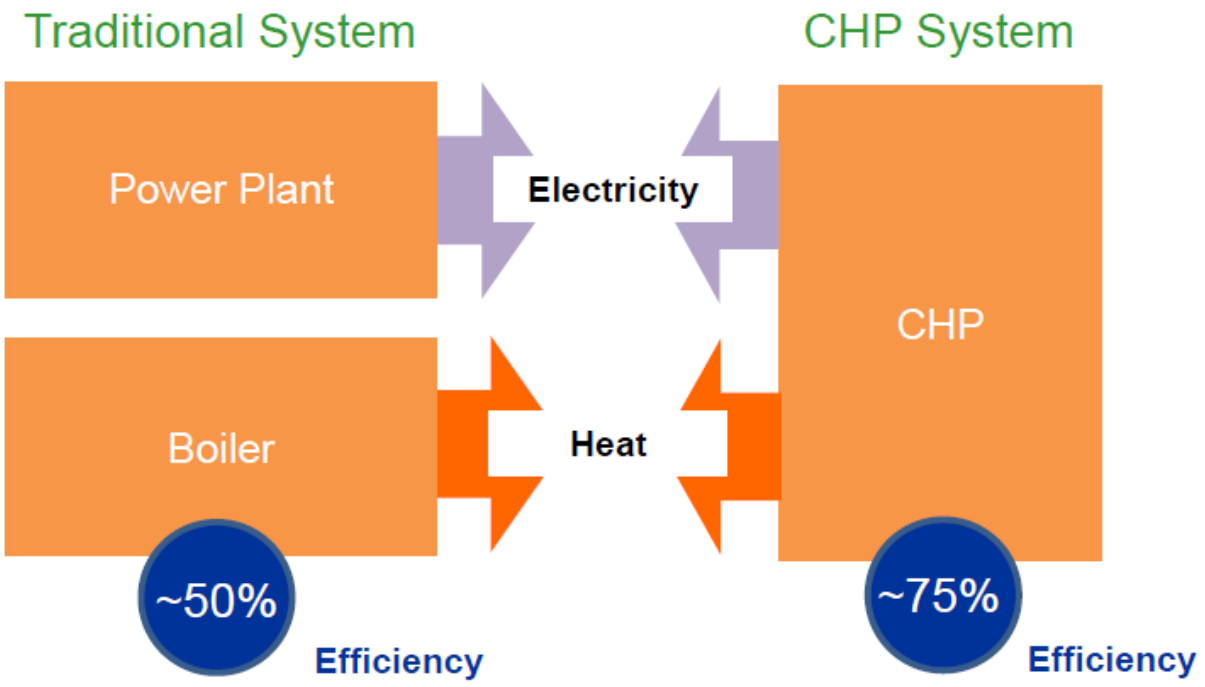
CHP Increases Efficiency and Lowers Emissions



30 to 55% less greenhouse gas emissions

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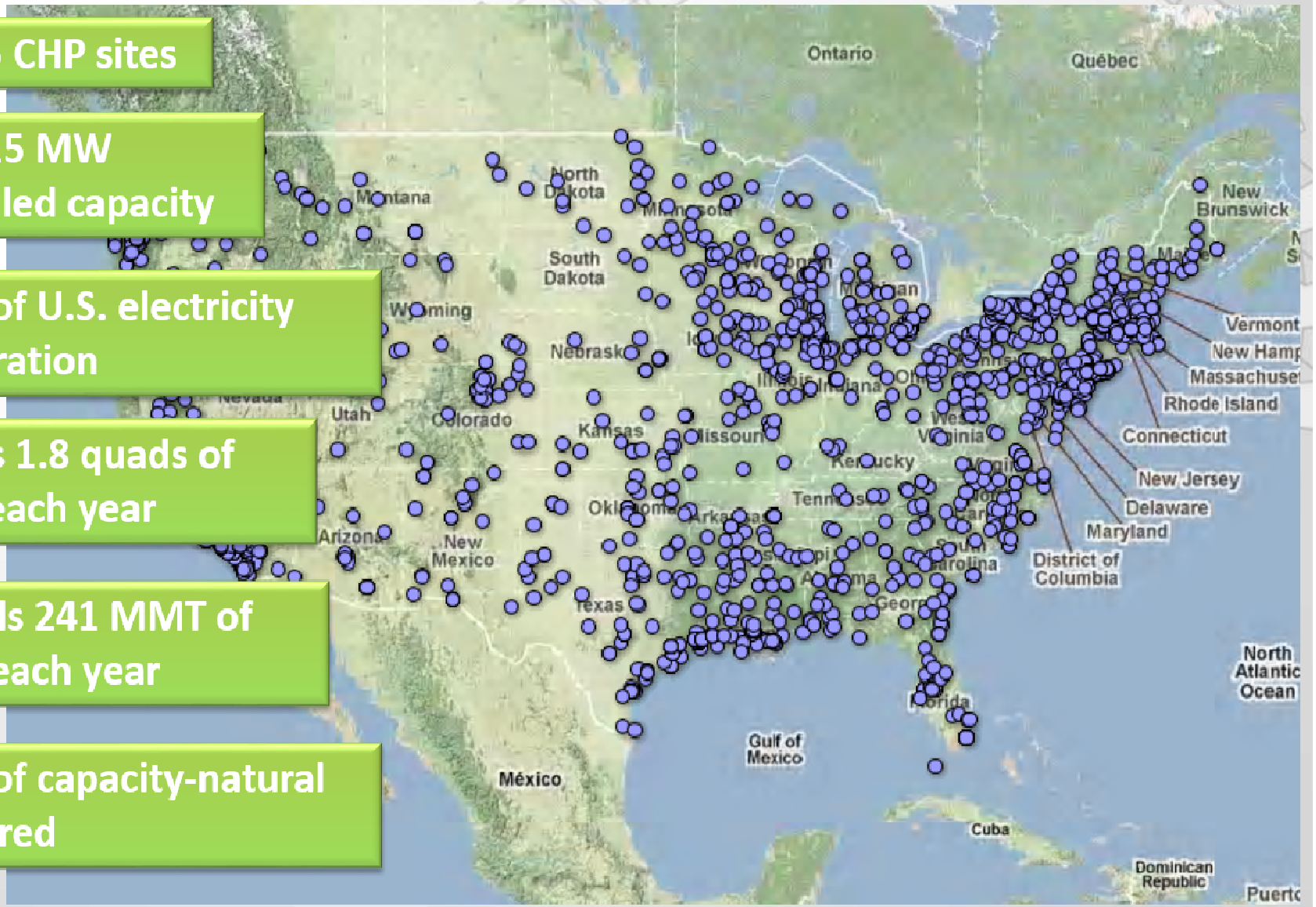
CHP Benefits

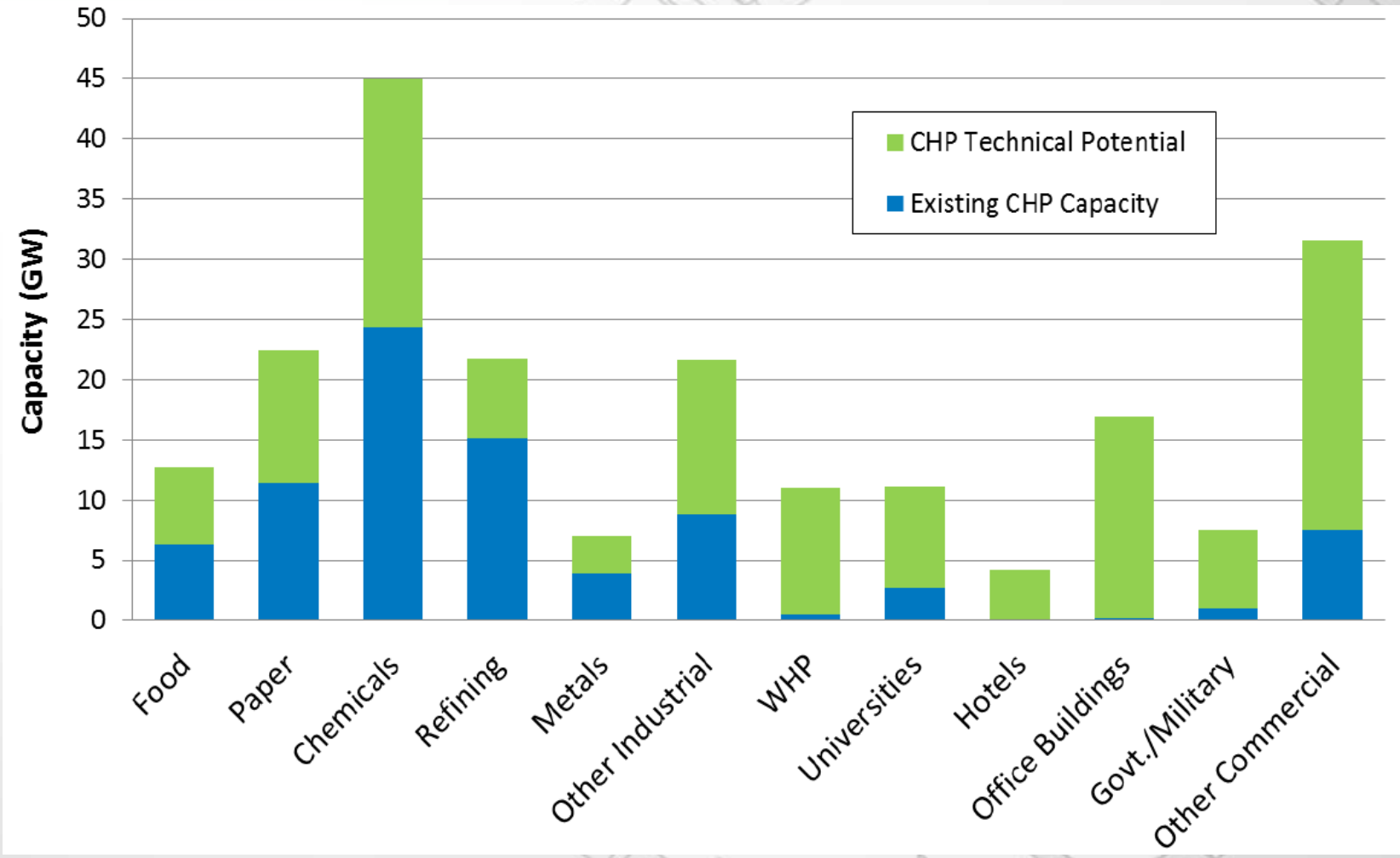
- Increased efficiency
- Reduced emissions
- Lower energy costs
- Reliable electricity supply
- Reduced grid congestion and avoided transmission and distribution costs/losses

CHP is Already a National Resource

- 4,345 CHP sites
- 83,025 MW installed capacity
- 12% of U.S. electricity generation
- Saves 1.8 quads of fuel each year
- Avoids 241 MMT of CO_2 each year
- 70% of capacity-natural gas fired



…But There is Potential for Growth



Source: CHP: A Clean Energy Solution, U.S. DOE and EPA, 2012

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Attractive CHP Markets




Industrial

- Chemicals
- Manufacturing
- Ethanol
- Food processing
- Natural gas pipelines
- Petrochemicals
- Pharmaceuticals
- Pulp and paper
- Refining
- Rubber and plastics

Commercial

- Data centers
- Hotels and casinos
- Multi-family housing
- Planned communities
- Laundries
- Apartments
- Office buildings
- Refrigerated warehouses
- Restaurants
- Supermarkets
- Green buildings

Institutional

- Military bases
- District energy systems
- K-12 schools
- Airports
- Hospitals
- Nursing homes
- Landfills
- Universities & colleges
- Wastewater treatment
- Prisons

Agricultural

- Concentrated animal feeding operations
- Dairies
- Wood waste (biomass)

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CHP Value Proposition

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_t	None	None
Footprint Required	6,000 sq ft	1,740,000 sq ft	76,000 sq ft
Capital Cost	$20 million	$60.5 million	$24.4 million
Cost of Power	7.6 ¢/kWh	23.5 ¢/kWh	7.5 ¢/kWh
Annual Energy Savings	**316,218 MMBtu**	**225,640 MMBtu**	**306,871 MMBtu**
Annual CO_2 Savings	**42,506 Tons**	**20,254 Tons**	**27,546 Tons**
Annual NOx Savings	**87.8 Tons**	**26.8 Tons**	**36.4 Tons**

Based on: 10 MW Gas Turbine CHP - 28% electric efficiency, 68% total efficiency, 15 PPM NOx; Electricity displaces National All Fossil Average Generation (eGRID 2010) - 9,720 Btu/kWh, 1,745 lbs CO_2/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

Source: ICF International, 2012

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Federal Support for CHP

- Executive Order - Accelerating Investment in Industrial Energy Efficiency
  - Goal is to add 40 GW by 2020
- Tax benefits
  - 10% investment tax credit (ITC) for the first 15 MW of CHP property *(through 2016)*
  - CHP qualifies for 5 year depreciation under Modified Accelerated Cost Recovery System (MACRS)

CHP and the Clean Air Act (CAA)

- As an efficiency measure
- In output-based regulations

Importance of Output-Based Regulations

- Encourage energy efficiency and CHP by relating emissions to the productive output of a process rather than the amount of fuel burned
- Key for CHP is to recognize thermal output

CAA Regulations with Output-Based Limits

- Existing Utility Boiler New Source Performance Standard (NSPS) (40 CFR 60,Subpart Da)
- Existing Gas Turbine NSPS (40 CFR 60, Subpart KKKK)
- Existing Mercury and Air Toxic Standards for Power Plants
- Boiler MACT (40 CFR 63, Subpart DDDDD)- National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers and Process Heaters

More information about State and Federal output-based limits: http://www.epa.gov/chp/policies/output_fs.html

State Policies that Support CHP

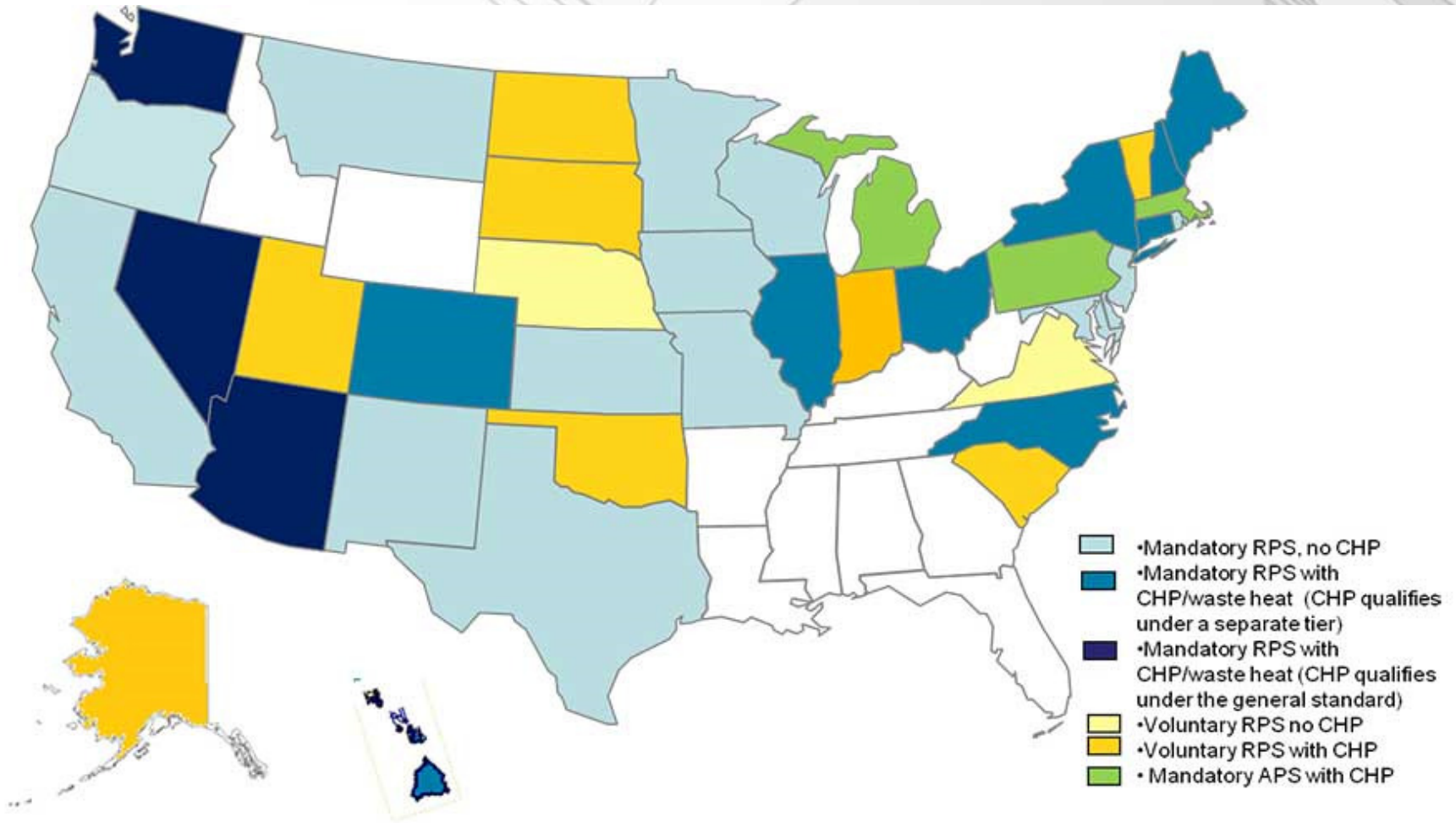
- Financial support (e.g., grants, loans, tax incentives, production incentives)
- Environmental regulations (e.g., OBR)
- Mandated utility policies
  - Standby/backup rate relief
  - Standardized interconnection
- Renewable portfolio standards and energy efficiency resource standards

NYSERDA CHP Financing Programs

- NYSERDA CHP Acceleration Program
  - Provides incentives for the installation of pre-qualified, pre-engineered CHP systems by approved CHP system vendors
  - CHP systems must be 50 kW-1.3 MW in size
  - Maximum incentive per project is $1.5 million
- NYSERDA CHP Performance Program
  - Performance-based payments
  - CHP systems must be greater than 1.3 MW in size
  - Upstate: $0.10/kWh + $600/kW
  - Downstate: $0.10/kWh + $750/kW
  - CHP Incentives are capped at the lesser of $2.6 million per project or 50% of total project cost

Portfolio Standards

20 states specifically include CHP as eligible



CHPP Tools and Resources

- Catalog of CHP Technologies
- CHP Project Development Handbook
- CHP Emissions Calculator
- *d*CHPP (CHP Policies and incentives database)
- ENERGY STAR CHP Awards (showcase model systems)

www.epa.gov/chp

Other Resources

- EPA State and Local Climate and Energy Program - http://epa.gov/statelocalclimate/
  - Energy and Environment Guide to Action
- Department of Energy, CHP Technical Assistance Partnerships - http://energy.gov/eere/amo/chp-technical-assistance-partnerships-chp-taps
- NASEO - http://www.naseo.org/
- ACEEE - http://aceee.org/topics/combined-heat-and-power-chp

Conclusion

- 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_2 reductions
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Contact Us

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