United States Department of Energy CHP Deployment Program Activities

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NYSERDA's CHP Conference
CHP in New York State: The Next Generation
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Today

1. Regional Clean Energy Application Centers
2. 6 State Policy Initiative
3. Boiler MACT Technical Assistance
4. SEE Action IEE/CHP Working Group

Why CHP Matters

- CHP is an important energy resource that provides
  - <u>Benefits for U.S. Industry</u>
    - Reduces energy costs for the user
    - Reduces risk of electric grid disruptions
    - Provides stability in the face of uncertain electricity prices
  - <u>Benefits for the Nation</u>
    - Provides immediate path to increased energy efficiency and reduced GHG emissions
    - Offers a low-cost approach to new electricity generation capacity and lessens need for new T&D infrastructure
    - Enhances grid security
    - Enhances U.S. manufacturing competitiveness
    - Uses abundant, domestic energy sources
    - Uses highly skilled local labor and American technology

Why CHP Now

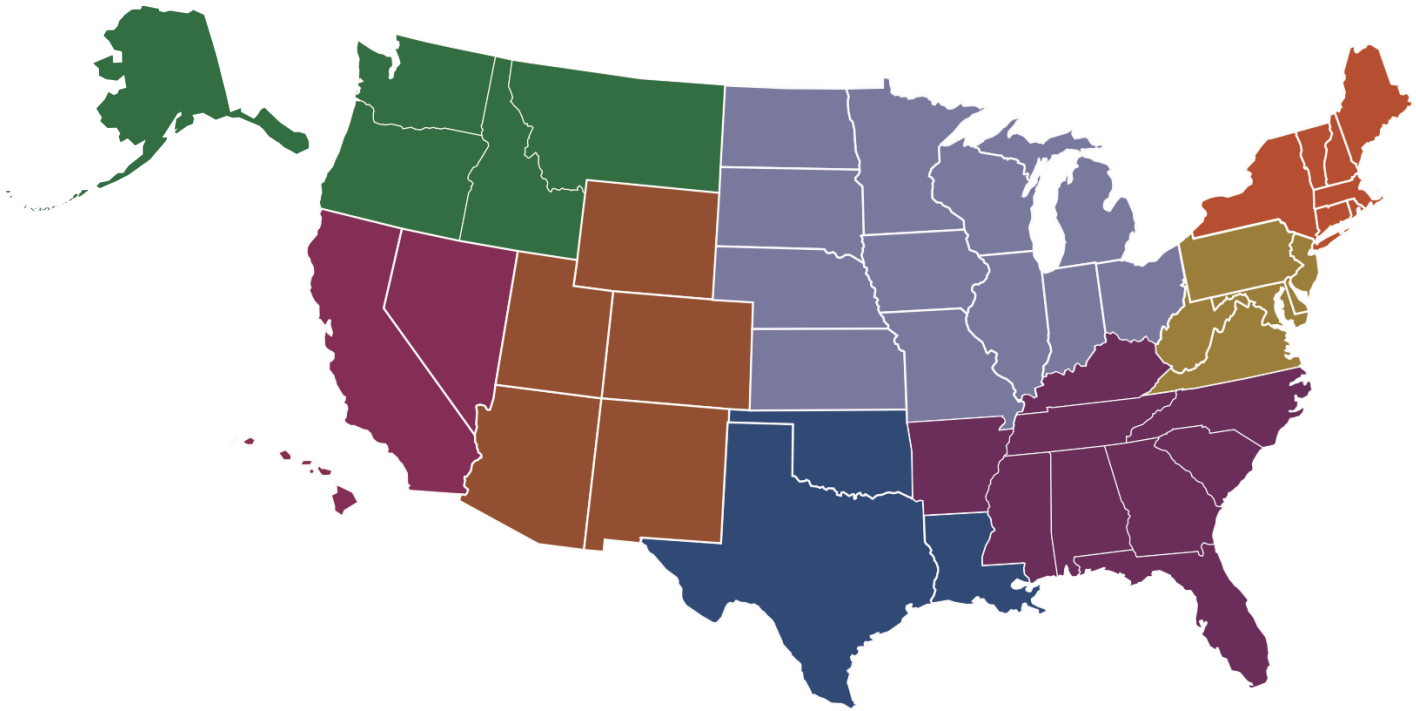
- Federal and state policymakers recognizing CHP benefits
  - DOE refining CHP technology deployment efforts
  - CHP receives credits in proposed Clean Energy Standard
  - Increasing state support
    - Ohio includes CHP and WHP in portfolio standards
    - New Jersey establishes incentive programs and reviewing standby rates
    - Maryland PUC establishes CHP pilot program
- Coal and oil power plant retirements announced / planned in a number of states
  - CHP can help replace generation capacity.
- Near-term market opportunities driven by environmental pressures and sustainability goals
  - Industrial/Commercial/Institutional Major Source Boiler MACT
  - Universities and some companies have set reducing carbon footprint as a priority
- Shale gas has changed the outlook for natural gas in North America
  - Moderate gas prices and less volatility

DOE CHP Deployment Goal

- **40 gigawatts (GW) of new, cost-effective CHP by 2020**
  - Goal same as SEE Action IEE/CHP Working Group (WG)
- Context:
  - 81.7 GW CHP today at over 3700 facilities
  - Technical potential: 132 GW (64 Industrial, 68 Commercial)
- Energy savings from achieving goal
  - Nearly 1 quad savings = 7% of the total 13.4 quads estimated potential energy savings in the industrial sector by 2020
- CO_2 savings from achieving goal
  - Over 150 million metric tons (equivalent to displacing the CO_2 emissions from 29 millions cars)

Regional Clean Energy Application Centers (CEACs)

- Eight Regional CEACs & International District Energy Association (the 9th CEAC)



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CEAC Mission and Focus

- **CEAC Mission:** Develop technology application knowledge and the educational infrastructure necessary to promote "clean energy" technologies as viable energy options and reduce any perceived risks associated with their implementation.

CEAC Focus: Assist in transforming the market for CHP, WHR, and DE technologies and concepts throughout the United States by providing:

- Market Analysis & Evaluation
- Education & Outreach
- Technical Assistance

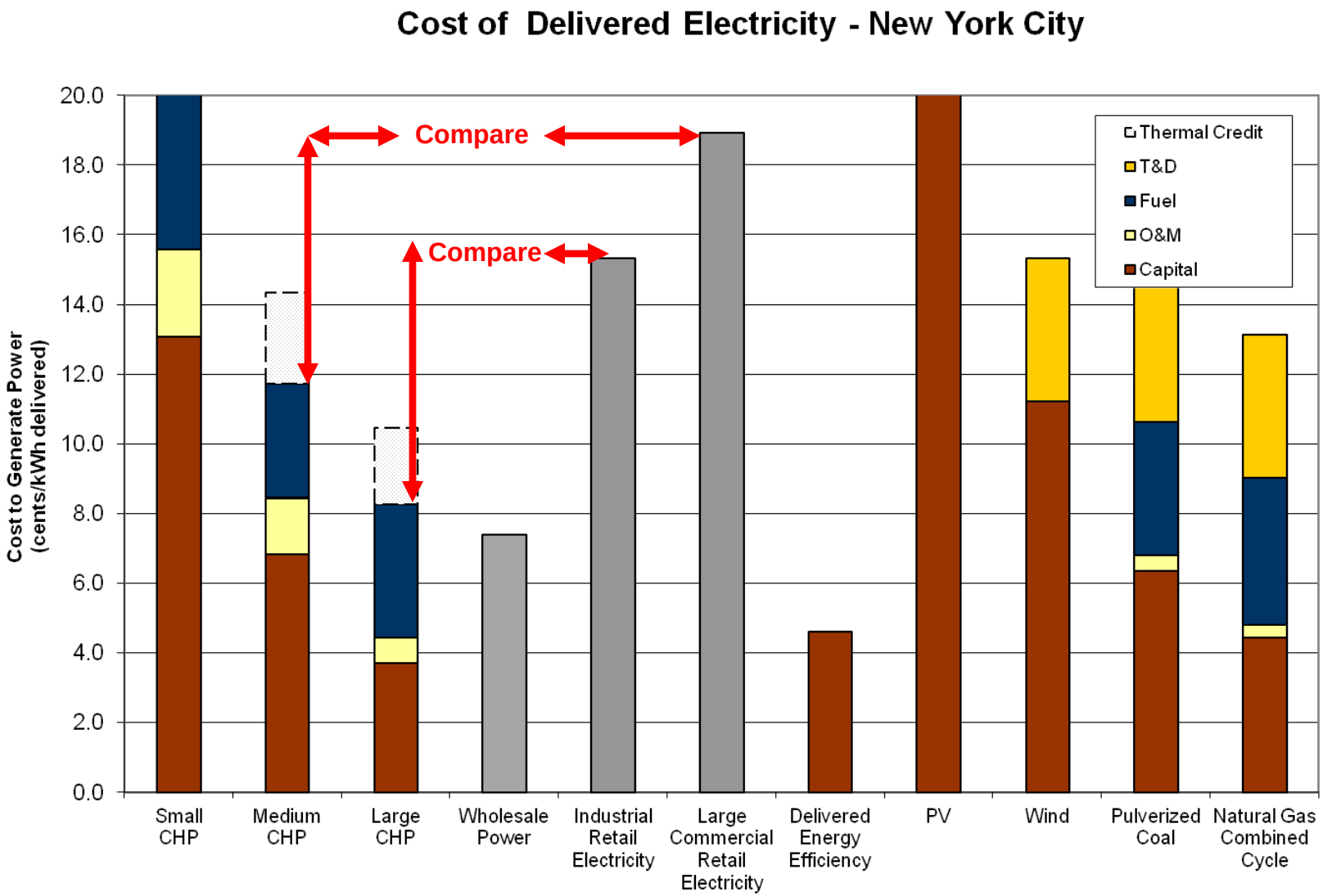
DOE's 6 State CHP Policy Initiative

- Objective
  - *To increase CHP deployment in states with demonstrated or emerging leadership*
- Method
  - Identify states with strong likelihood of success: Two-tiered approach for achieving State-specific and Nationwide results.
    - Leading states with demonstrated CHP market activity but now facing policy challenges to maintain or increase growth: California, Texas, and New York City
    - Emerging states with large untapped potential but not much CHP market activity: New Jersey, North Carolina, and Ohio
  - Success in these states could be replicated to other states
  - Clean Energy Application Centers lead the effort

Key Challenges

- Policy and technical issues affecting increased CHP Penetration:
  - CHP recognized as an effective GHG reduction measure but may be thwarted by institutional, regulatory and policy issues.
  - As states struggle to emerge from economic downturn, job creation is a high priority. Link between CHP and job creation has not been fully recognized.
  - Establishing and maintaining favorable policies for CHP requires continual education as policy leaders change.
  - Inclusion of CHP in state portfolio standards is growing, but many states still do not include it as an eligible resource.
  - Increasing amounts of distributed supply (renewables and CHP) pose integration challenges for power pools and RTOs.

CHP Represents a Cost-Effective Electricity Resource in NYC

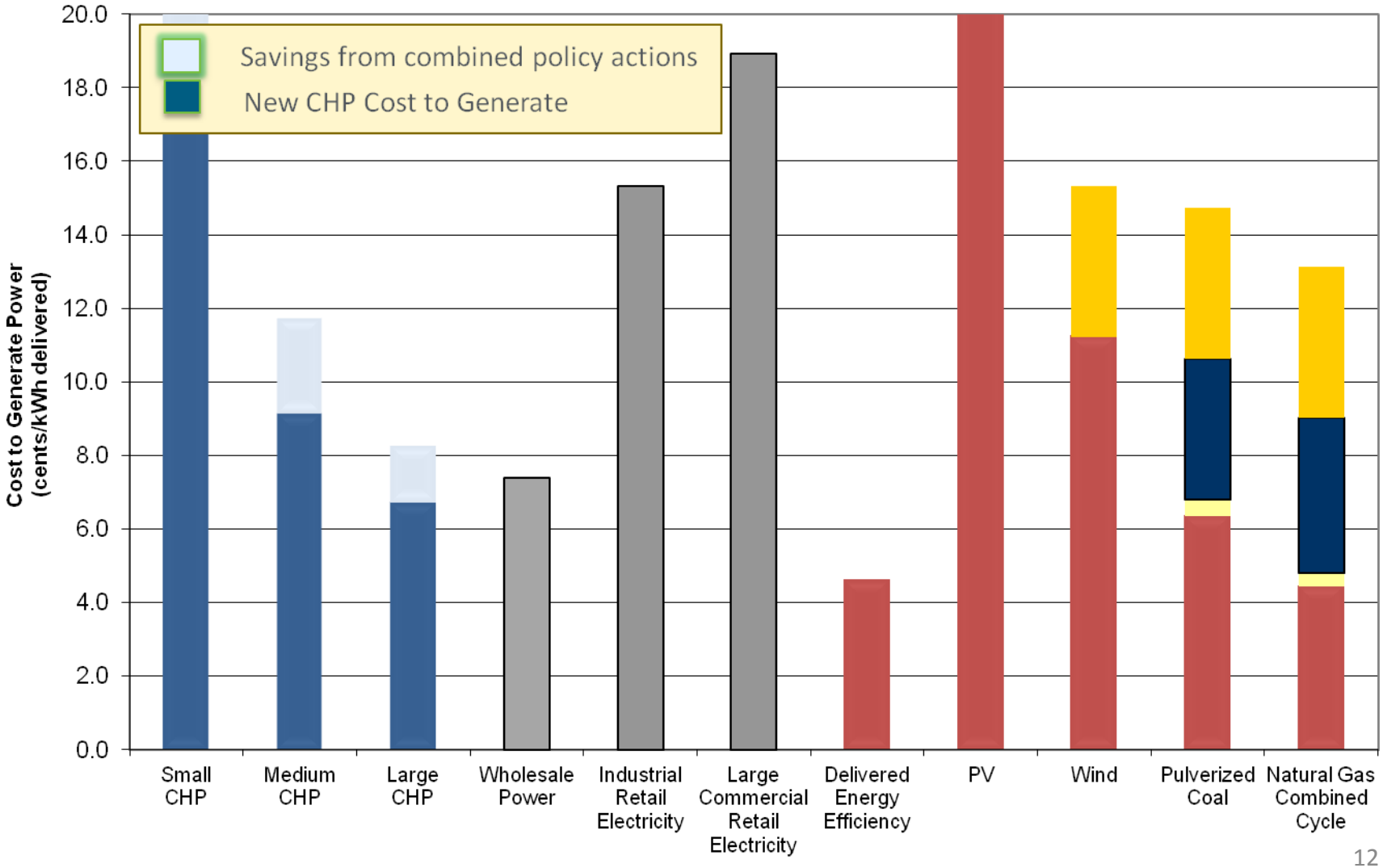


CHP thermal credit reflects the cost of boiler fuel avoided by capturing and using the waste heat from CHP

NYC Target Policy Scenarios

Policy		Description	Modeling Metric
A	Pay for Performance Program	CHP Representation in SBC IV – Recip engines, gas turbines, and microturbines above 250 kW will be paid for their operation during the peak summer period.	10 cents/kWh for operation during peak hours (12 – 6 pm, M-F, May–Oct), $2 million max payment per site, payment is annual for 3 years
B	CHP as alternative to Distribution Capital Investment	ConEd provides funding to demand reduction projects	$350/kW, one time payment, sites eligible for the first 5 years of the forecast period, after which the program will end
C	Emissions Credit	Incorporate CHP into Climate Action Plan Development	Thermal credit valued at $15/ton of CO2 saved
D	Innovative financing mechanisms for CHP	Low interest loans, loan guarantees	Reduce total capital cost by 5%, applied to just cooling markets

Cost of Delivered Electricity – NYC
Impact of Incentives



EPA Boiler MACT

- **ICI Boiler NESHAPs** (National Emissions Standards for Hazardous Air Pollutants). ("Boiler MACT")
  - 3 separate rules: major sources, area sources, and solid waste incinerators
  - Sets national emissions standards for hazardous air pollutants (HAP) (e.g., mercury, other metals, organics) from boilers
- DOE Technical Assistance effort focused on Major Source rule
- Creates opportunity for facilities to consider CHP as a compliance strategy

Impacts of the Boiler MACT (reconsidered proposal)

- Compliance straight forward for natural gas fired units (tune-ups in lieu of more rigorous control options)
- Rule significantly impacts oil, coal and biomass boilers and process gas boilers
  - Controls potentially required for Hg, PM, HCl and CO
  - Emissions limits must be met at all times except for start-up and shutdown periods
  - Also includes monitoring and reporting requirements
- Limits difficult, technically and economically, for oil and coal units - some may consider switching to natural gas
  - Potential opportunity for natural gas CHP:
    - Trade off of benefits and additional costs
    - Economics now based on incremental investment over compliance costs

Affected Industrial / Commercial / Institutional Boilers

	EPA ICR Database	
Number of Facilities	753	
Fuel Class	# Units	Capacity (MMBtu/hr)
Coal	544	135,720
Heavy Liquid	286	38,347
Light Liquid	275	25,477
Biomass	485	107,359
Process Gas	82	21,226
Total	**1,672**	**328,128**

Excludes non-continental liquid, Gas 1 (NG/RG) and limited use units

Affected Facilities by Technical Assistance CEAC Region

CEAC Region for Technical Assistance	Number of Facilities	Number of Coal Units	Number of Heavy Oil Units	Number of Light Oil Units
Mid-Atlantic	109	150	67	43
Midwest	232	377	100	82
Northeast	58	22	88	26
Southeast	168	202	112	90
Total	**567**	**751**	**367**	**241**

The data in this chart is still being refined

- Facilities are categorized by the CEAC region conducting their technical assistance, not their actual location
- This table includes only industrial/commercial/institutional boilers

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Coal and Oil Units by Application

	Coal		Oil		Total	
Description	# Units	Capacity (MMBtu/hr)	# Units	Capacity (MMBtu/hr)	# Units	Capacity (MMBtu/hr)
Food	115	26,445	56	6,107	171	32,553
Beverage/Tobacco	13	1,641	7	445	20	2,086
Textile Mills	36	2,993	14	698	50	3,691
Wood Products	14	4,121	12	646	26	4,767
Paper Manufacturing	114	38,718	89	18,349	203	57,067
Petroleum and Coal	28	7,992	37	5,154	65	13,146
Chemicals	138	36,622	130	12,661	268	49,284
Plastics and Rubber	12	1,670	57	4,150	69	5,820
Primary Metals	25	18,509	17	4,448	42	22,957
Fabricated Metals	5	1,290	5	152	10	1,442
Machinery	12	5,192	2	84	14	5,276
Transportation Equip.	73	11,435	62	5,901	135	17,336
Furniture	15	784	3	72	18	856
Other Industrial	26	8,764	26	3,107	52	11,871
Professional Services	1	112	12	1,101	13	1,213
Educational Services	72	9,663	12	1,884	84	11,547
Hospitals	12	889	2	139	14	1,027
National Security	22	2,718	48	2,039	70	4,758
Other Commercial	18	967	17	3,293	35	4,260
Total	**751**	**180,525**	**608**	**70,430**	**1,359**	**250,955**

The data in this chart is still being refined

CHP as a Compliance Strategy

- Compliance with limits will be expensive for many coal and oil users
- May consider converting to natural gas
  - Conversion for most oil units?
  - New boilers for some coal units?
- May consider moving to natural gas CHP
  - Represents a productive investment
  - Potential for lower steam costs due to generating own power
  - Higher overall efficiency and reduced emissions
  - Higher capital costs, but partially offset by required compliance costs or new gas boiler costs
  - State / local / utility incentives can help

DOE Boiler MACT Technical Assistance Program

- DOE, through the CEACs, is supplementing standard CEAC services, by providing site-specific technical and cost information on clean energy compliance strategies to those major source facilities affected by the Boiler MACT rule currently burning coal or oil.
- DOE Boiler MACT Technical Assistance program is being piloted in Ohio now, and will be rolled out nationally when the EPA Rule reconsideration process is complete.

For more information on DOE Boiler MACT Technical Assistance:
http://www.1.eere.energy.gov/manufacturing/distributedenergy/boilermact.html

Potential CHP Capacity

Fuel Type	Number of Facilities	Number of Affected Units	Boiler Capacity (MMBtu/hr)	CHP Potential (MW)	CO_2 Emissions Savings (MMT)
Coal	332	751	180,525	18,055	114.2
Heavy Liquid	170	367	48,296	4,830	22.9
Light Liquid	109	241	22,133	2,214	10.5
Total	**611***	**1,359**	**250,954**	**25,099**	**147.6**

The data on this chart is still being refined

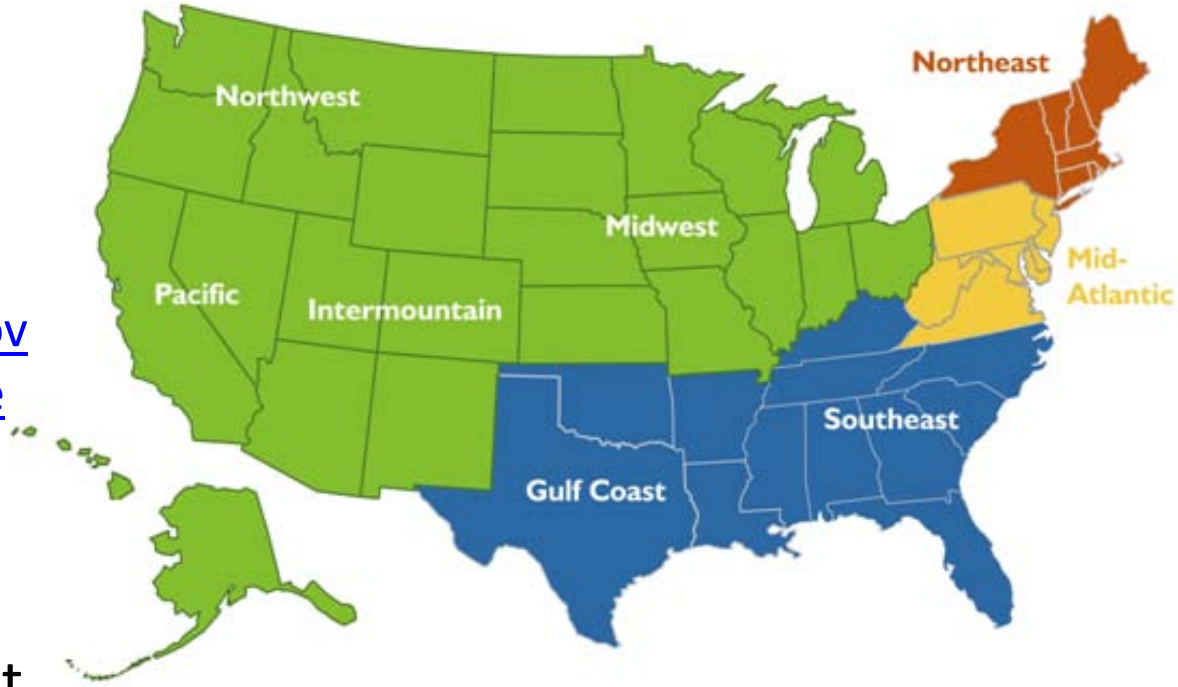
*Some facilities are listed in multiple categories due to multiple fuel types; there are 567 ICI affected facilities

- CHP potential based on average efficiency of affected boilers of 75%; Average annual load factor of 65%, and simple cycle gas turbine CHP performance (power to heat ratio = 0.7)
- GHG emissions savings based on 8000 operating hours for coal and 6000 hours for oil, with a CHP electric efficiency of 32%, and displacing average fossil fuel central station generation

More Info on DOE Boiler MACT Technical Assistance

DOE Boiler MACT Technical Assistance: http://www1.eere.energy.gov/manufacturing/distributedenergy/boilermact.html

DOE Boiler MACT Technical Assistance Fact Sheet: http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/boilermact_tech_asst_factsheet.pdf



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SEE Action: The State and Local Energy Efficiency Action Network

- State- and local-led effort facilitated by the federal government to bring energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.
- Provides knowledge resources and technical assistance for decision makers
- Network of more than 200 leaders.

SEE Action IEE/CHP WG: http://www1.eere.energy.gov/seeaction/combined_heat_power.html

SEE Action IEE/CHP Working Group

- Chairs: Todd Currier – Washington Energy Office; Joshua Epel, Chairman – Colorado PSC
- Members include: ACEEE, ASE, NRDC, NYSERDA, SoCal Gas, MW CEAC, Saint Gobain
- DOE/EPA staff leads: IEE (Sandy Glatt, Betsy Dutrow-EPA) and CHP (Katrina Pielli, Neeharika Naik-Dhungel-EPA)
- Four focuses:
  - Demand for Industrial Energy Efficiency & CHP
  - Build the Workforce
  - Promote Efficient Operations & Investment
  - Move the Market

SEE Action IEE/CHP WG: http://www1.eere.energy.gov/seeaction/combined_heat_power.html

SEE Action IEE/CHP Working Group (2)

- Planned CHP activities:
  1. *Guide to Implementing Successful State CHP Policies*. Fall 2012
  2. CHP Webinar Series based on the *Guide*
  3. Regional utility-industry workshops on overcoming barriers (IEE and CHP)
     - Midwest: Columbus, Ohio, June 21, 2012
     - Southeast, West, Northeast/Mid-Atlantic: Fall 2012

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