

CEE NATIONAL MARKET TRANSFORMATION COMBINED HEAT & POWER

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U.S. DEPARTMENT OF ENERGY
CHP Technical Assistance Partnerships
MID-ATLANTIC

Outline

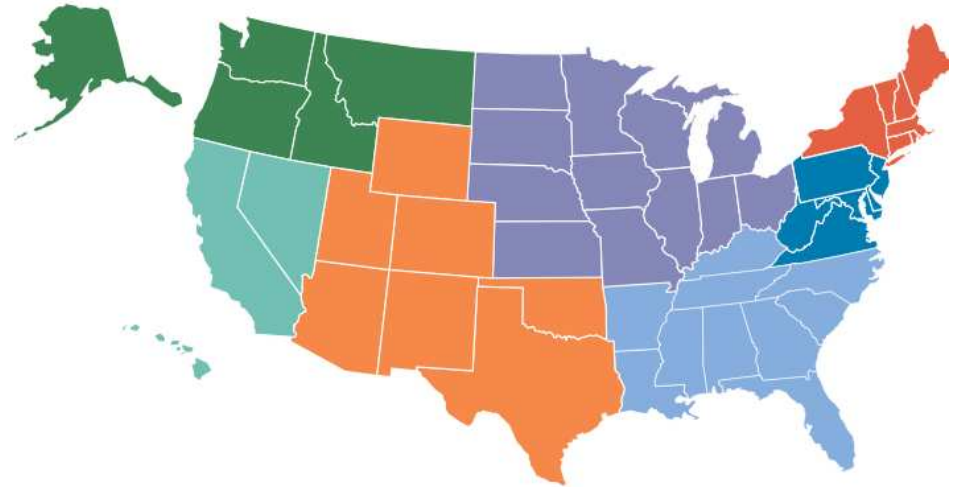
- Who we are
- What is CHP
- Drivers & Applications



CHP Technical Assistance Partnerships

Key Activities

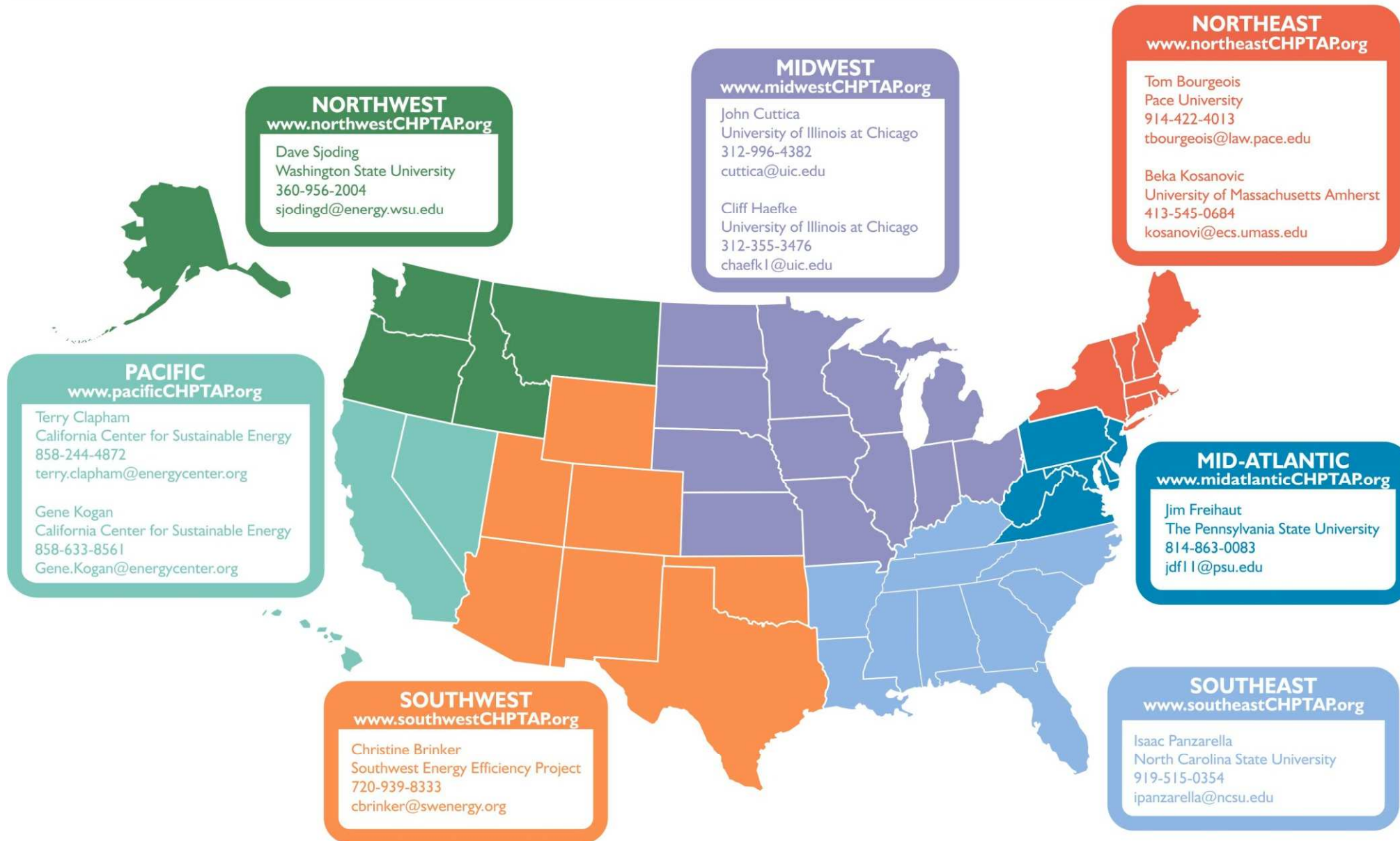
- **Market Opportunity Analysis.**
Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors
- **Education and Outreach.**
Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, 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 development process from initial CHP screening to installation.



<http://eere.energy.gov/manufacturing/distributedenergy/chptaps.html>



DOE CHP Technical Assistance Partnerships (CHP TAPs)



DOE CHP Technical Assistance Partnerships (TAPs): Program Contacts

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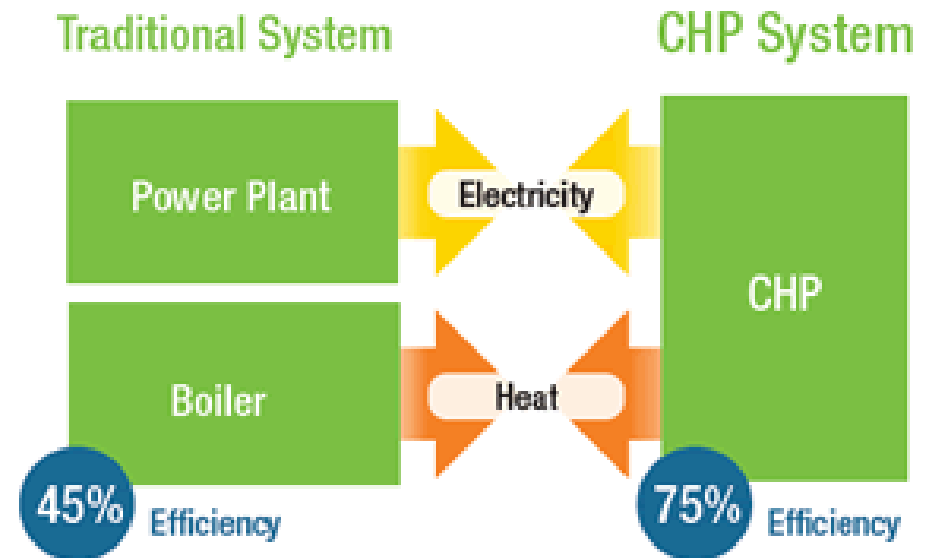
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What is CHP

- 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 Throughout the US



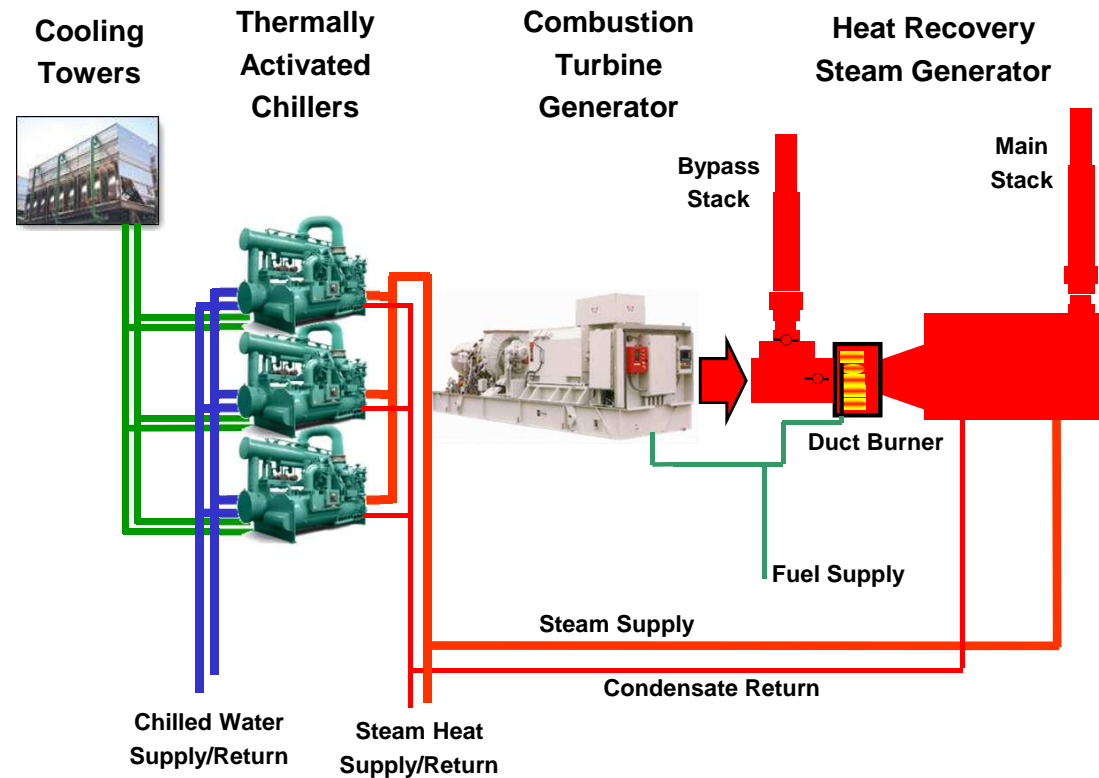
Source: ICF International



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CHP System Components

- Prime Mover
- Heat Recovery
- Thermal Technology
- Accessory Devices
- Switchgear
- Interconnection
- Fuel Supply
- Controls/M&V



Combustion Turbine/Steam Turbine CHP System



Prime Movers

- Gas Combustion Turbines > 1 MW
- Microturbines 35 kW – 1 MW
- IC Engines 30 kW – 6 MW
- Fuel Cells 250 kW



- 75% - 60% HEAT
- 25% - 40% Electricity



Thermally Activated Technologies

- Technologies:

- Hot Water HEX
- Boilers/Steam Generators
- Organic Rankine Cycle
- Backpressure Turbines
- Absorbers
- Steam Turbines
- Desiccants
- Adsorbers

- Applications:

- Process Heat
- Space Heat
- Domestic Hot Water
- Cooling
- Freezing
- Dehumidification
- Power Generation



CHP Drivers

- Cost Savings **#1**
 - Offset Utility/3rd Party kWh's + Therms
 - Reduce Utility Demand Charges - Demand Response
 - Offset Capital Costs – Require Redundancy
 - Improved Power Reliability/Quality
- Emissions Reductions
 - In the same way that it saves fuel cost, CHP reduces pollution by using the fuel's energy twice, yielding half to a third of the emissions from separate fossil fuelled grid power and boilers.
 - Supported by US DOE & US EPA

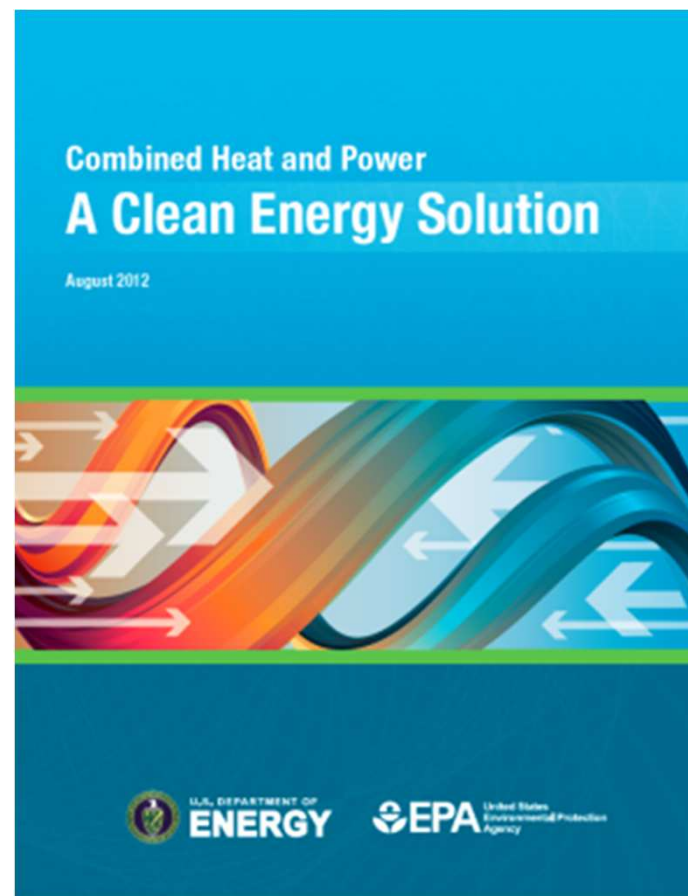


CHP Drivers

- Reliability
 - Provides local grid support and improves power quality
 - Can often be configured to provide emergency power back-up
 - Natural Gas grid can be more reliable for long term outages
- National Security
 - Reduced fossil fuel usage extends US resources and reduces dependence on foreign energy imports
 - Multiple points of power generation are less subject to catastrophic failure or attack

CHP Drivers

- Benefits of CHP recognized by policymakers
 - President Obama signed an Executive Order to accelerate investments in industrial EE and CHP on 8/30/12 that sets national goal of 40 GW of new CHP installation over the next decade
 - 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
- Energy resiliency and critical infrastructure



DOE / EPA CHP Report (8/2012)

CHP Applications

■ Industrial Process Integration, PA



- Adding second 50 MW CHP Systems 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

■ University Campus, NJ



- The 15 MW CHP plant provides steam and chilled water throughout 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

■ 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.

