U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

CIBO Committee Meetings

June 12, 2012

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U.S. Department of Energy

Today

- DOE Boiler MACT Technical Assistance program
- Better Buildings, Better Plants

DOE Boiler MACT Technical Assistance program

CHP Benefits

- Combined Heat & Power (CHP) is an important energy resource that provides
  - Benefits for U.S. Industry
    - Reduces energy costs for the user
    - Reduces risk of electric grid disruptions
    - Provides stability in the face of uncertain electricity prices
  - Benefits for the Nation
    - 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

CHP Today

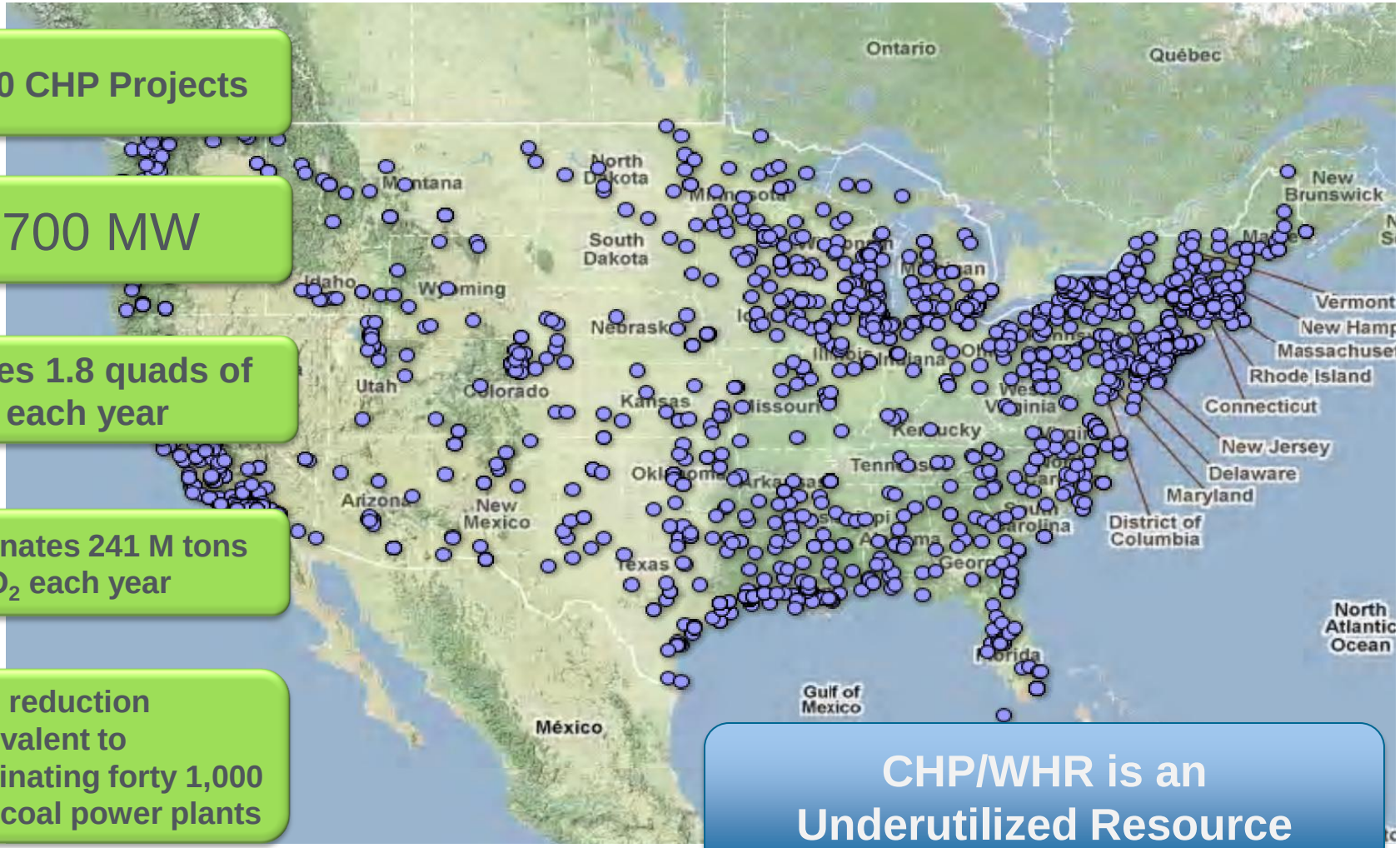
3,600 CHP Projects

81,700 MW

Saves 1.8 quads of fuel each year

Eliminates 241 M tons of CO_2 each year

CO2 reduction equivalent to eliminating forty 1,000 MW coal power plants

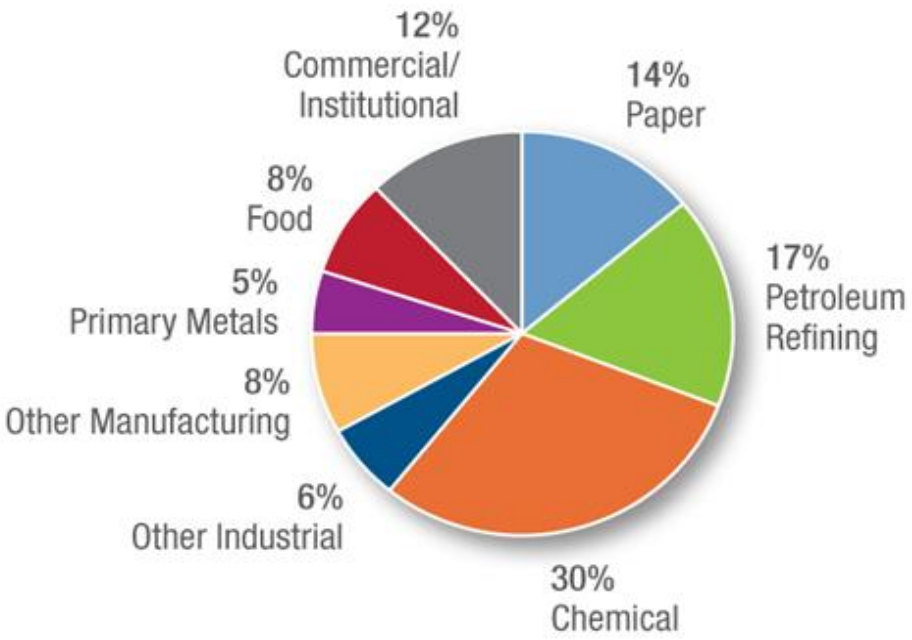


CHP/WHR is an Underutilized Resource

Source: ICF International

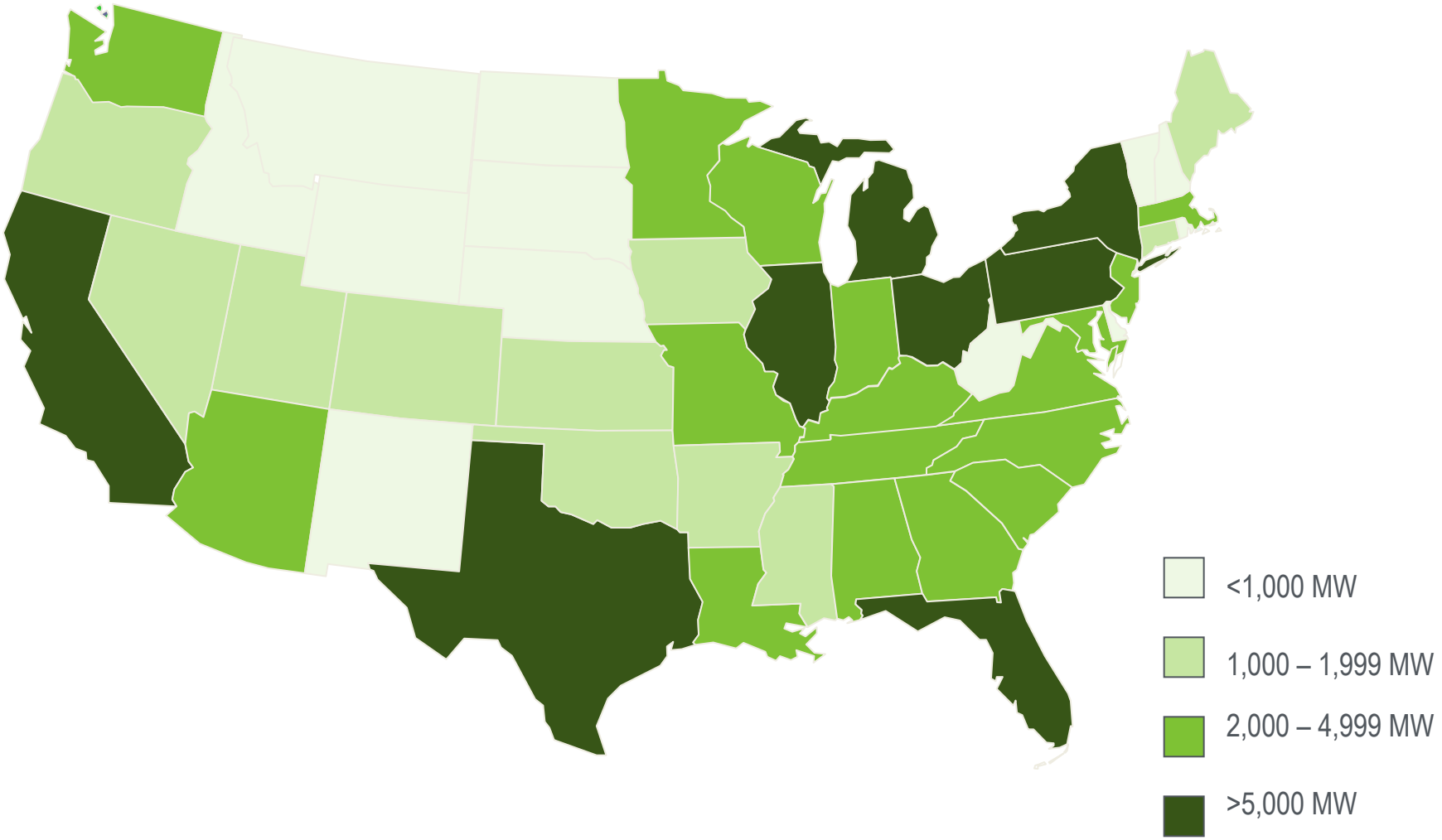
Existing CHP Capacity

- ~ 8% US generating capacity
- ~ 12% total annual MWh generated
- Industrial applications represent 88% of existing capacity
- Commercial/institutional applications represent 12% of existing capacity:
  - Hospitals, Schools, University Campuses, Hotels, Nursing Homes, Office Buildings, Apartment Complexes, Data Centers, Fitness Centers



Source: ICF International

CHP On-site Technical Potential



Source: ICF internal estimates

EPA Boiler MACT

- Dec 2, 2011: EPA released proposed amendments to previously released rules setting air toxic standards for boilers, process heaters and certain solid waste incinerators (CIWSI) incinerators.
  - EPA initially issued final rules for these units in March 2011, setting standards intended to cut emissions of hazardous air pollutants (HAPs) such as mercury, dioxin and lead.
  - At the same time it issued the final rules in March, EPA also announced that it intended to reconsider those standards under a Clean Air Act process that allows the agency to seek additional public review and comment to ensure full transparency in its rulemaking.
- Three rules:
  - Proposed Emissions Standards for **Area** Source Industrial, Commercial, and Institutional Boilers
  - Proposed Emissions Standards for **Major** Source Industrial, Commercial, and Institutional Boilers and Process Heaters
  - Proposed Emissions Standards for **Commercial/Industrial Solid Waste Incinerators** (CISWI)
- DOE's effort focused on **Major Source** rule

EPA Boiler MACT (2)

- Standards for hazardous air pollutants from major sources: industrial, commercial and institutional boilers and process heaters (excludes any unit combusting solid waste)
- Major source is a facility that emits:
  - 10 tpy or more of any single Hazardous Air Pollutant, or 25 tpy or more of total Hazardous Air Pollutants (HAPs)
- Emissions limits applicable to new and existing units > 10 MMBtu/hr
  - Mercury (Hg)
  - Particulate Matter (PM) as a surrogate for non-mercury metals (alternative limits for total selective metals (TSM))
  - Hydrogen Chloride (HCl) as a surrogate for acid gases
  - Carbon Monoxide (CO) as a surrogate for non-dioxin organics

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

DOE Boiler MACT Technical Assistance

- DOE currently provides technical information and assistance, market development, and education on CHP, Waste Heat to Power, and District Energy options through its 8 regional Clean Energy Application Centers (CEACs)
- DOE is supplementing this ongoing effort 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.
  - These facilities may have opportunities to develop compliance strategies, such as CHP, that are cleaner, more energy efficient, and that can have a positive economic return for the plant over time
- 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 (Spring 2012)

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

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 Approach

- Site-specific “Decision Trees” will include:
  - Facility Info
  - Site Financial Data
  - Contact Info
  - Boiler Unit Data
  - Compliance Control Requirements
  - CHP as an Alternative Compliance Option
  - Comparative Cost of Compliance Options
  - CHP Payback
  - Available Financial Options

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

Ohio Effort

"Because of coal plant retirements, educating consumers on combined heat power is of particular interest to the PUCO. A facility's decision to invest in CHP may constitute a rational market response that not only benefits the facility but which will also supports grid reliability in Ohio."

- Public Utilities Commission of Ohio Chairman Todd Snitchler. February 23, 2012

http://www.puco.ohio.gov/puco/index.cfm/industry-information/industry-topics/combined-heat-and-power-in-ohio/ /

DOE Boiler MACT Assistance Available

- DOE webpage on 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
- List of available state incentives for emissions controls, EE measures, boiler replacements/tune-ups, CHP, and energy assessments (DOE)
  - http://www1.eere.energy.gov/industry/states/pdfs/incentives_boiler_mact.pdf
    - Will be updated when rule is final
- Extensive assistance materials for Area Source rule available from EPA
  - Tune-up guidance, fast facts, brochure, table of requirements, small entity compliance guide, etc.
  - www.epa.gov/ttn/atw/boiler/boilerpg.html

For More Information on DOE Boiler MACT Technical Assistance

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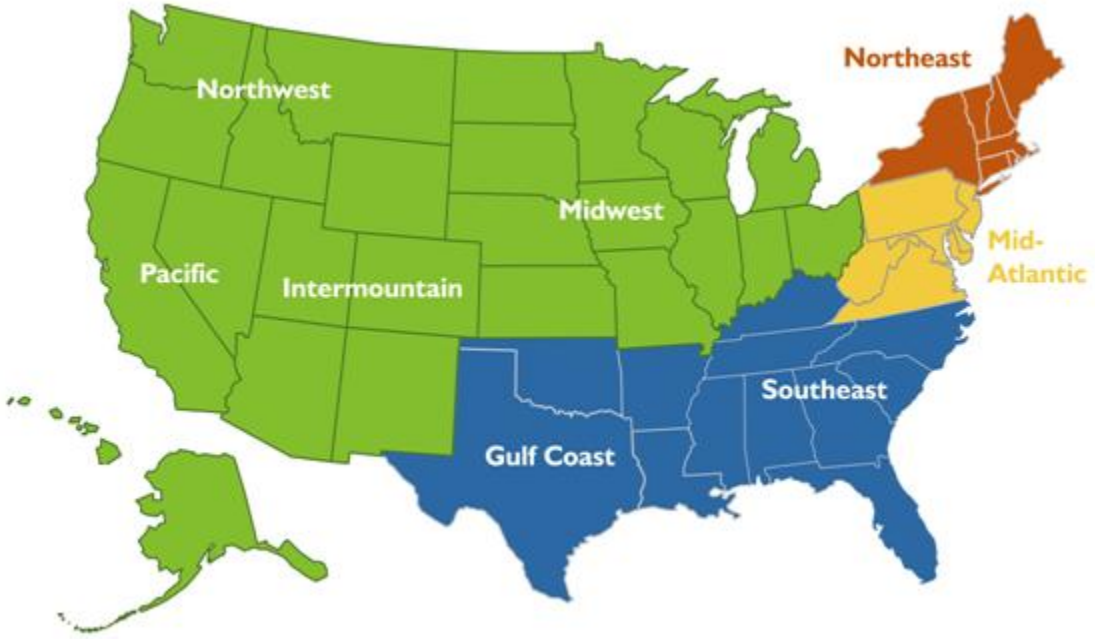
DOE Boiler MACT Technical Assistance:
http://www1.eere.energy.gov/manufacturing/distributedenergy/boilermact.html

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



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Better Buildings, Better Plants

Better Buildings Challenge

Make commercial & industrial buildings 20% more efficient by 2020

Save more than $40 billion annually for US organizations

Create American jobs

- Market leadership; high level partnership with DOE
- Overcome market barriers/persistent obstacles with replicable, marketplace solutions
- Showcasing real solutions; provide models for others to follow
- Recognition from DOE and Administration for success
- Partnering with industry leaders to better understand policy and technical opportunities
- Portfolio wide commitment to continuous improvement

High Level Milestones

- ✓ President Obama announces Better Buildings Initiative, including the Better Buildings **Challenge**, in February 2011
- ✓ DOE Secretary Chu highlights the Better Buildings Challenge at the Clinton Global Initiative in June; DOE and White House profile inaugural partners
- ✓ President Obama and Former President Clinton officially launch the program in December 2011

  GOAL: Achieve a 20 percent improvement in the energy efficiency of commercial and industrial buildings by 2020.

President Obama at Penn State University
February 3, 2011

Current Partners and Allies

65 public, private and non-profit organizations:

- 22 Commercial Partners
- 9 Better Buildings, Better Plants Partners
- 12 Community Partners
- 10 Education Partners
- 11 Financial Allies
- 1 Utility Ally

Together, they represent:

- 1.6 billion square feet of commercial and industrial space committed
- 300 manufacturing plants
- ~$2 billion in private sector financing


enerGi
Walgreens
Schneider Electric
RREEF
DAS
GCP
USAA
USAA Real Estate Company
Cleveland Clinic
FORESTCITY
BRIGGS&STRATTON
GREEN SPORTS ALLIANCE
KOHL'S
RENEWABLE FUNDING
SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company
transcend
WYNDHAM WORLDWIDE
LA COMMERCIAL BUILDING PERFORMANCE PARTNERSHIP
Ygrene ENERGY FUND
Delaware State University
Making our mark on the world
Douglas County School District
legrand
CBRE
citi
BLUE HILL
TRANSWESTERN
THE UNIVERSITY OF UTAH
ALLEGHENY COLLEGE
Lend Lease
ABUNDANT POWER
SAINT-GOBAIN
JONES LANG LASALLE
METRUS ENERGY
FOUDRE SCHOOL DISTRICT
PROLOGIS
SHORENSTEIN
ASCENSION HEALTH
sustainable.dc
has your voice been heard?
MINNESOTA DEPARTMENT OF COMMERCE
MICHIGAN STATE UNIVERSITY
ALCOA
HEI HOTELS & RESORTS
SeriousCapital™
IHG
InterContinental Hotels Group
BEST BUY
DENVER
THE MILE HIGH CITY
Cummins
NISSAN
TIAA CREF
3M
PNC
KCTCS
SEATTLE 2030 DISTRICT
SUPERVALU

Better Buildings, Better Plants

- DOE has evolved its industrial partnership program to align it with the **Better Buildings Challenge** and provide greater integration across the industrial and commercial sectors
- The industrial component of the Better Buildings Challenge provides different opportunities for national recognition based on level of commitment:
  - **Better Buildings, Better Plants Program Partners** pledge energy savings goals consistent with national targets and agree to report progress annually to DOE. Program requirements largely match those of the *Save Energy Now* LEADER initiative
  - **Better Buildings, Better Plants Challenge Partners** agree to transparently pursue innovative approaches to energy efficiency, and make a significant, near-term investment in an energy saving project or set of projects

Better Buildings, Better Plants

- 10-year, 25% savings target or more
- Adopt “market innovations”
- Transparency in market innovations
- Quarterly reporting on innovations
- Annual reporting on results

Recognized as premier market leaders

- 10-year, 25% savings target
- Annual reporting

Better Buildings, Better Plants Program

- Better Buildings, Better Plants Program builds on the success of previous DOE partnership programs. Partners:
  - Set a 10-year, 25% energy intensity improvement target
  - Develop energy management plans
  - Track and report energy data annually to DOE
  - Receive national recognition for their achievements
  - Receive support from technical account managers
- Program currently consists of 110 companies and over 1,400 plants, consuming about 1,000 TBtus of energy annually, or about 5% of the total U.S. manufacturing energy footprint
- Most companies are on track to meet the 10-year target

Better Buildings, Better Plants Challenge

Partner Agrees to:

Commit

- Assign Senior Executive
- Announce innovations/market solutions

Take Action

- Showcase project within 9 months
- Organization wide plan, schedule and milestones within 9 months

Report Results

- Share information and implementation models
- Share portfolio wide, facility level energy performance once* a year
- Quarterly updates on progress on showcase projects, other

DOE Agrees to:

Assist

- Technical assistance
- With the development of implementation models

Connect

- Establish marketplace of energy efficiency stakeholders

Recognize

- National and local recognition
- Showcase and highlight partners who develop and share innovative and cost effective marketplace blueprints

* Commercial Partners report twice a year

For More Information on Better Buildings, Better Plants

Better Buildings Challenge:
www.betterbuildings.energy.gov/challenge

Better Buildings, Better Plants:
http://www1.eere.energy.gov/manufacturing/tech_deployment/betterplants/index.htm

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Appendix

DOE Boiler MACT Technical Assistance: Frequently Asked Questions

Q. How accurate is the Decision Tree Analysis results?

A. The results are only as good as the assumptions utilized. We expect the facilities will update the assumptions after the one-on-one meetings.

Q. What are the sources of the facility and unit data assumptions?

A. ICR – Survey data on boilers, process heater and other combustion units, submitted to EPA (facility & unit level data)

ECHO – EPA Enforcement & Compliance History Online database (facility level data on major source polluters)

REPIS – NREL Renewable Electric Plant Info System database (facility and unit level data for biomass facilities)

MIPD – Major Industrial Plant database (facility data for large industrial plants

LBDB – Large Boiler database (facility & unit level data – boilers > 250 MMBtu/hr

ELECUTIL – ICF Electric Utility database (facility & unit level data for utility boilers

GHGRP – EPA Greenhouse Gas Reporting Program (facility level and unit level data)

DOE Boiler MACT Technical Assistance: Frequently Asked Questions

Q. What is the value of an option that may have a significantly larger first cost?

A. Investment (with payback) versus a cost - higher efficiencies & lower emissions – potential for lower steam costs

Q. As a "rule of thumb," which boilers have the best opportunity to consider CHP as a compliance strategy?

A. Older coal and oil boilers where installing standard control technologies and/or converting the existing boiler to natural gas is very expensive.

Q. If the facility wants to further explore CHP, what specific services can the CEAC provide?

A. Assist in scoping the project (level 1 sizing, costs, design options); assist in securing needed engineering, financial and installation support