

CHP Technical Assistance Partnerships

NEEP Summit

Middletown, Rhode Island

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US DOE New England CHP TAP



CHP Technical Assistance Partnerships
NEW ENGLAND

DOE CHP Technical Assistance Partnerships (CHP TAPs)

- **End User Engagement**

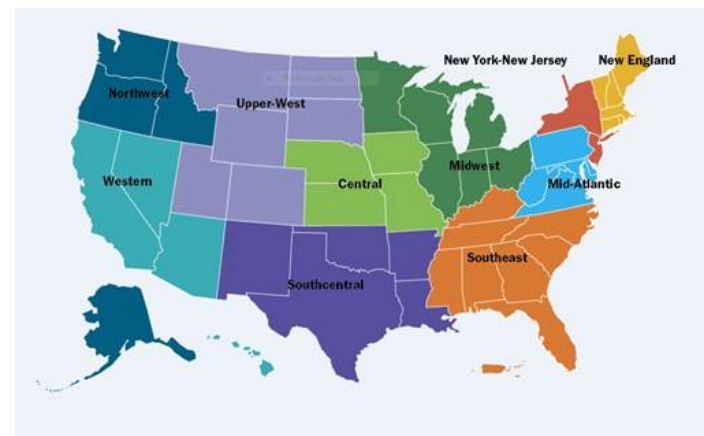
Partner with strategic End Users to advance technical solutions using CHP as a cost effective and resilient way to ensure American competitiveness, utilize local fuels and enhance energy security. CHP TAPs offer fact-based, non-biased engineering support to manufacturing, commercial, institutional and federal facilities and campuses.

- **Stakeholder Engagement**

Engage with strategic Stakeholders, including regulators, utilities, and policy makers, to identify and reduce the barriers to using CHP to advance regional efficiency, promote energy independence and enhance the nation's resilient grid. CHP TAPs provide fact-based, non-biased education to advance sound CHP programs and policies.

- **Technical Services**

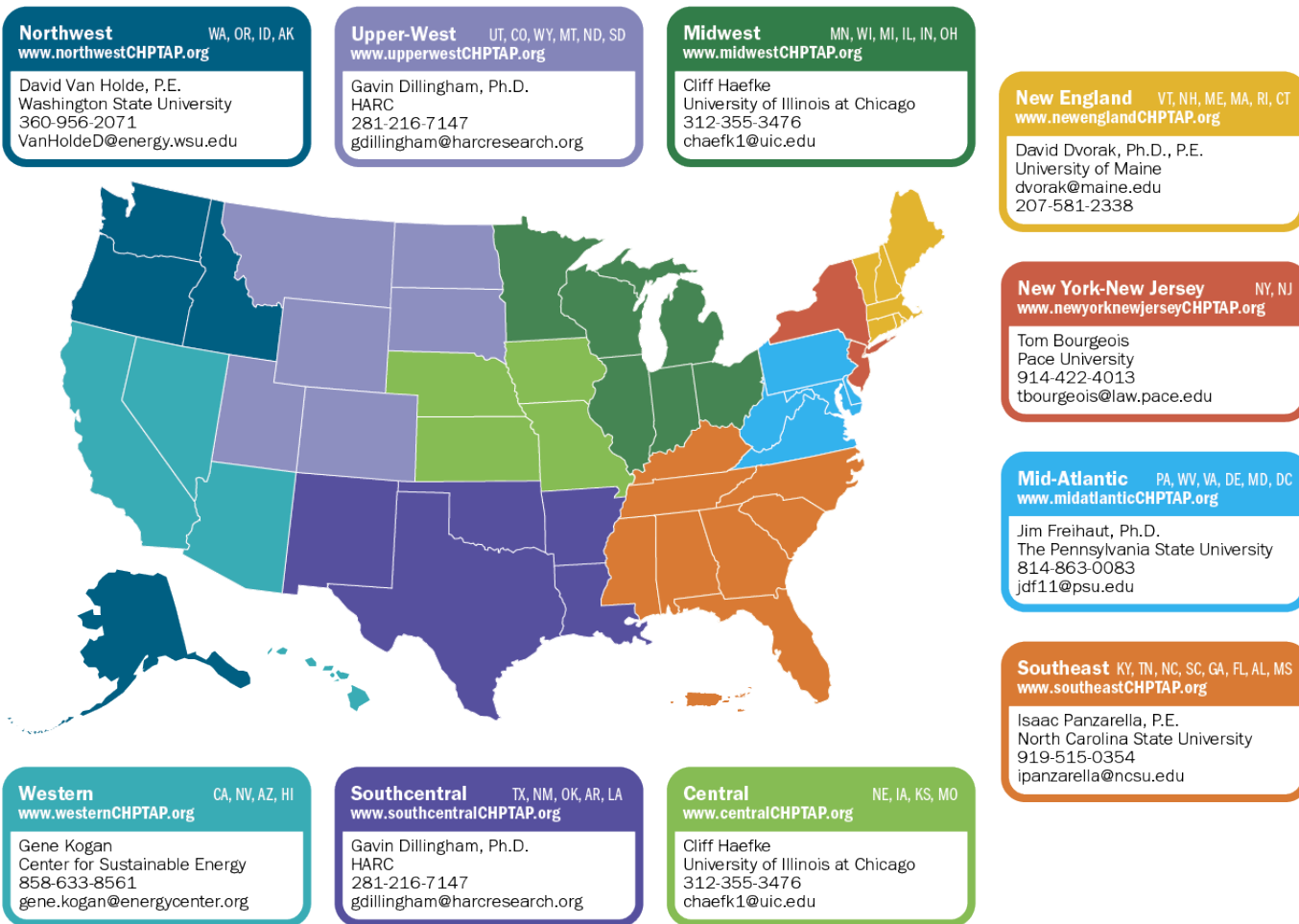
As leading experts in CHP (as well as microgrids, heat to power, and district energy) the CHP TAPs work with sites to screen for CHP opportunities as well as provide advanced services to maximize the economic impact and reduce the risk of CHP from initial CHP screening to installation.



www.energy.gov/chp



DOE CHP Technical Assistance Partnerships (CHP TAPs)



DOE CHP Deployment
 Program Contacts
www.energy.gov/CHPTAP

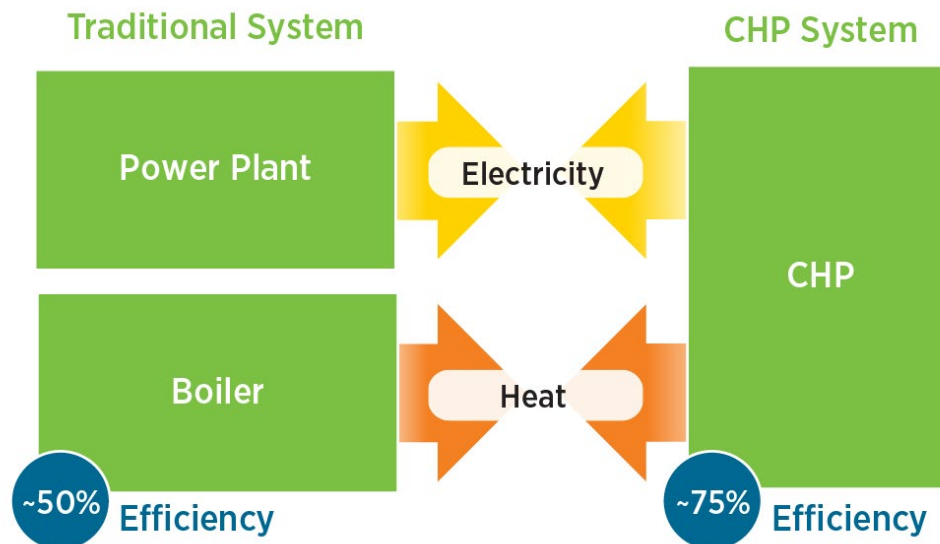
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CHP: A Key Part of Our Energy Future

- 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
 - Dehumidification



CHP provides efficient, clean, reliable, affordable energy – today and for the future.

Source: www.energy.gov/chp



What Are the Benefits of CHP?

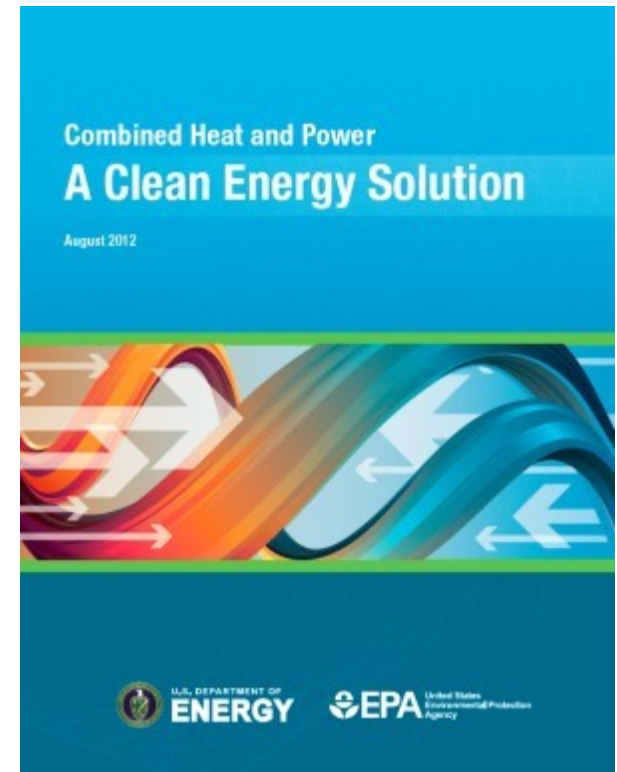
- CHP is more efficient than separate generation of electricity and heating/cooling
- Higher efficiency translates to lower operating costs (but requires capital investment)
- Higher efficiency reduces emissions of pollutants
- CHP can also increase energy reliability and enhance power quality
- On-site electric generation can reduce grid congestion and avoid distribution costs.



Emerging National Drivers for CHP

- Benefits of CHP recognized by policymakers
 - State Portfolio Standards (RPS, EEPS), Tax Incentives, Grants, standby rates, etc.
- Favorable outlook for natural gas supply and price in North America
- Opportunities created by environmental drivers
- Utilities finding economic value
- Energy resiliency and critical infrastructure

DOE / EPA CHP Report (8/2012)



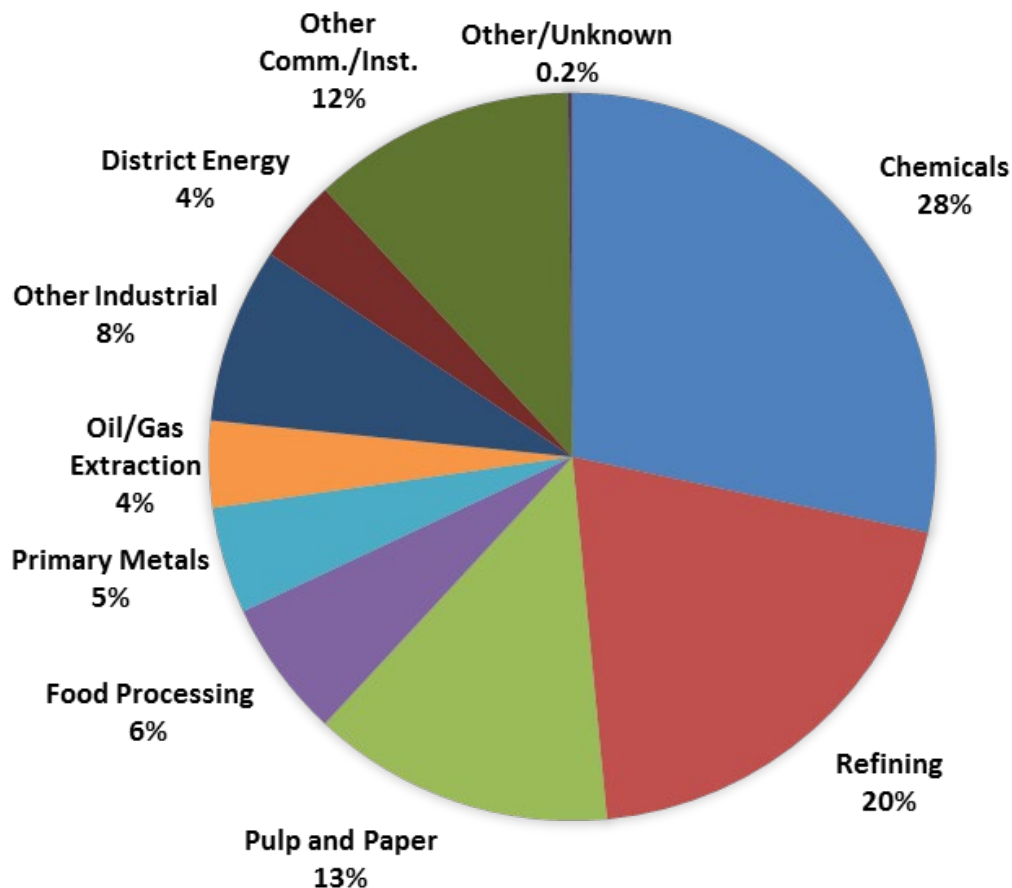
http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

CHP Is Used Nationwide In Several Types of Buildings/Facilities



CHP Today in the United States

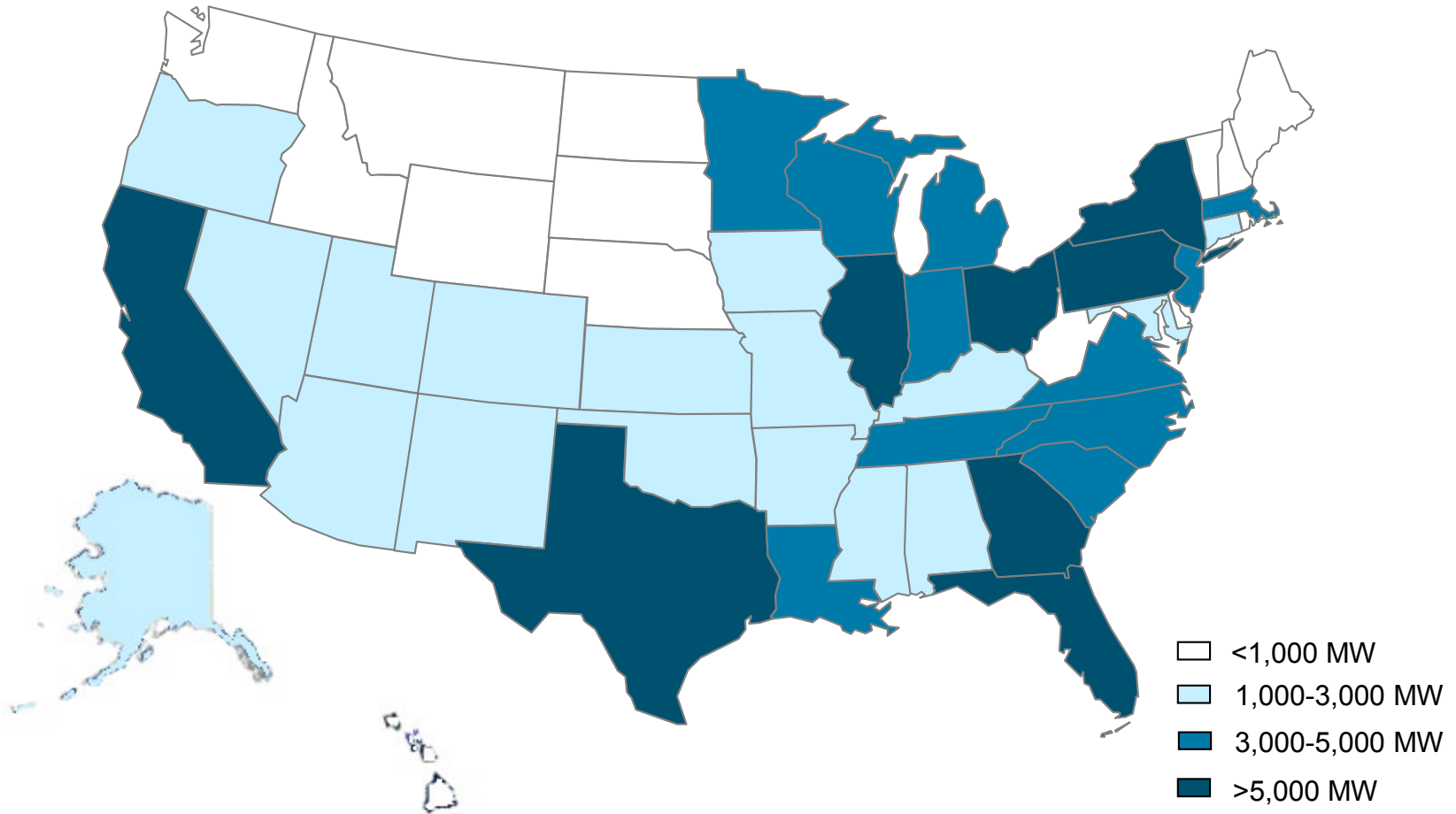
Existing CHP Capacity



- **81.3 GW** of installed CHP at more than 4,400 industrial and commercial facilities
- 8% 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 CO₂** compared to separate production

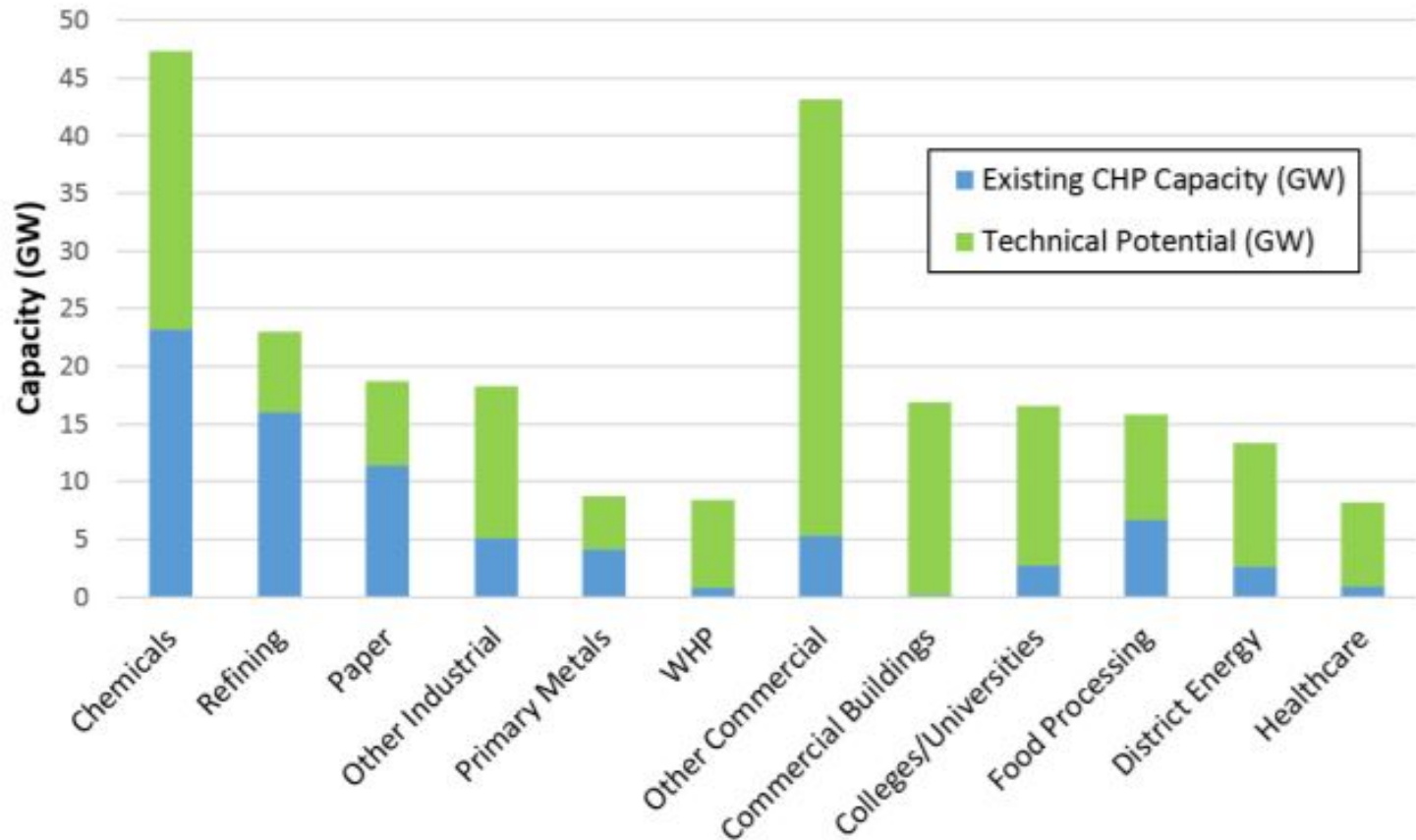
Source: DOE CHP Installation Database (U.S. installations as of December 31, 2017)

The Potential for Additional CHP Is Nationwide



Where is the Remaining Potential for CHP?

Existing CHP Compared to On-Site Technical Potential by Sector



U.S. Dept. of Energy, "Combined Heat and Power (CHP) Technical Potential in the United States", March 2016.

Project Snapshot:

Grid Congestion Relief

Frito-Lay North America

Killingly, CT

Application/Industry: Food processing

Capacity: 4.6 MW

Prime Mover: Gas turbine

Fuel Type: Natural gas

Thermal Use: Process steam

Installation Year: 2009

Testimonial: *“Working with the State of Connecticut and the Department of Energy, we were able to invest in sustainable business practices that benefit this community and the country by providing relief to the Northeast power grid and using technologies with a lower environmental impact.”*

- Leslie Starr Keating, Senior Vice President of Supply Chain, North America Foods, PepsiCo



Project Snapshot:

Environmental Stewardship / Sustainability

Seneca Sawmill

Eugene, Oregon

The Seneca Family of Companies
Our Quality Keeps On Growing

Application/Industry: Forest Products

Capacity: 19.8 MW

Prime Mover: Double extraction
condensing steam turbine

Fuel Type: Wood mill by-products,
timberland thinning and forest slash for
wildfire prevention

Thermal Use: Kiln drying, power
generation

Installation Year: 2011

Highlights: The emission control technology at this plant includes a multiclone cyclonic separator, a 4-field electrostatic precipitator and a continuous emission monitoring system, all of which allows the plant to far exceed minimum air quality standards. All biomass material fed to the facility utilize a fully enclosed system including truck dump, conveyors and fuel storage building. All fuel handling ducts to one of two baghouses to remove particulate emissions with 99.9% efficiency.



Seneca Sawmill, Eugene, Oregon.

Source: <https://senecasawmill.com/news/2015/biomass-operating-permit/>

Project Snapshot:

Cost Savings

Essex Junction WWTF

Essex Junction, VT

Application/Industry: Wastewater Treatment

Facility Size: 2 million gallons/day

Capacity: 60 kW

Prime Mover: Microturbine

Fuel Type: Biomass

Thermal Use: Heat for the digestion process

Project Cost: \$303,000

Payback: 7 years

Installation Year: 2003

Testimonial: *"The Essex Junction CHP installation is proof that small scale CHP retrofits are viable and cost effective."*



Project Snapshot:

Environmental Responsibility

Smith College

Northampton, MA

Application/Industry: College

Capacity: 3.5 MW

Prime Mover: Combustion turbine

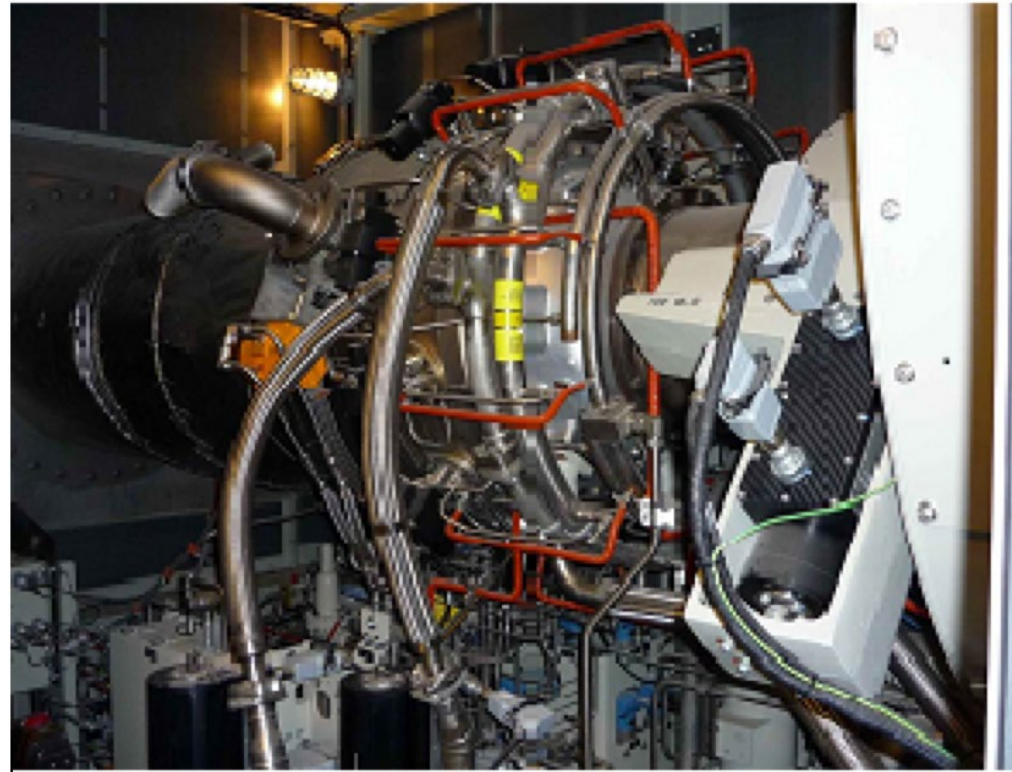
Fuel Type: Natural gas

Thermal Use: Heating, cooling & hot water

Installation Year: 2008

Testimonial: *“For several years, Smith has sought ways to reduce and manage the college’s environmental impact. This new cogeneration system is a significant step in Smith’s efforts to remain at the forefront of environmental responsibility.”*

- Carol T. Christ, former Smith College President



Source:

<http://northeastchptap.org/Data/Sites/5/documents/profiles/SmithCollege3.5MWCHPApplication.pdf>

Project Snapshot:

Cow Power (5 Cows = 1 kW)

Hunter Haven Farms

Pearl City, IL

Application/Industry: Dairy Farm

Capacity: 260 kW

Prime Mover: Caterpillar engines (2)

Fuel Type: Anaerobic digester biogas

Thermal Use: Heating the digester

Installation Year: 2008

Energy Savings: Unknown

Highlights: Hunter Havens Farm owns and operates 24/7 a 260 kW anaerobic digester and biogas-fired combined heat and power (CHP) system. The system produces electricity for the site and to sell to the local utility. The recovered heat is used to maintain the temperature of the digester, heat farm buildings, and provide the farm with hot water. The system can manage the waste for up to 1,200 dairy cows.



Source:

<http://www.midwestchptap.org/profiles/ProjectProfiles/HunterHavenFarms.pdf>

Project Snapshot:

Energy Security

Bradley Airport

Windsor Locks, CT

Application/Industry: Airport

Capacity (MW): 5.8 MW

Prime Mover: Reciprocating engines

Fuel Type: Natural gas

Thermal Use: Heating, cooling & hot water

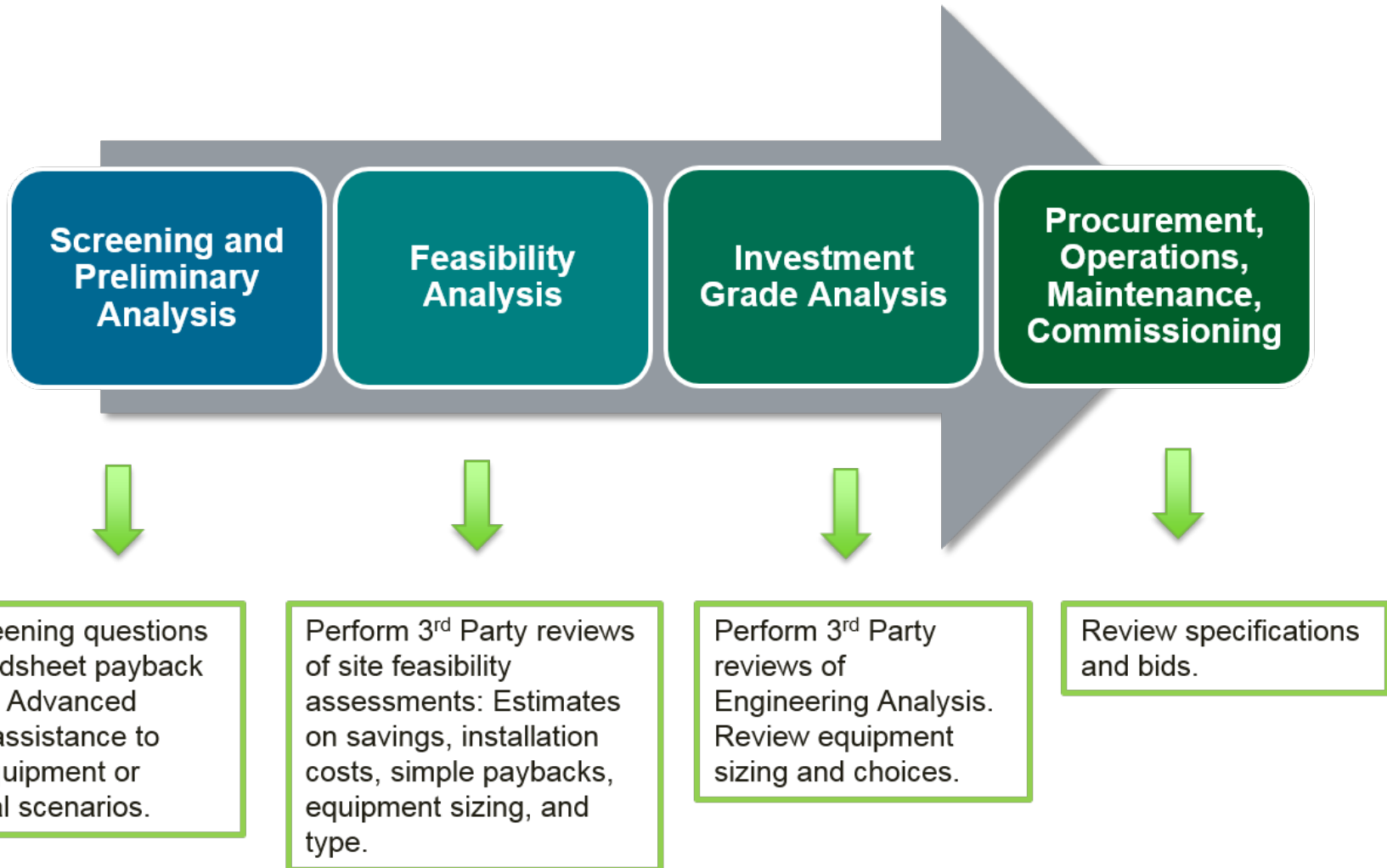
Installation Year: 2002

Highlights: The primary motivation for establishing the combined heat and power (CHP) center was to increase energy security, as the airport was encountering numerous power outages from its central power supplier. Additionally, the airport wanted to lower its operating costs and decided that a CHP plant would allow for substantial operating cost savings when compared to conventional central heating/cooling plant.



Source: <http://northeastchptap.org/Data/Sites/5/documents/profiles/BradleyAirportpp.pdf>

CHP TAP Role: Technical Assistance



DOE TAP CHP Screening Analysis

- High level assessment to determine if site shows potential for a CHP project
 - Qualitative Analysis
 - Energy Consumption & Costs
 - Estimated Energy Savings & Payback
 - CHP System Sizing
 - Quantitative Analysis
 - Understanding project drivers
 - Understanding site peculiarities

Annual Energy Consumption		Base Case	CHP Case
Purchased Electricity, kWh		88,250,160	5,534,150
Generated Electricity, kWh		0	82,716,010
On-site Thermal, MMBtu		426,000	18,872
CHP Thermal, MMBtu		0	407,128
Boiler Fuel, MMBtu		532,500	23,590
CHP Fuel, MMBtu		0	969,845
Total Fuel, MMBtu		532,500	993,435
Annual Operating Costs			
Purchased Electricity, \$		\$7,060,013	\$1,104,460
Standby Power, \$		\$0	\$0
On-site Thermal Fuel, \$		\$3,195,000	\$141,539
CHP Fuel, \$		\$0	\$5,819,071
Incremental O&M, \$		\$0	\$744,444
Total Operating Costs, \$		\$10,255,013	\$7,809,514
Simple Payback			
Annual Operating Savings, \$			\$2,445,499
Total Installed Costs, \$/kW			\$1,400
Total Installed Costs, \$/k			\$12,990,000
Simple Payback, Years			5.3
Operating Costs to Generate			
Fuel Costs, \$/kWh			\$0.070
Thermal Credit, \$/kWh			(\$0.037)
Incremental O&M, \$/kWh			\$0.009
Total Operating Costs to Generate, \$/kWh			\$0.042



Screening Questions



- Do you pay more than \$.06/kWh on average for electricity (including generation, transmission and distribution)?
- Are you concerned about the impact of current or future energy costs on your operations?
- Are you concerned about power reliability?
What if the power goes out for 5 minutes... for 1 hour?
- Does your facility operate for more than 3,000 hours per year?
- Do you have thermal loads throughout the year?
(including steam, hot water, chilled water, hot air, etc.)



Screening Questions (cont.)

- Does your facility have an existing central plant?
- Do you expect to replace, upgrade, or retrofit central plant equipment within the next 3-5 years?
- Do you anticipate a facility expansion or new construction project within the next 3-5 years?
- Have you already implemented energy efficiency measures and still have high energy costs?
- Are you interested in reducing your facility's impact on the environment?
- Do you have access to on-site or nearby biomass resources? (i.e., landfill gas, farm manure, food processing waste, etc.)



Finding the Best Candidates:

Some or All of These Characteristics

- High and constant thermal load
- Favorable spark spread
- Need for high reliability
- Concern over future electricity prices
- Interest in reducing environmental impact
- Existing central plant
- Planned facility expansion or new construction; or equipment replacement within the next 3-5 years



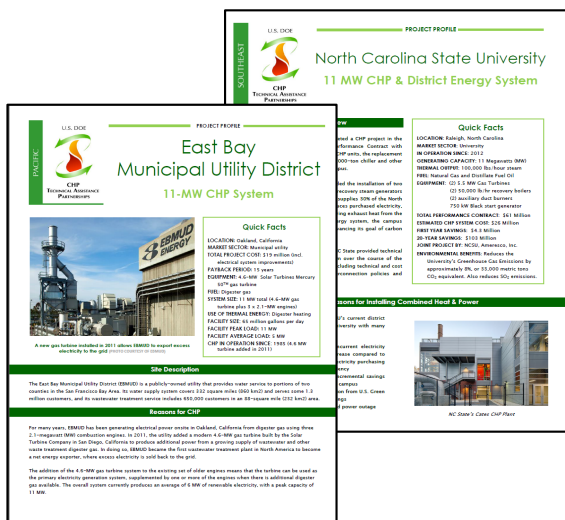
Good Primer Report

The image shows the front cover of a report. The top half has a solid blue background with the title 'Combined Heat and Power' in white, followed by 'A Clean Energy Solution' in a larger white font. Below the title, 'August 2012' is printed in a smaller white font. A horizontal band with a green-to-blue gradient separates the title from the bottom section. The bottom section features a complex graphic of overlapping, wavy lines in shades of orange, red, and blue, with white arrows pointing in various directions. At the bottom, the U.S. Department of Energy logo is on the left, and the EPA logo is on the right, with the text 'United States Environmental Protection Agency' to its right.

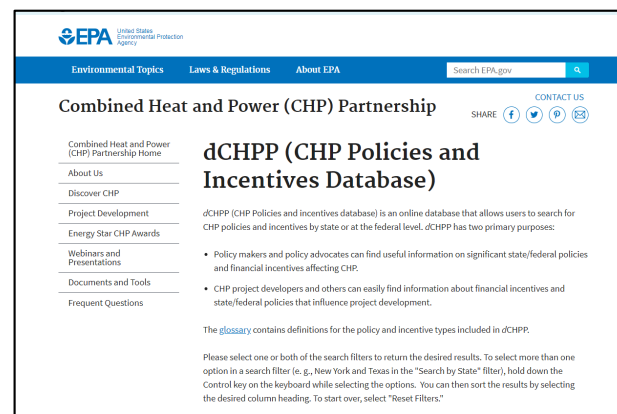
www.energy.gov/chp-technologies

CHP Project Resources

DOE Project Profile Database



EPA dCHPP (CHP Policies and Incentives Database)

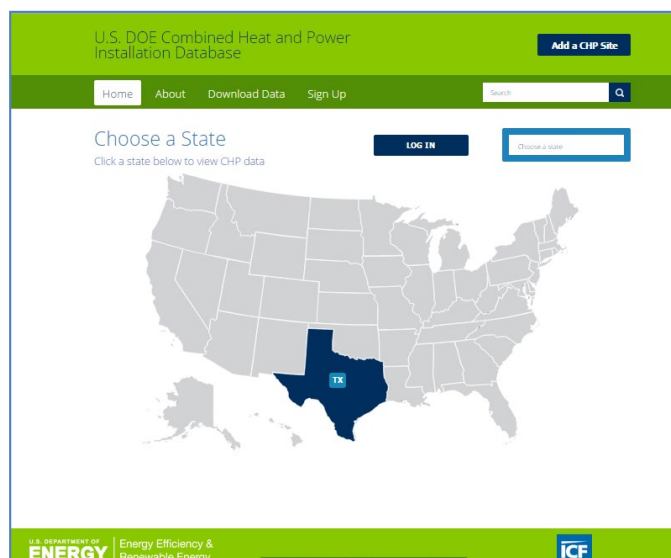


energy.gov/chp-projects

www.epa.gov/chpdchpp-chp-policies-and-incentives-database

CHP Project Resources

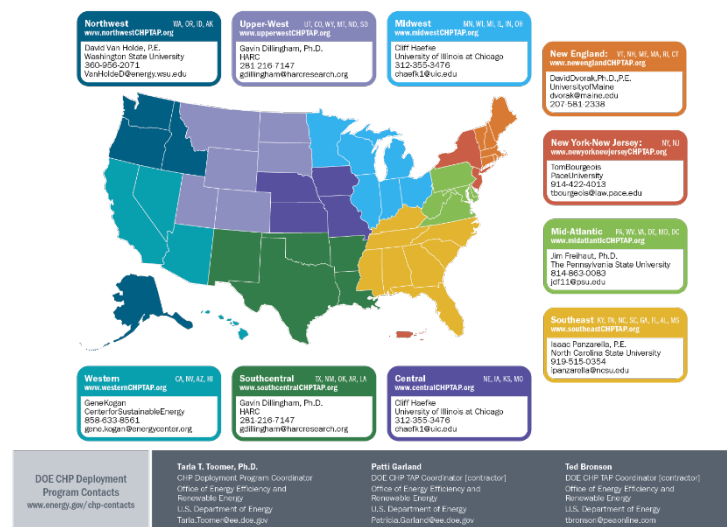
DOE CHP Installation Database (List of all known CHP systems in U.S.)



energy.gov/chp-installs

Low-Cost CHP Screening and Other Technical Assistance from the CHP TAP

DOE CHP Technical Assistance Partnerships (CHP TAPs)



energy.gov/CHPTAP



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Next Steps

Contact your Regional CHP TAP for assistance if:

- You are interested in having a “no-cost” Qualification Screening performed to determine if there is an opportunity for CHP on-site.
- If you have an existing CHP plant and are interested in expanding the plant.
- If you need an unbiased 3rd Party Review of a proposal.



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Thank You

Questions?

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