Better Buildings
U.S. DEPARTMENT OF ENERGY

CHP: A Proven High-Impact Opportunity

U.S. DEPARTMENT OF ENERGY

CHP: A Proven High-Impact Opportunity

Moderator: Claudia Tighe, DOE

PANELISTS:

- Claudia Tighe, DOE
- Pam Maines, Pepco Energy Services
- John Park, U.S. Department of Veteran Affairs
- Mel Nickerson, Illinois Department of Commerce and Economic Opportunity
- Steve Swinson, Texas Medical Center

Advanced Manufacturing Office

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

CHP: A Proven High-Impact Opportunity– DOE Perspective

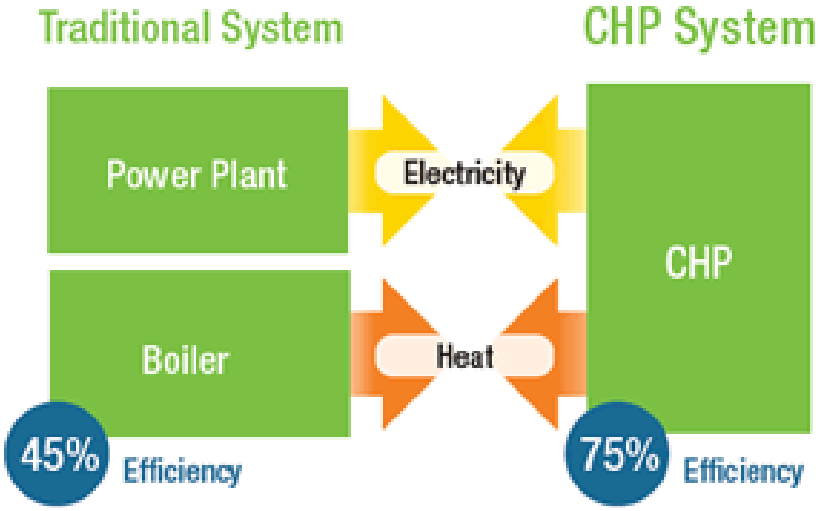
May 8, 2014

Claudia Tighe

CHP Deployment Program Manager

What is CHP?

- Form of Distributed Generation (DG)
- An integrated system
- Located at or near a building / facility
- Provides at least a portion of the electrical load and
- Uses thermal energy for:
  - Space Heating / Cooling
  - Process Heating / Cooling
  - Refrigeration/Dehumidification



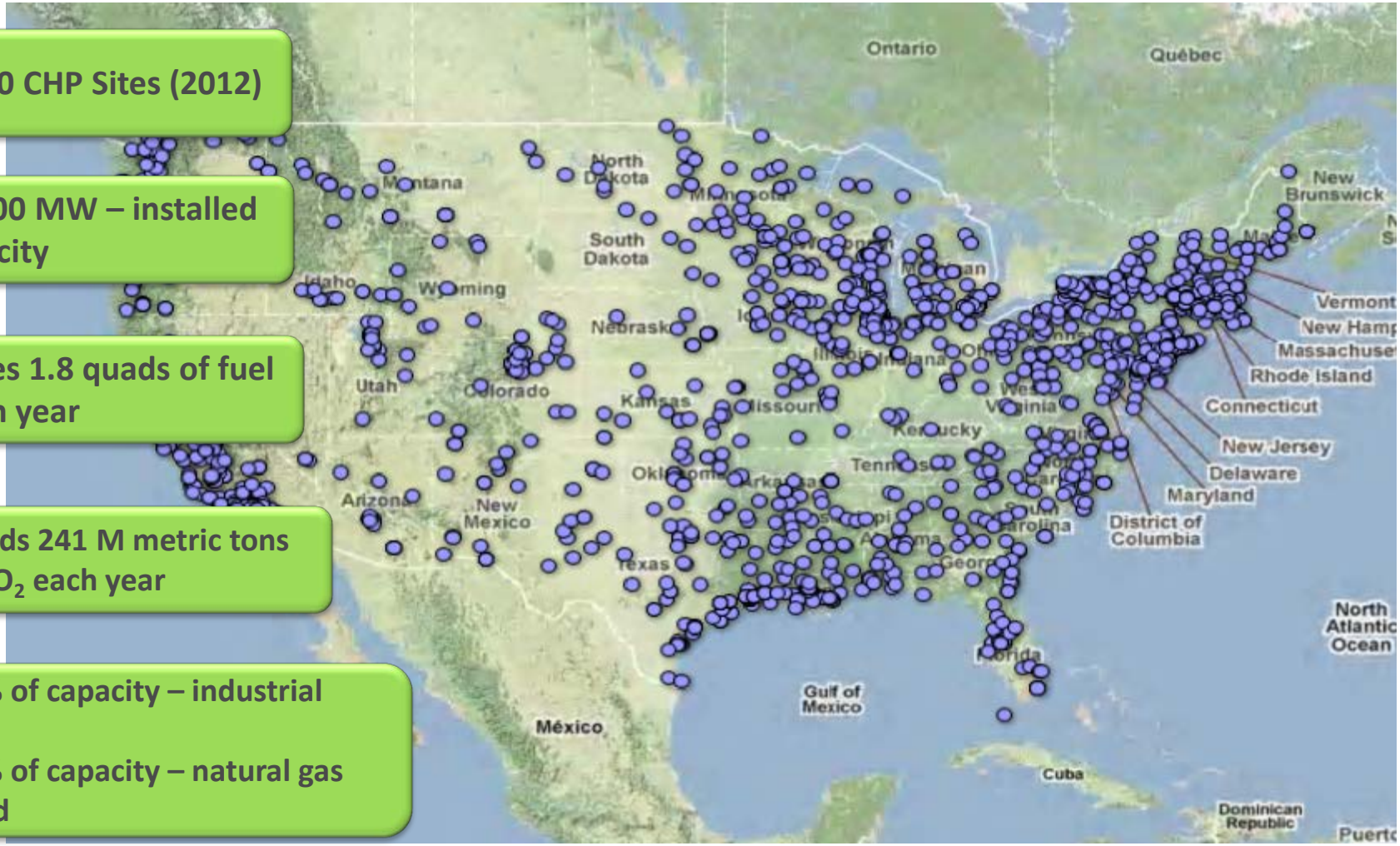
Source: http://www1.eere.energy.gov/manufacturing/distributedenergy/chp_basics.html

CHP provides cost-effective, clean and reliable energy – today and for the future.

CHP Is Used at the Point of Demand

- 4,200 CHP Sites (2012)
- 82,400 MW – installed capacity
- Saves 1.8 quads of fuel each year
- Avoids 241 M metric tons of CO_2 each year
- 87% of capacity – industrial

  71% of capacity – natural gas fired



Source: ICF International

Executive Order

- August 30th, 2012: President Obama signed an Executive Order to **accelerate investments in industrial energy efficiency (EE), including combined heat and power (CHP)** with the goal of bringing together all stakeholders to seize this opportunity and ensuring that Federal agencies are taking the maximal steps to support private sector investment in this space.
- Sets a national **goal of 40 GW** of new **combined heat and power** installation over the next decade
- The Executive Order is part of the President's efforts to both **Revitalize American Manufacturing** and to pursue **an All-of-the-Above energy strategy**
- Often **barriers exist** that prevent otherwise economic investments in industrial EE and CHP from occurring.
- The Administration believes it is important to **accelerate investment in industrial energy efficiency** in a way that **benefits all stakeholders**.

National Goal of 40 GW of CHP by 2020

Achieving the President's goal would:

- Increase total CHP capacity in the U.S. by **50 percent** in less than a decade
- Save energy users **$10 billion a year** compared to current energy use
- Save **one quadrillion Btus** (Quad) of energy — the equivalent of 1 percent of all energy use in the U.S.
- Reduce emissions by **150 million metric tons of CO2 annually** — equivalent to the emissions from over 25 million cars
- Result in **$40-$80 billion in new capital investment in manufacturing** and other U.S. facilities over the next decade

Source: DOE/EPA, CHP: A Clean Energy Solution, August, 2012, www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

The Role of CHP in Energy Strategy

CHP considered formidable energy efficiency solution on both sides of meter:

- CHP provides significant technical, economic, and environmental benefits
- CHP offers resiliency options when faced with man-made and natural disasters
- CHP provides additional economic development options in capacity constrained areas
- CHP can harden/stabilize the grid

Source: McKinsey, DOE 2012

CHP Drivers

- Cost Savings #1

  Offset Utility/3rd Party kWh's + Therms
- Emissions Reductions

  Supported by US DOE & US EPA
- Reliability

  Provides local grid support and improves power quality
- Resiliency

  CHP is emerging as a key tool in developing cost-effective Microgrids that improve energy resiliency and can provide emergency power back-up
- National Security

  Reduced fossil fuel usage extends U.S. resources; and multiple points of power generation are less subject to catastrophic failure or attack

CHP Systems Kept the Power On During Super Storm Sandy

- 820 miles in diameter on 10/29/12
  - Double the landfall size Isaac & Irene combined
- Caused 106 fatalities
- Total estimated cost to date - $71 billion+ (lost business)
  - New York - $42
  - New Jersey - $29
- Affected 21 states (as far west as Michigan)
- 8,100,000 homes lost power
- 57,000 utility workers from 30 states & Canada assisted Con Ed in restoring power

CHP Applications

- University Campus, NJ

  - The 15 MW CHP plant provides steam and chilled water throughput the campus and is integrated with the wholesale and transmission markets.
  - Through the efficiency of CHP, Princeton has dramatically reduced its fuel use, avoiding over 27,900 metric tons of carbon emissions and making it one of the leading campus energy plants in the country in both efficiency and environmental sustainability

- Hospital, NY
  - 2 x 250 kW Reciprocating Engines
  - Designed to island from grid during outage
  - Provided 100% of electric and thermal needs for 15 days during and after Hurricane Sandy.

CHP Applications

- Industrial Process Integration, PA

  - Adding second 50 MW CHP System for total installed capacity of 100 MW internal use only
  - Total CHP plant will provide most of the plant's electric and thermal energy needs driven by local Shale Gas.

- Food Processing, CT

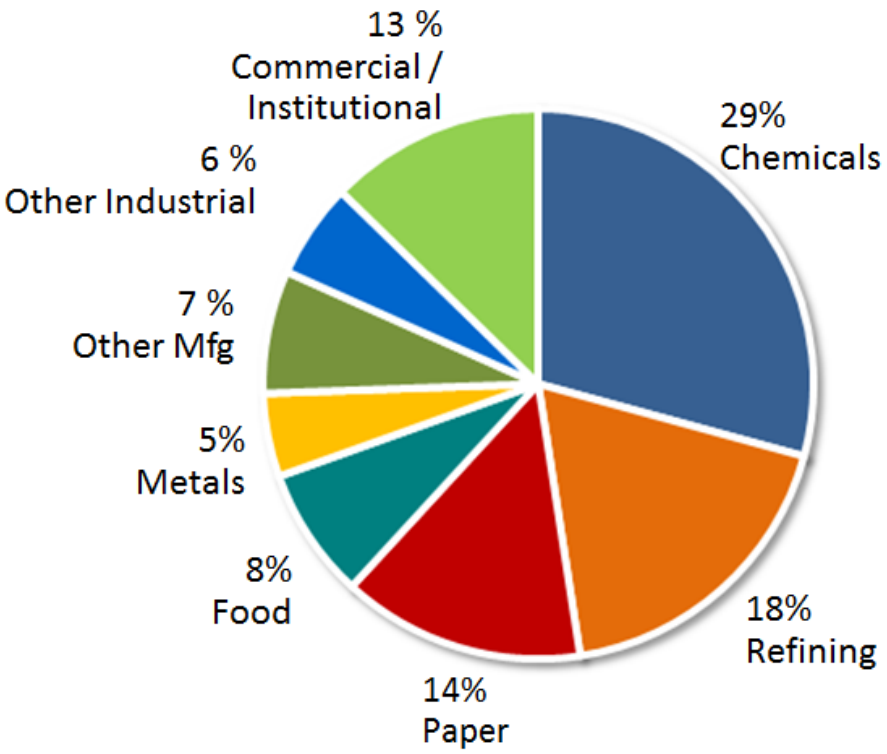
Food processing plant gets 100% of its power and 80% of its thermal energy from a 4.6 MW CHP plant with duct burner and HRSG.

CHP Applications

- Office Building, CA
  - 1 MW Reciprocating Engine Plant with 320 Ton Chiller
  - Reduces grid peak loads with chiller output as well as generator output. Operates concurrent with grid load
  - Provides power, space heating and space cooling.

- Bank, NE
  - In order to assure the highest quality power, the bank installed four 200 kW Fuel Cells and operates with a 99.99999% reliability factor.
  - The waste heat is used to provide space heating and snow melting in winter and dehumidification in summer.

CHP Today in the United States (2012 Data)

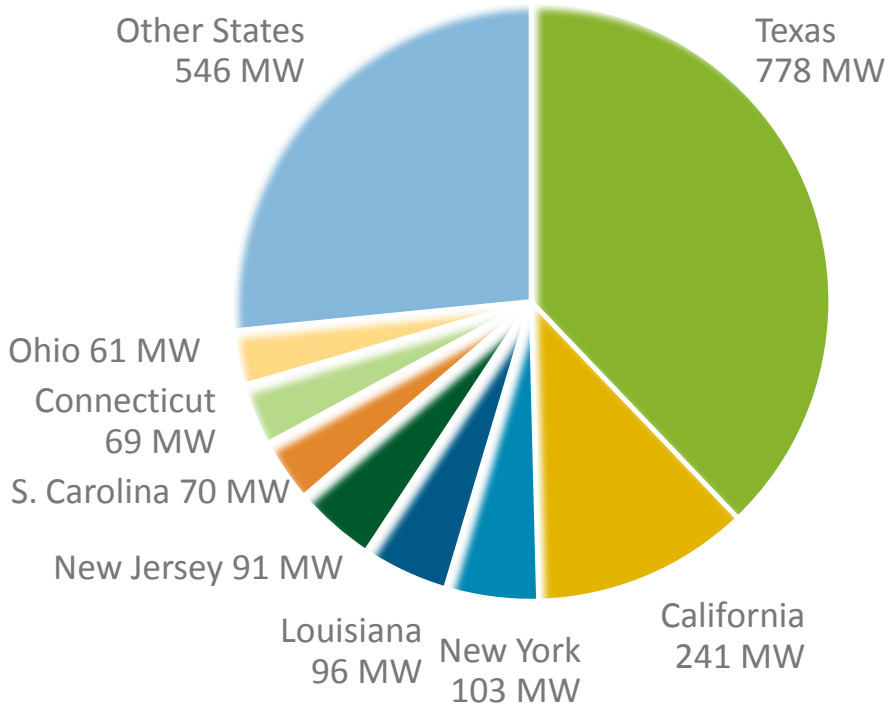


- **82.4 GW** of installed CHP over 4,200 industrial and commercial facilities
- 7% of U.S. Electric Generating Capacity; 14% of Manufacturing
- Avoids more than **1.8 quadrillion Btus** of fuel consumption annually
- Avoids **241 million metric tons of CO_2** compared to separate production

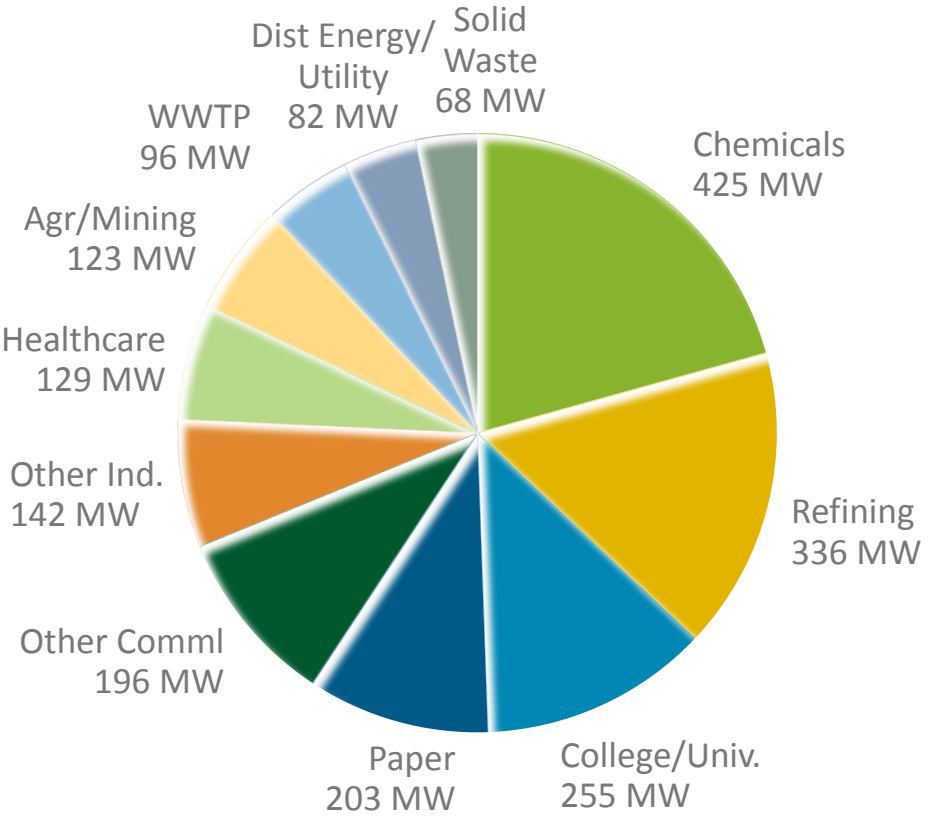
Sources: ICF CHP Installation Database (2012 Data);
EIA http://www.eia.gov/todayinenergy/detail.cfm?id=8250
Energetics, "US Manufacturing Energy Use and Greenhouse Gas Emissions Analysis, November 2012"

CHP Additions, 2010-2012 (2,054 MW)

By State (MW)



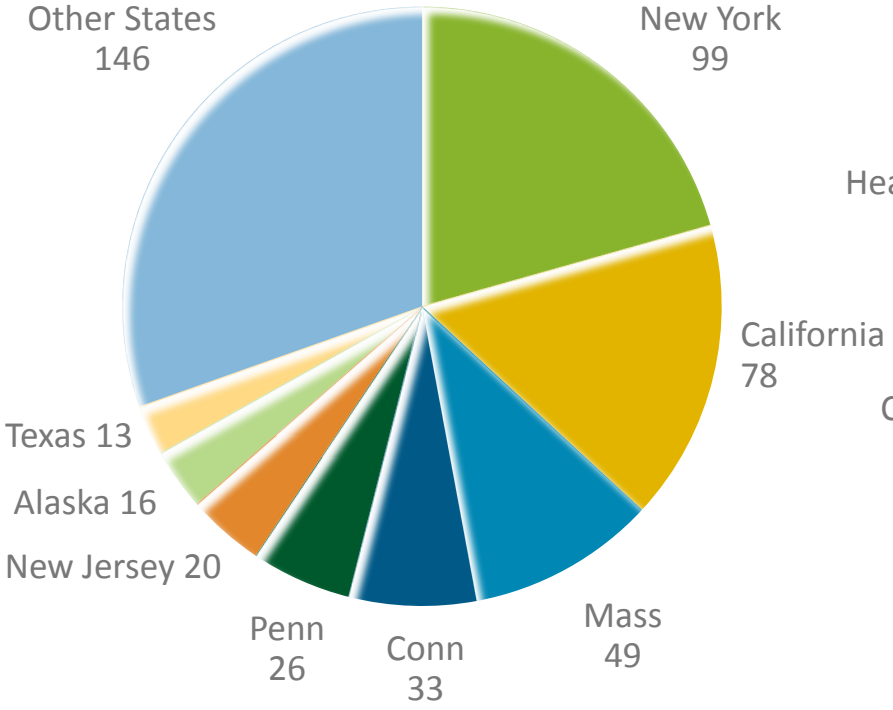
By Application (MW)



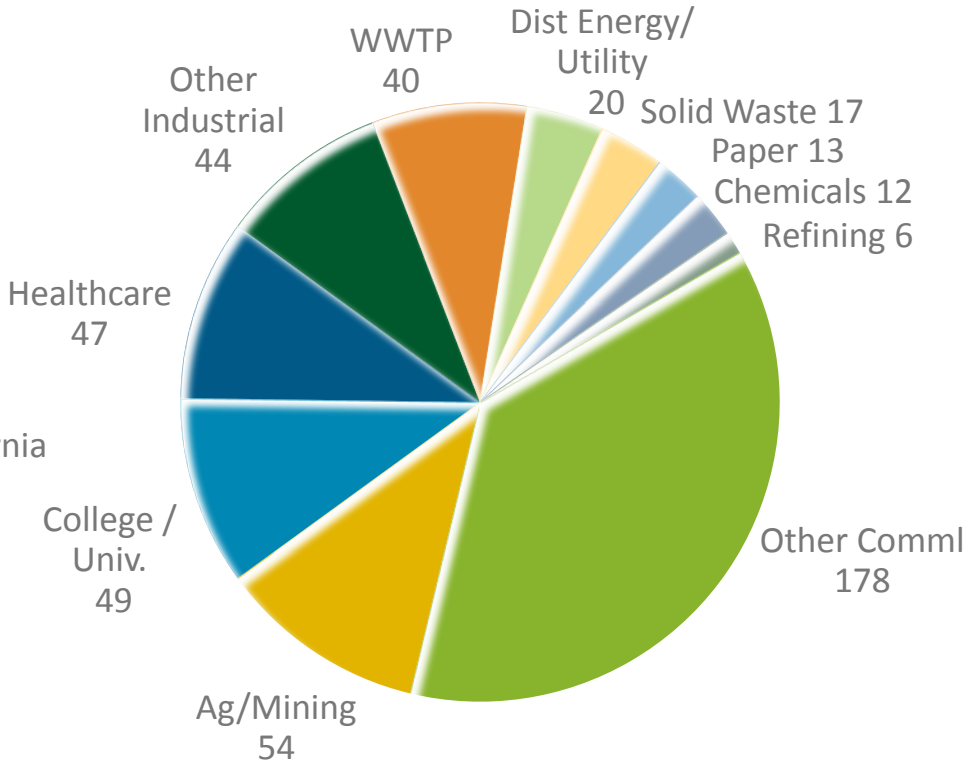
Source: ICF CHP Installation Database (2012 Data)

CHP Additions, 2010-2012 (480 Sites)

By State (Sites)

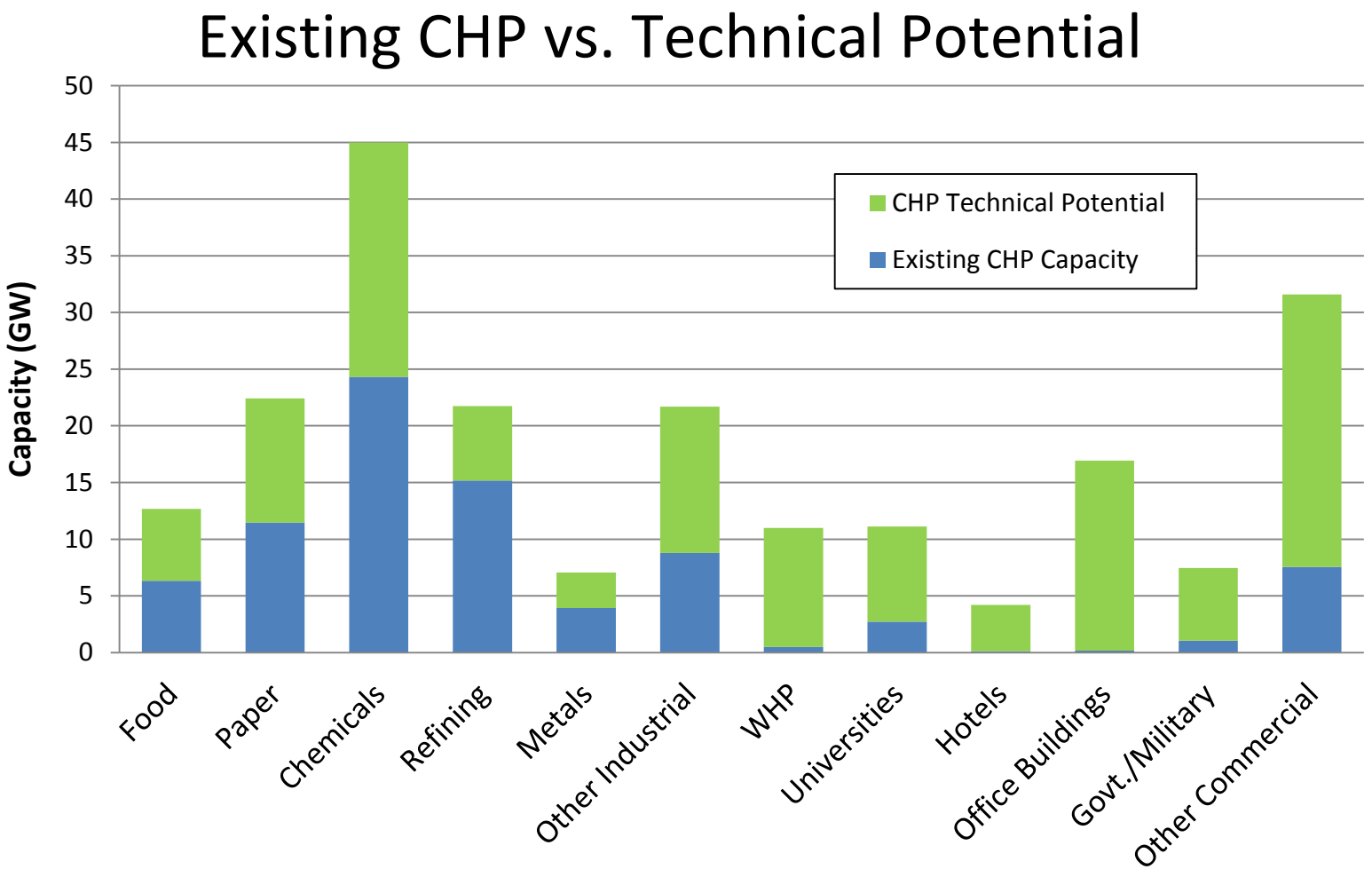


By Application (Sites)



Source: ICF CHP Installation Database (2012 Data)

Where is the Remaining Potential for CHP?



Source: ICF internal estimates (2013)

CHP Technical Potential

Application	50-500 kW (MW)	500 - 1 MW (MW)	1 - 5 MW (MW)	5 - 20 MW (MW)	>20 MW (MW)	Total MW
Mid-Atlantic	3,341	2,718	4,367	2,963	2,889	16,278
Northeast	6,635	5,488	8,675	5,665	5,447	31,910
Southeast	2,700	2,478	3,550	1,700	728	11,157
Midwest	1,139	770	1,264	644	1,381	5,198
Pacific	2,872	2,229	3,288	1,873	1,280	11,543
Southwest	6,127	4,958	8,027	5,625	7,721	32,458
Northwest	3,688	3,078	4,397	2,699	4,301	18,163
Total	**26,502**	**21,720**	**33,568**	**21,170**	**23,747**	**126,707**

Source: ICF internal estimates (2013)

DOE's Role in Supporting the President's E.O.: 40GW Goal

DOE's AMO CHP Deployment Program's *CHP Technical Assistance Partnerships (CHP TAPs)* are critical components to achieve the President's CHP goal.

CHP TAPs provide:

- Regional CHP expertise
- Fact-based, un-biased information on CHP:
  - Technologies
  - Project development
  - Project financing
  - Local electric and natural gas supplier interfaces
  - State best practice policies
- Vendor, fuel, and technology neutral assessments of CHP viability.

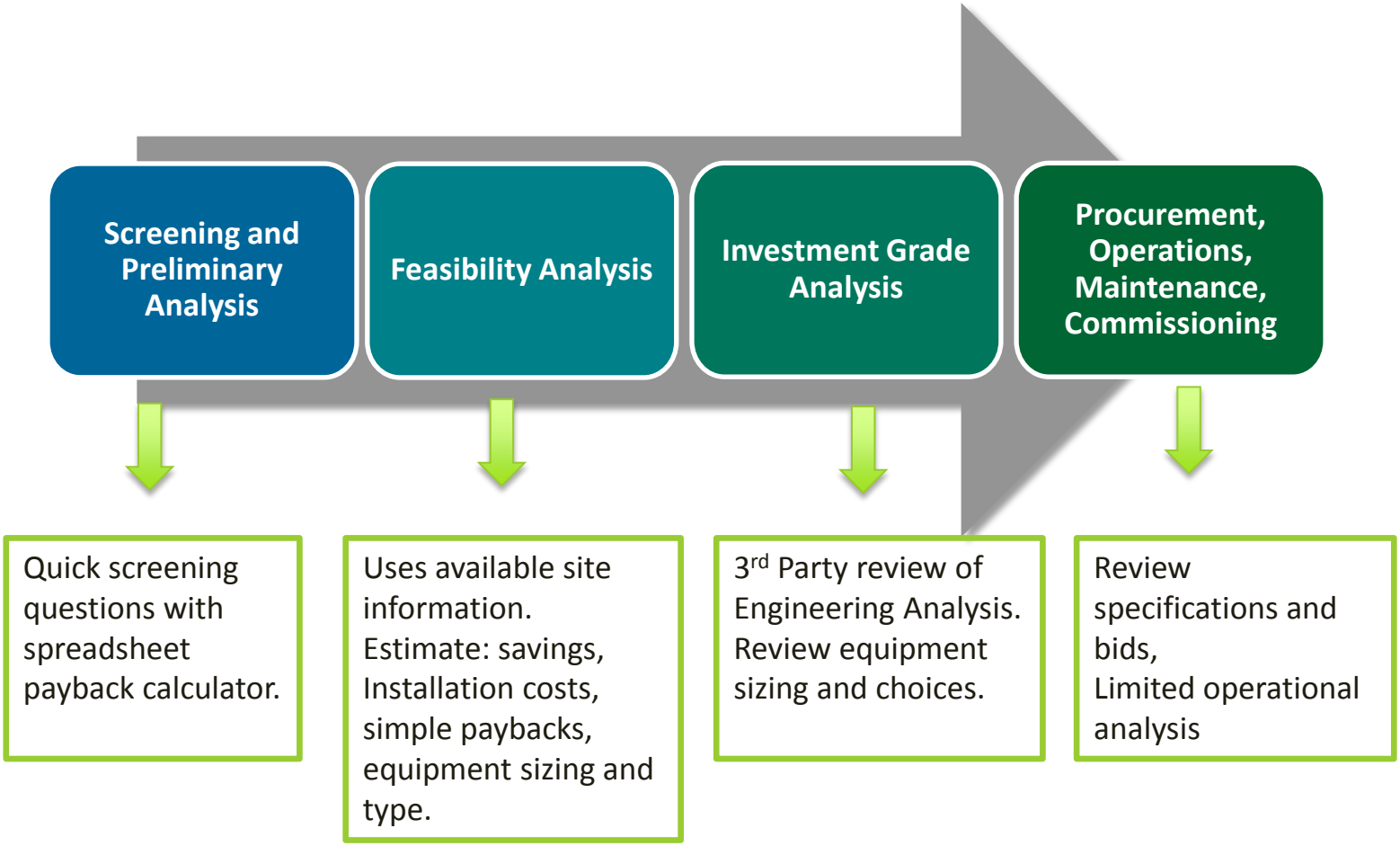
Key Activities:

Market Opportunity Analysis: Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors.

Education and Outreach: Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, utilities, energy end-users, trade associations and others.

Technical Assistance: Providing technical assistance to end-users and stakeholders to help them consider CHP, waste heat to power, and/or district energy with CHP in their facility and to help them through the project development process from initial CHP screening to installation

CHP TAP Project Development Technical Assistance



What is the SEE Action Network?

- Network of 200+ leaders and professionals, led by state and local policymakers, bringing energy efficiency to scale
- Support on energy efficiency policy and program decision making for:
  - Utility regulators, utilities and consumer advocates
  - Legislators, governors, mayors, county officials
  - Air and energy office directors, and others
- Facilitated by DOE and EPA; successor to the National Action Plan for Energy Efficiency

To stay updated on SEE Action activities and resources, sign-up for email alerts:

www1.eere.energy.gov/seeaction/index.html

- The Guide provides state policy makers with actionable information regarding:

  - Design of standby rates
  - Interconnection standards for CHP with no electricity export
  - Excess power sales
  - Clean energy portfolio standards
  - Emerging market opportunities: CHP in critical infrastructure and utility participation in CHP markets

Guide to the Successful Implementation of State Combined Heat and Power Policies

Industrial Energy Efficiency and Combined Heat and Power Working Group

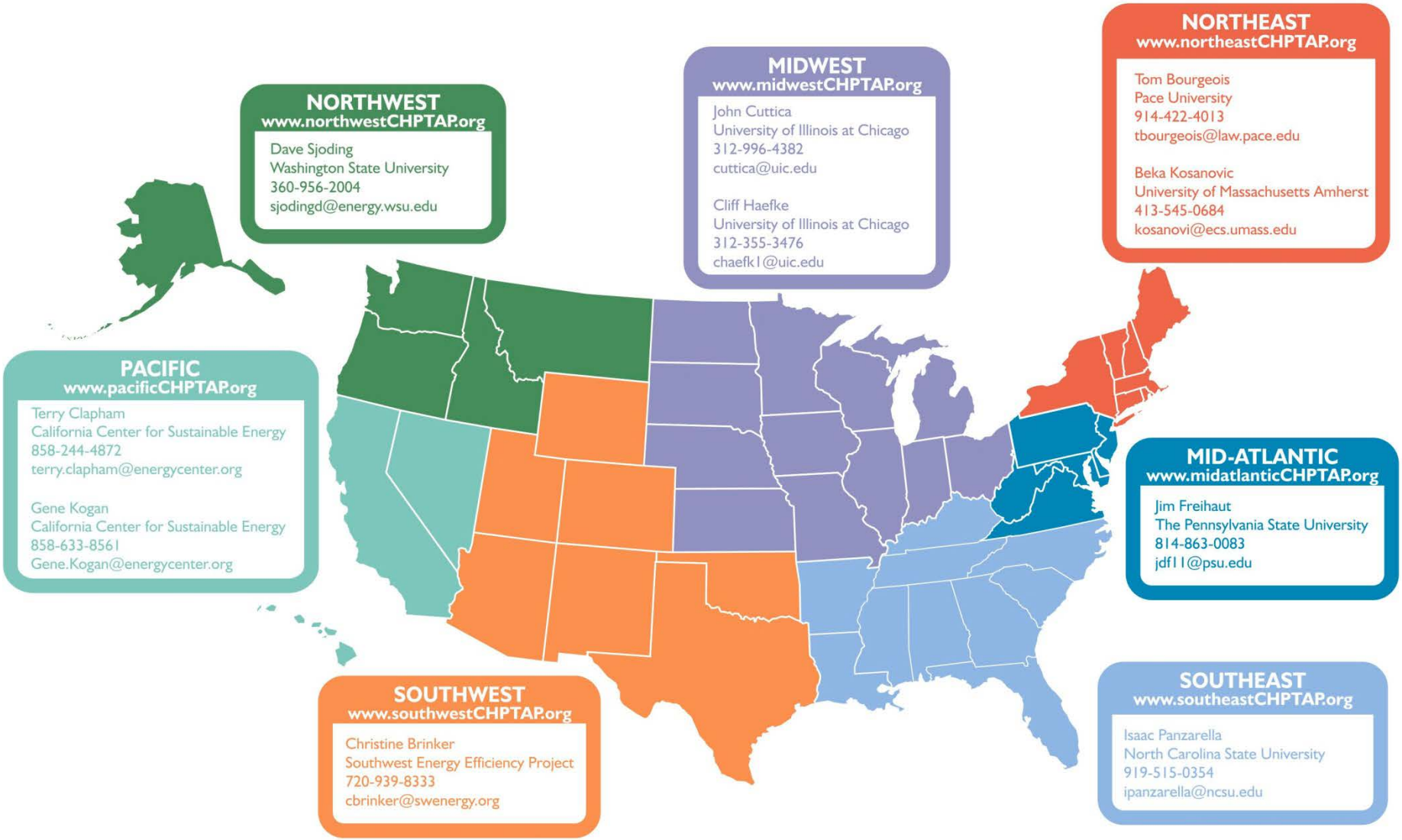
Driving Ratepayer-Funded Efficiency through Regulatory Policies Working Group

March 2013

The State and Local Energy Efficiency Action Network is a state and local effort facilitated by the federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.

Learn more at www.seeaction.energy.gov

DOE CHP Technical Assistance Partnerships (CHP TAPs)



NORTHWEST
www.northwestCHPTAP.org

Dave Sjoding
Washington State University
360-956-2004
sjodingd@energy.wsu.edu

MIDWEST
www.midwestCHPTAP.org

John Cuttica
University of Illinois at Chicago
312-996-4382
cuttica@uic.edu

Cliff Haefke
University of Illinois at Chicago
312-355-3476
chaefk1@uic.edu

NORTHEAST
www.northeastCHPTAP.org

Tom Bourgeois
Pace University
914-422-4013
tbourgeois@law.pace.edu

Beka Kosanovic
University of Massachusetts Amherst
413-545-0684
kosanovi@ecs.umass.edu

PACIFIC
www.pacificCHPTAP.org

Terry Clapham
California Center for Sustainable Energy
858-244-4872
terry.clapham@energycenter.org

Gene Kogan
California Center for Sustainable Energy
858-633-8561
Gene.Kogan@energycenter.org

MID-ATLANTIC
www.midatlanticCHPTAP.org

Jim Freihaut
The Pennsylvania State University
814-863-0083
jdf11@psu.edu

SOUTHWEST
www.southwestCHPTAP.org

Christine Brinker
Southwest Energy Efficiency Project
720-939-8333
cbrinker@swenergy.org

SOUTHEAST
www.southeastCHPTAP.org

Isaac Panzarella
North Carolina State University
919-515-0354
ipanzarella@ncsu.edu

DOE CHP Technical Assistance Partnerships (TAPs): Program Contacts

Claudia Tighe
CHP Deployment Lead
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Phone: 202-287-1899
E-mail: claudia.tighe@ee.doe.gov

Jamey Evans
Project Officer, Golden Field Office
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Phone: 720-356-1536
E-mail: jamey.evans@go.doe.gov

Patti Welesko Garland
CHP Technical Support Coordinator
Oak Ridge National Laboratory
Supporting, Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Phone: 202-586-3753
E-mail: garlandpw@ornl.gov

Ted Bronson
DOE CHP TAPs Coordinator
Power Equipment Associates
Supporting, Office of Energy Efficiency and Renewable Energy
Phone: 630-248-8778
E-mail: tlbronsonpea@aol.com

Thank you!

Contact Information:

Claudia.tighe@ee.doe.gov




Combined Heat & Power (CHP)

2014 Better Buildings Summit

Pam Maines

May 8, 2014

About Pepco Energy Services

An Energy Services Company

HQ in Arlington, VA with MD, NC, TX, NJ Offices

UESC, ESPC, Design Build, and Related Services

Local Partners and Alliances

ESCO Industry Leader Since 1995, and Pepco's UESC Representative

Investment Grade / Fortune 500 Utility Parent (PHI)

More than 400 Projects with $1B Value

Success with Over 30 Federal Agencies

Member of:

NAESCO

Combined Heat & Power Overview

Agenda

- CHP Project Development
- Typical CHP Application
- CHP Project Characteristics
- Case Studies
- Benefits

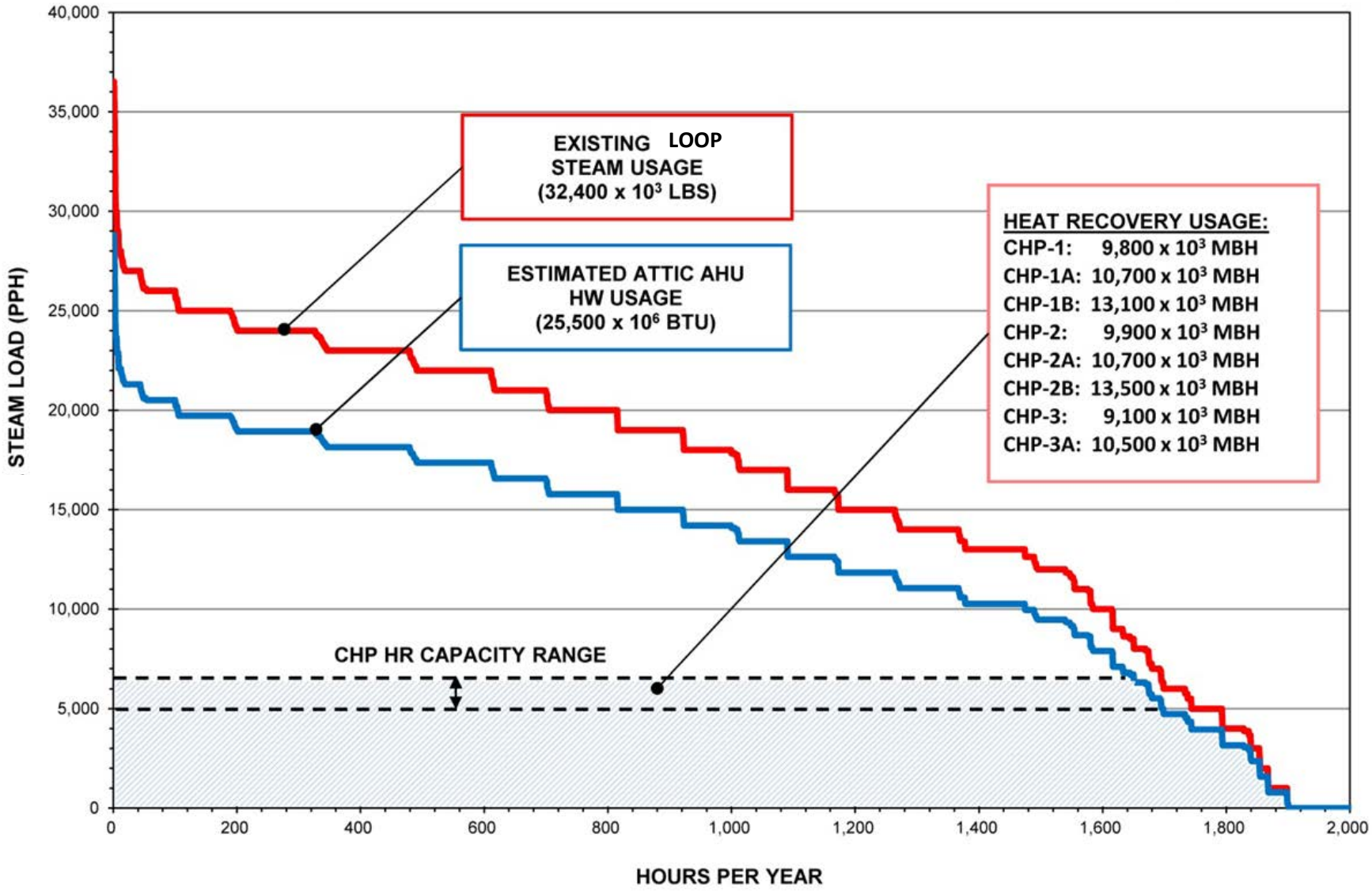
CHP Project Development

Role of a Project Developer

- Project Scoping (Preliminary, Schematic or 10% Design Phase)
  - General overview →location, equipment needs, estimated costs/savings
- Feasibility Analysis (IGA or 30% Design Phase)
  - Detailed technical & financial calculations
- CHP Configuration (IGA or 30% Design Phase)
  - Select primary equipment & contact vendors → price, performance, schedules
- Create Financial Proforma (IGA or 30% Design Phase)
  - Detailed cash flows
- Obtain Permits (IGA or 30% Design Phase)
  - Environmental/air, interconnection, site, ROW's, etc.
- Secure Financing (Task Order, Design-Build Phase, or IFC Drawings)
- Contract with Engineering/Construction/Equipment Firms (Task Order)
  - Select firms, negotiate T&C's, execute subcontracts
- Provide ***Overall*** Project Management (Task Order)
  - Includes entire process from design through commissioning
- Ownership/Operations (Performance Period)

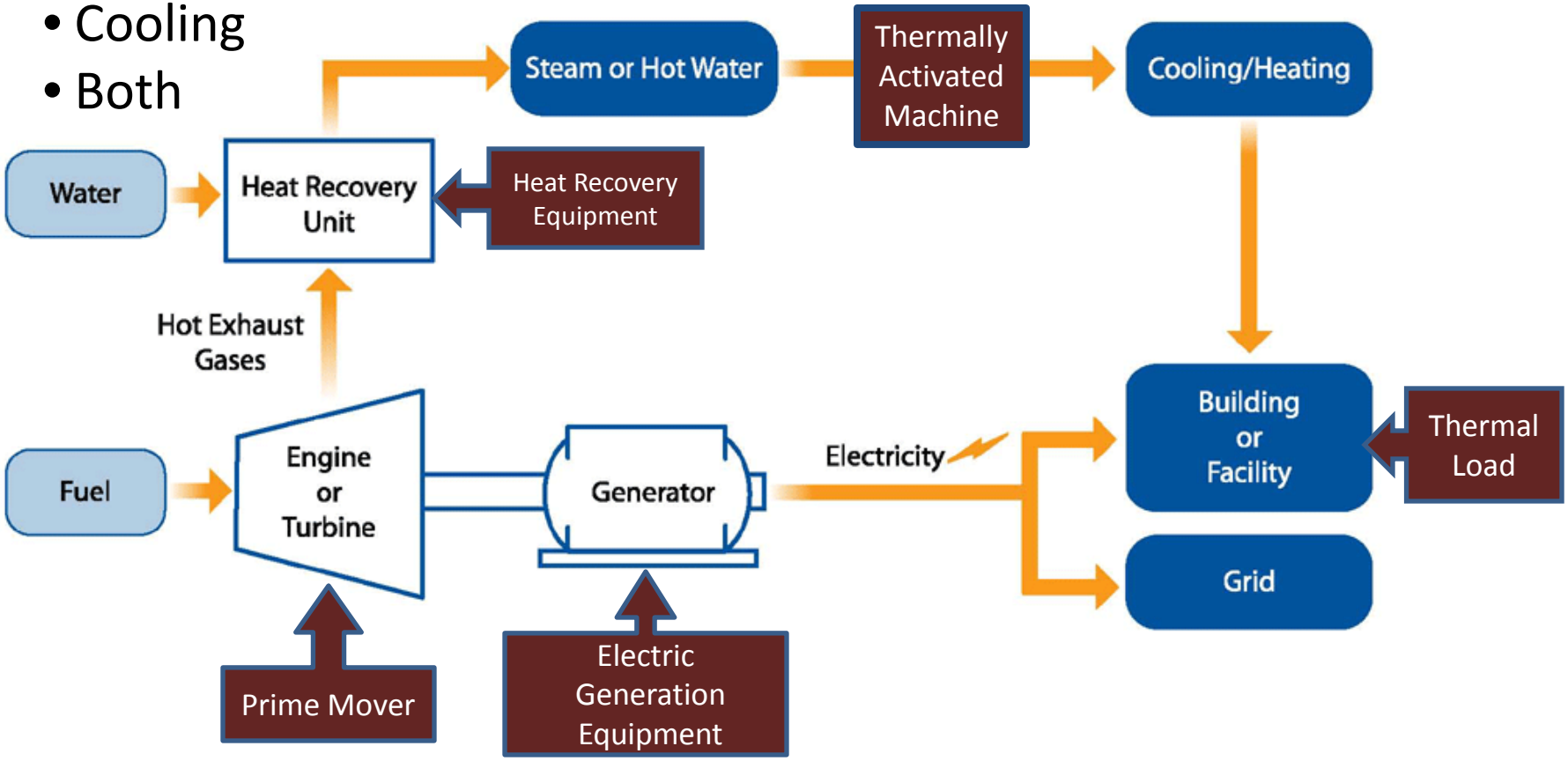
CHP Feasibility Modeling

Steam and/or Hot Water Load Duration Curve



CHP Typical Application

- Uses fuel to first Generate Power, then
- Capture resulting heat for use as:
  - Heating
  - Cooling
  - Both



CHP Case Study

CHP Case Study – National Institutes of Health (NIH)

- Siemens GT 10B 23MW combustion Turbine
  - Inlet air cooling
  - 1200 HP gas compressor
- Dual fuel capability
- 100,000 lbs/hour steam unfired
- 180,000 lbs/hour steam fired
- Interfaces to existing systems
- Interconnect with PEPCO/PJM
- PES designed, permitted and built
- 10 year Operation and Maintenance contract
- Provision for Temporary boilers
- CHP Energy Star Award

CHP Case Study

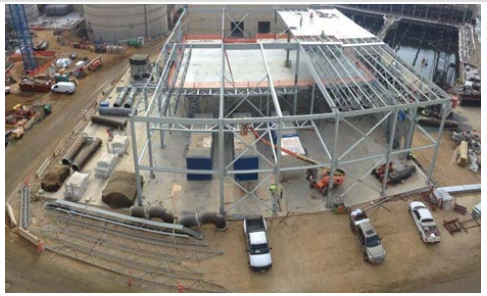
DC Water BioGas CHP

- World's Largest Advanced Wastewater Treatment Facility (AWTP)
- Serves 2 Million residents in DC, MD and VA
- Average Capacity of 370 Million Gallons/Day of Raw Sewerage
- Peak Capacity of 1.076 billion Gallons per day
- Site is 153 Acres

CHP Case Study

DC Water BioGas CHP

- 15 MW Combined Heat and Power (CHP) facility
  - Three 4.6 MW Solar Mercury 50 low-nitrogen oxide gas turbines
  - Digester gas cleaning and compression
  - Heat recovery steam generators, low NOX duct burners
  - Backup boiler
- Uses biogas from DC Water's water treatment process to produce steam and electricity
  - 33,000 lb/hr Steam returned and used in DC Water's treatment process
- Contract value
  - Construction: $82 million
  - O&M: $90 million
- Schedule
  - Contract signed February 2012
  - Construction begins Summer 2012
  - Construction completion January 2015;
    - 15-year O&M Phase begins



CHP Case Study (continued)

DC Water BioGas CHP

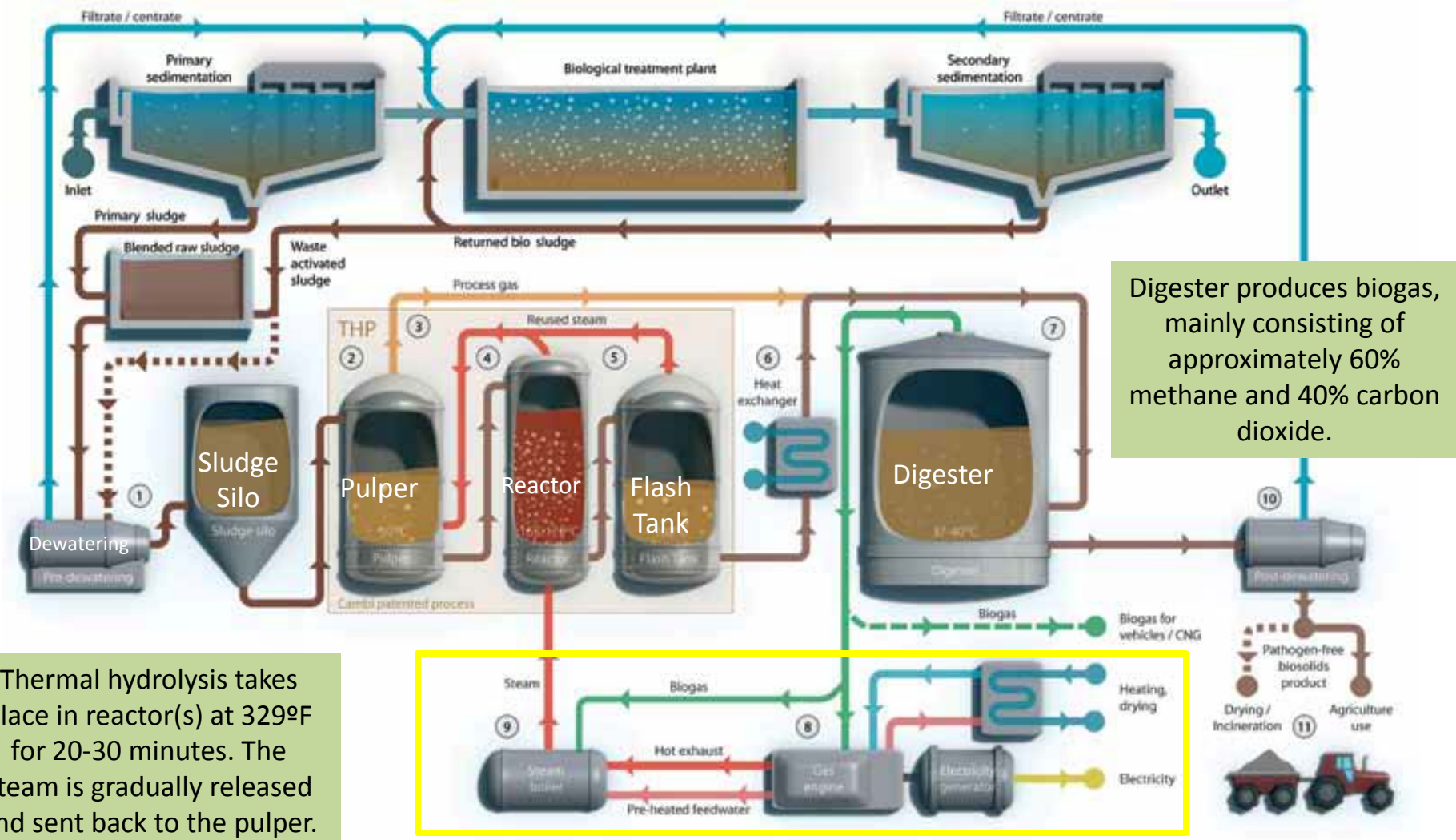
DC Water is currently upgrading its facilities to replace the majority of the lime stabilization with anaerobic digestion to treat the sludge and reduce odors.

This equipment will:

- Reduce biosolids volume by 50%;
- Reduce odors;
- Reduce truck traffic and truck emissions by an estimated 1.2 Million miles;
- **Produce clean-burning digester gas for heat and power;**
- Reduce O&M of Lime Stabilization;
- Reduce Electricity Costs;
- Class A biosolids available for beneficial reuse.

This process requires the use of steam for the anaerobic digesters. **This steam will be provided by the Combined Heat and Power facility being constructed by Pepco Energy Services.**

Cambi Thermal Hydrolysis Process (THP)



Digester produces biogas, mainly consisting of approximately 60% methane and 40% carbon dioxide.

Thermal hydrolysis takes place in reactor(s) at 329ºF for 20-30 minutes. The steam is gradually released and sent back to the pulper.

CHP Facility

Courtesy of CAMBI

CHP Benefits

- Reduced Energy Costs / High Efficiency
  - Efficient Fuel Utilization
  - Waste Heat captured for useful work
  - No transmission and lower distribution losses
- Environmental Advantages
  - Compared to Existing Equipment
- Improved Energy Security
  - Generation is “on-site”
  - Particularly applicable to Military Bases
- Improved Electric Reliability
  - Reduced susceptibility to grid failures
- Improved Power Quality
  - Reduced line losses/steady voltage

Contact Information

Combined Heat & Power Projects

Pam Maines
Pepco Energy Services
1300 N. 17th Street, Ste. 1600
Arlington, VA 22209
(703)253-1644
pmaines@pepcoenergy.com
www.pepcoenergy.com

VA Combined Heat and Power Program

Presentation at
U.S. Dept. of Energy Better Buildings Summit

John Park, PE, CEM
Portfolio Manager
U.S. Dept. of Veterans Affairs

May 8, 2014

WHAT WE WILL DISCUSS TODAY...

VA's Footprint and Difficulties in Meeting Mandates

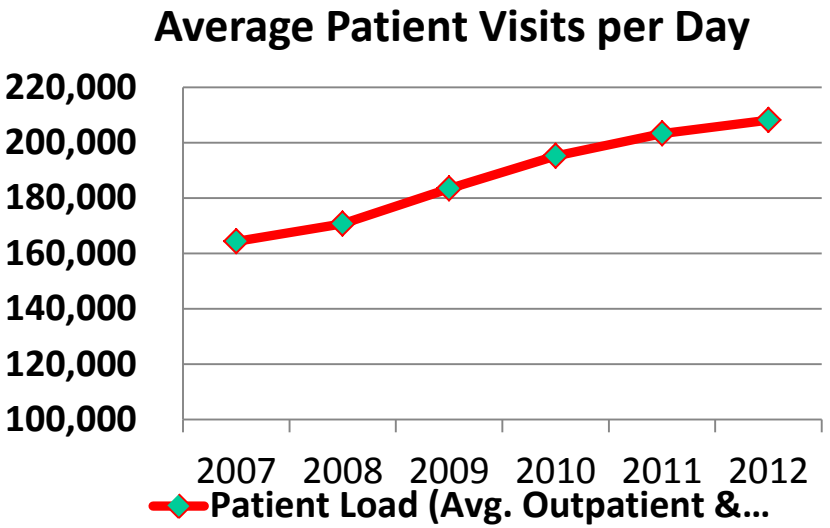
- **More than 170 Medical Center campuses**
  (VA-owned hospitals, long-term care and support facilities)
  - **Approximately 6,000 buildings with more than 170 million GSF**
  - **Nearly 34,000 acres of land – including National Cemeteries**
  - **The average age of VA facilities is est. at 60 years**
- **Uniqueness for Hospitals**
  - **24 Hour/7 Days a Week Operation**
  - **Energy Intensive**
  - **Patient (Veterans) Concerns are #1 Priority**
    - **Safety, Infection Control, Power Reliability**

VA's Footprint and Difficulties in Meeting Mandates

Federal Mandates

- Reduce energy intensity (30% by 2015)
- Increase Renewables (20% of electricity use by 2020)
- Reduce GHG Emission (Scope 1 & 2- 30% by 2020)
- Improve Power Security (JCAHO standard)

VA's Reality



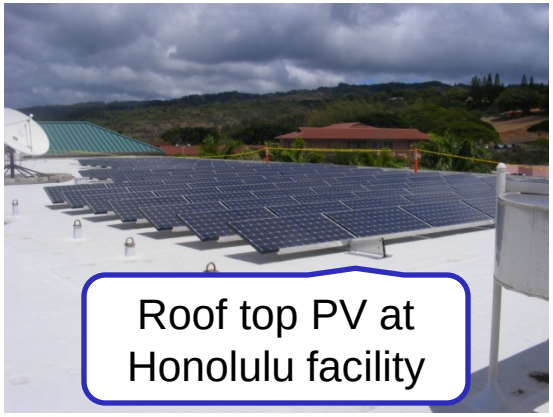
History of VA Renewable Energy & CHP Program

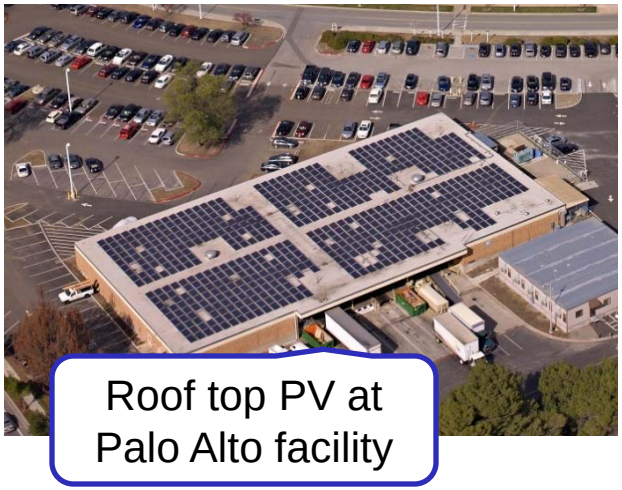
- VA Energy Taskforce Team Created – Charter signed by VA Secretary in 2005
- VA Energy Action Plan (including Detailed Renewable Energy Plan) was developed in 2006.

- Detailed Renewable Energy Plan
  - Renewable Energy Screening for All VA facilities – √ in 2007
  - Detailed feasibility studies – first16 sites √ in 2007, >20/yr (after)
  - Pilot Solar PV Projects – 2 sites awarded √ in 2008, >75 proj awd
  - Pilot projects for Wind, Geothermal, CHP… systems - √ in 2008-9
  - Determine strategies and priorities in RE systems - √ in 2009
  - Majors – 15% RE requirement (VA) - √ starts from 2009 (+ 3% budget)

SOLAR PVS

•Awarded over 75 projects (2008-14) - 80 MW capacity
• Est. generation – 130 million kWh





Other Renewables

50 kW Wind turbine at Bourne National Cemetery

Biomass CHP at Chillicothe VAMC

Drilling for Ground Piping Loop at St. Cloud Medical Center

VA's Renewable CHP Projects

Site	State	Capacity (kW)	Fuel Types	Status
Togus	ME	660	Wood chip	99% complete
White R Junction	VT	250	Wood chip	99% complete
Chillicothe	OH	400	Wood chip	operating
Battle Creek	MI	2,000	Wood chip	99% complete
Canandaigua	NY	450	Wood chip	Under construction
Mt. Home	TN	4,700	NG + Landfill gas	Operational

Renewable CHP Plant at Mt. Home Medical Center

- 4.7 MW Combined Heat and Power (CHP) system (EUL)
- Generating 18,400 MWh electricity annually
- Using 60% Natural Gas + 40% Processed Methane
- RE generation – Approx. 7,500 MWh yearly
- Source Energy Savings Credit – 153,000 MMBtu

Mountain Home CHP plant

VA's Natural Gas CHP Projects

Site	State	Capacity (kW)	Fuel Types	Status
Murfreesboro	TN	450	NG	99% complete
Houston	TX	6,000	NG	50% complete
Dallas	TX	5,000	NG	99% complete
Ann Arbor	MI	800	NG	99% complete
Tomah	WI	3,200	NG	construction started
Newington	CT	1,300	NG	construction started
Manchester	MA	650	NG	50% complete
North Chicago	IL	13,000	NG	Operating (EUL)
Chicago West	IL	4,000	NG	Operating (EUL)
San Diego	CA	5,300	NG	Operating (ESPC)
Loma Linda	CA	800	NG FC	Operating

VA's CHP Projects Under Design

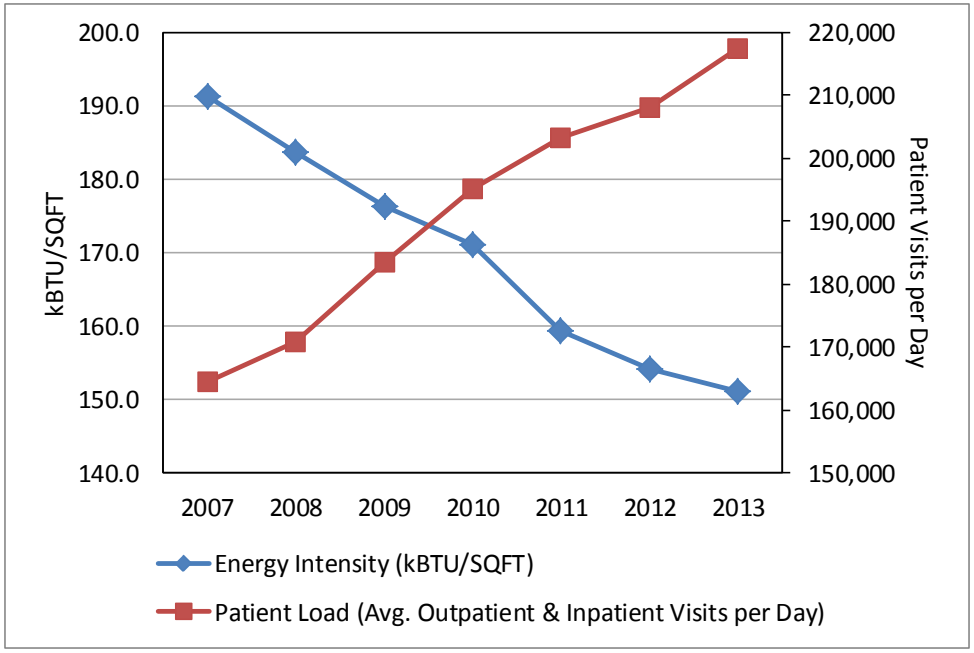
Site	State	Capacity (kW)	Fuel Types
Albany	NY		NG
Jamaica Plain	MA		NG
West Roxbury	MA		NG
Atlanta	GA		NG
Cheyenne	WY		NG
Columbus	OH		NG
Salt Lake City	UT		NG
Syracuse	NY		NG

VA's Accomplishments in Meeting Mandates

Mandates & VA status -2013

- **Reduce energy intensity (30% by 2015) – 22%** ⇩
- **Increase Renewables (20% by 2020) - 13%** ⇧
- **Reduce GHG Emission (30% by 2020) – 12%** ⇩
- **Power Security (JCAHO standard) - improved** ⇧

VA's Accomplishments



5. Lessons Learned

❑ Interconnection Agreements for CHP systems

- ➢ Issues
  - Delay in project completion due to Inter-connection agreements with Electricity Provider
  - Indemnity clause, stand-by charges

- ➢ Resolution
  - Communicate with utility provider from the early design phase

5. Lessons Learned

- **Don't use design-build method for CHP projects**
  - Delays, project modifications, disputes, etc.
- **Provide Training for O&M Personnel**
  - Not only train O&M personnel after installation, but also require training for all newly hired O&M personnel
- **Should Hire 3rd Party Commissioning Agent**
  - Do not use design firm or construction contractor as the 3rd party Cx Agent
- **Designs should be reviewed and make changes if needed during design**

Questions?

Contact Information:

John Park: john.park2@ va.gov
CJ Cordova: cynthia.cordova@va.gov

Investing in

Illinois Energy & Recycling

for a vibrant economy

Melville Nickerson

Deputy Director, Illinois Energy & Recycling Office

Department of Commerce & Economic Opportunity

Illinois Department of Commerce & Economic Opportunity

. . . implementing Governor Quinn's vision

Illinois' Combined Heat & Power Initiative

Energy Efficiency Portfolio Standard

- 2013 legislation amended the Public Utility Act to include "measures that reduce total Btus of electricity & natural gas eligible for energy efficiency savings"
- The amendment opened the door for the inclusion of CHP & geothermal heat pumps
- 2013 DCEO in partnership the Energy Resource Center proposed a Public Sector CHP program to our Public Utilities Commission

Illinois Department of Commerce & Economic Opportunity

ERC Energy Resources Center

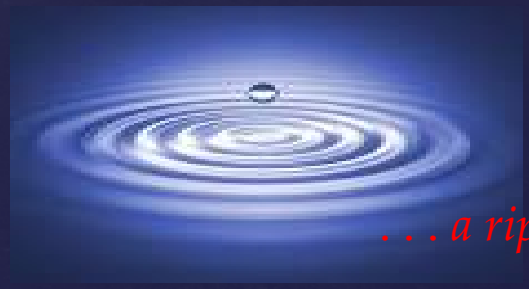
. . . a new path

Illinois Commerce Commission Order:

- Approved DCEO Public Sector CHP program
- Directs DCEO and the utilities to work with the Stakeholder Advisory Group to incorporate a standardized energy savings calculation for CHP for inclusion Technical Resource Manual
- Qualifies CHP as an eligible measure within Commonwealth Edison's efficiency program and to evaluate CHP for program inclusion

Illinois Department of Commerce & Economic Opportunity

ComEd



. . . a ripple effect

DCEO
Public Sector CHP Program

Performance based incentive program:

- requires estimated performance of 60% minimum annual efficiency
- requires measured performance for 12 months of operation
- Production incentive based on useful kWhs produced

Incentives to assistance at various stages of a project:

- Design & Engineering Phase
- Construction Phase
- Energy Production Phase, 2/3 of the incentive

. . . investing in emerging markets

DCEO
CHP Program Incentive Structure

Type	Incentive Value	Issue Date
Design Incentive	$75/kW capacity	Completion of the design phase
Construction Incentive	$175/kW capacity	Successful commissioning of the system
Production Incentive (Conventional CHP)	$0.08/kWh ($\eta \geq 70\%$ HHV) OR $0.06/kWh ($60\% \leq \eta < 70\%$ HHV) of "useful electric energy" produced	After 12 months of operation based on meeting the measured operating requirements of the system
Production Incentive (WHP)	$0.08/kWh of "useful electric energy produced" – assumes no additional fossil fuel utilized	At the end of 12 months of operation

. . . expanding new markets

DCEO
CHP Program Energy Savings

Customer interested in incentive levels based on attained efficiency levels & realized production levels.

Program interested in system energy savings realized

Data required to calculate system performance used to calculate the energy savings.

Higher efficiency equals larger energy savings

. . . leveraging economies of scale

DCEO Energy Efficiency CHP Calculations

Fuel Savings: fuel that would have been used to generate electricity output of the CHP system if that electricity was provided from the local electric grid *plus* fuel that would have been utilized by a boiler on-site to provide the useful thermal energy output of the CHP system– the total fuel consumed by the CHP system

S fuel CHP = (F grid + F thermal CHP) – F total CHP

DCEO CHP Program Implementation

Date	Activity
June, 2014	RFP Announcement
June through August , 2014	Webinars – How to Apply
August/September, 2014	Deadline for Project Applications
November/December, 2014	Project Awards Announced
January/May, 2015	Deadline for Project Commissioning
January/May, 2016	Deadline for 12 Months of CHP Operation

. . . clean power for a sustainable economy

Illinois Department of Commerce & Economic Opportunity

DCEO Biomass CHP Program

Waste Water Treatment Facilities

Anaerobic Digesters

- Danville, IL 150kW engine system
- Downers Grove, IL 150kW engine system
- Village of Fox Lake, IL 100kW engine system

. . . clean power for a sustainable economy

Thank you for your attention

Melville Nickerson
Deputy Director, Illinois Energy & Recycling Office
Department of Commerce & Economic Opportunity
(217) 785-3416 / Mel.Nickerson@illinois.gov

Illinois Department of Commerce & Economic Opportunity

ILLINOIS ENERGY NOW

. . . solutions today for tomorrow's success

Thermal Energy Corporation

Better Buildings Summit

U. S. Department of Energy

May 8, 2014

Texas Medical Center

Thermal Energy Corporation

- Serve the Texas Medical Center – the largest medical center in the world
- 18 Institutions, all are not-for-profit
  - 7 hospitals
  - 2 medical schools
  - 3 nursing schools
  - 1 pharmacy school
- 19+ million square feet
- 6,800 hospital beds
- $1.3 billon of annually funded medical research

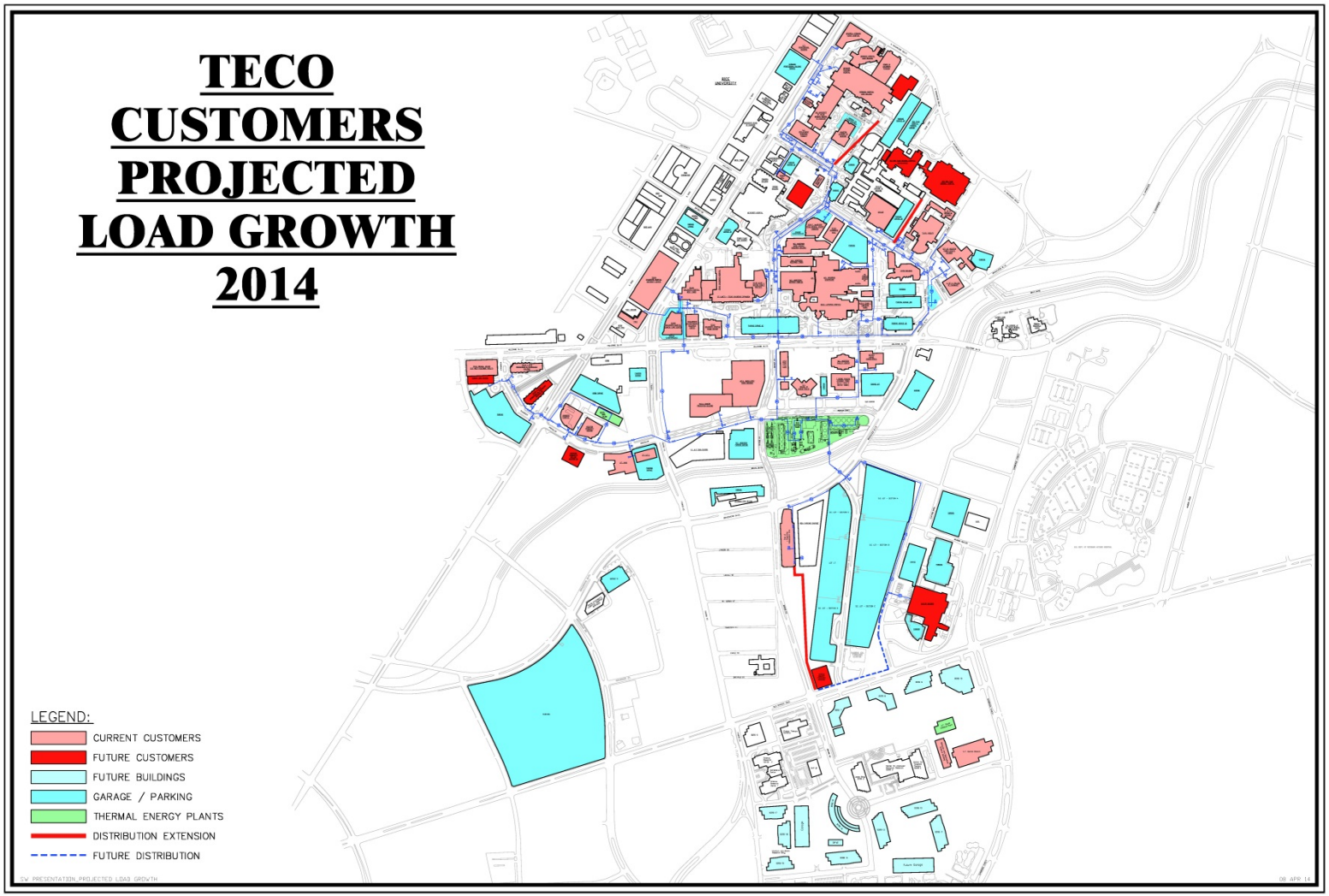
TECO Central Plant

TECO South Main Plant

Thermal Energy Corporation

- CHP District Energy System – provide thermal energy, chilled water and steam for air conditioning and heating
- Largest CHP district chilled water system in the country – 120,000 tons
- TECO is a 501(c)-3 not-for-profit corporation
- Revenues of $78 million, Total Assets over $575 million

TECO 2014 Customers



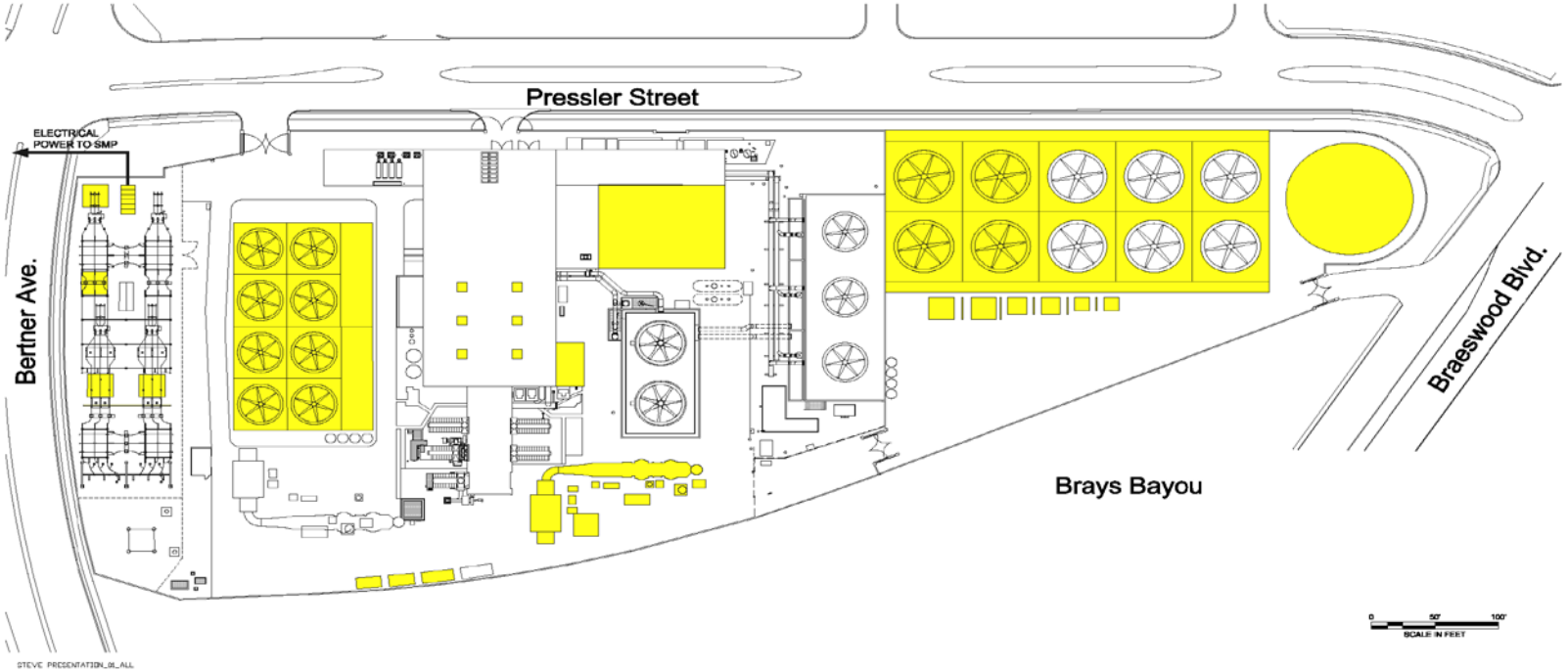
Thermal Energy Corporation

- TECO's Mission is to "Provide reliable, cost effective thermal energy"
- CHP Objectives:
  - Reliability
  - Efficiency
  - Environmental Responsibility
  - Capacity to meet customer growth
  - Maximize use of land

Thermal Energy Corporation

- In 2007, implemented the first phase of the 2006 Master Plan, completed in 2011
- $377 Million expansion
- Converted TECO from a traditional district energy plant to a combined heat and power plant
- 40,000 tons of new chilled water capacity
- 330,000PPH of new steam production

Master Plan Implementation Project - Phase I



Thermal Energy Corporation

- Will save $200 million over 15 years
- Further improved reliability
- Increased overall fuel conversion efficiency from 42% to over 80%
- Power generation heat rate of 6.2
- Reduced carbon dioxide by 302,000 tons per year, equivalent to taking 52,000 cars off the streets or planting 83,000 acres of new forest

Combined Heat and Power

Thermal Energy Storage

Hardened Control Room

Remote and Local Control

Thermal Energy Corporation

Better Buildings Summit

U. S. Department of Energy

May 8, 2014

Discussion

Now is the time to ask all those pressing questions: the CHP questions that you've been afraid to ask!

CHP: A Proven High-Impact Opportunity

- U.S. Department of Energy
  Claudia Tighe: claudia.tighe@ee.doe.gov

- Pepco Energy Services:
  Pam Maines: pmaines@pepcoenergy.com

- Veterans Affairs:
  John Park: John.park2@va.gov
  CJ Cordova: cynthia.cordova@va.gov

- Illinois Dept. of Commerce & Economic Opportunity
  Mel Nickerson: Mel.Nickerson@Illinois.gov

- Texas Medical Center:
  Steve Swinson: sswinson@teco.tmc.edu