

Combined Heat and Power Deployment Program

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FY 17-18

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Tarla T. Toomer, Ph.D.

U.S. DOE, Advanced Manufacturing Office

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Combined Heat and Power (CHP) Deployment Program Synopsis

- **CHP Deployment Program**

- Provides stakeholders with the resources necessary to identify CHP market opportunities and support implementation of cost-effective CHP systems in industrial, commercial, institutional, and other applications

- **Timeline**

- **CHP TAP Competitive Awards**

- Five Year Award
 - FY18-FY23
 - \$25M DOE funded
 - \$3M Cost-Share

- **Challenges & Barriers (Not Inclusive)**

- Cost
- Reliability
- Scalability
- Regulatory Barriers

- **Technical Assistance**

- CHP Technical Assistant Partnerships (CHP TAPs)
- 8 Direct Partners support 10 regions with multiple subcontractors

		FY18 Funding For CHP TAPs	FY 18 CHP Program	Total Planned Funding (FY 19-Project End Date)
DOE Funded	—	5M	12M	12M
Project Cost Share	—	0.6M	-	-

CHP Deployment Challenges & Barriers

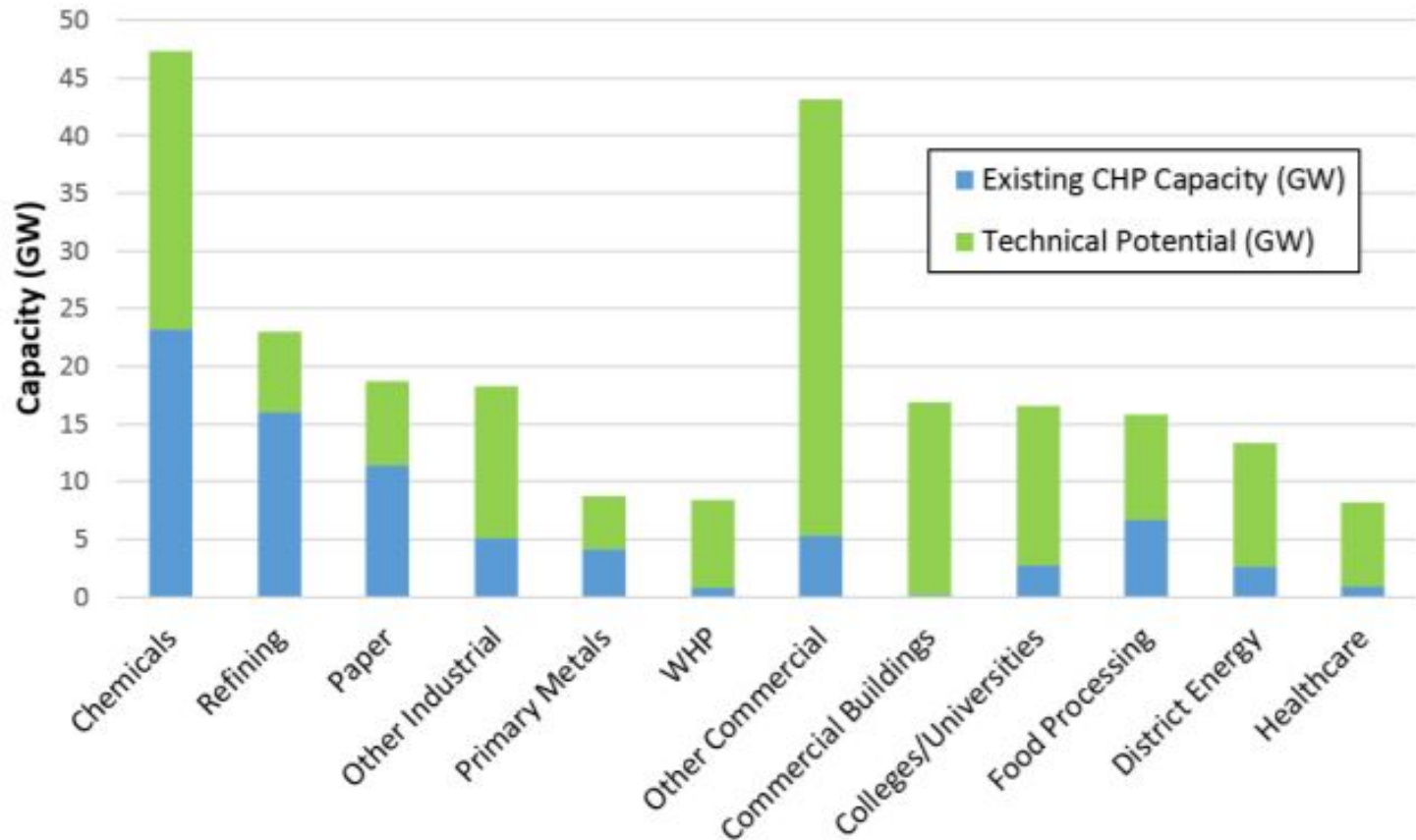
- Financial
 - Core business for capital investments versus operating expenditures
 - Lack of low-cost financing
 - Uncertain tax codes and accounting practices
 - Extensive utility regulations and practices with uncertain and often confusing interconnection standards and utility rates such as standby rates
 - Inconsistent and confusing local zoning codes
 - Environmental, health, and safety requirements
- Market Assessments
 - Need for increased market opportunity assessments, education and awareness about the benefits of CHP, and technical assistance to promote and transform the market for CHP systems
- CHP Market Recognition
 - Leaders in the deployment of CHP systems – including utilities, regions, cities, and states – should be recognized as role models and resources for other organizations
 - Changes are also occurring in the utility and grid operator space, where utilities and the grid operators are becoming supportive of policies that promote CHP and, in some cases, are leading to utility construction and operation of CHP for grid and end user usage

Project Objectives: CHP Deployment Program

- To Reach Remaining Combined Heat & Power Potential
 - 81.3 GW of CHP installed
 - 240.6 GW of remaining **technical potential**
 - 148.9 GW of onsite
 - 91.7 GW of export
- To Convert Technical Potential into Economic Potential
 - Need to reduce risk to adoption
 - Develop best practices in CHP policies and deployment
 - Provide expert tech assist to end users on technology options
 - Need to lower cost of installation
 - Research on best practices in interconnection, standby rates and other barriers
 - Partner with utilities and regulators to reduce time and cost of installation

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.

Multi Year Plan Target 2017-2021

- Target 13.1:
 - Achieve a ten-fold cumulative increase in direct CHP technical support activities to potential commercial, institutional, and industrial end-users.
 - Develop resources that lead to a doubling of the installation of cost effective CHP systems (with >75% efficiency at higher heating value (HHV)) that are fueled with renewable and opportunity fuels
 - Support the doubling of utilities that own or incentivize CHP as part of their business model.
 - Introduce over 75% of high-technical-potential commercial/industrial markets to CHP opportunities, including waste heat to power
 - Conduct CHP assessments for at least 50% of target markets with most significant CHP technical potential
 - Develop online resources for site self-assessment for CHP and waste heat to power potential
 - Work with at least 5 CHP developers in highlighting the opportunities with hybrid CHP-renewable systems
 - Establish 100 partnerships with cities, states and utilities to encourage the use of CHP

Project Objectives: CHP Field Verification

- **Technical Field Verification**

- **Partnership Engagement and Technical Services Through DOE's CHP Technical Assistance Partnerships (CHP TAPs)**

- Promote and assist in transforming the market for CHP, waste heat to power, microgrids, and district energy with CHP throughout the United States

- **Combined Heat and Power (CHP) for Resiliency Accelerator**

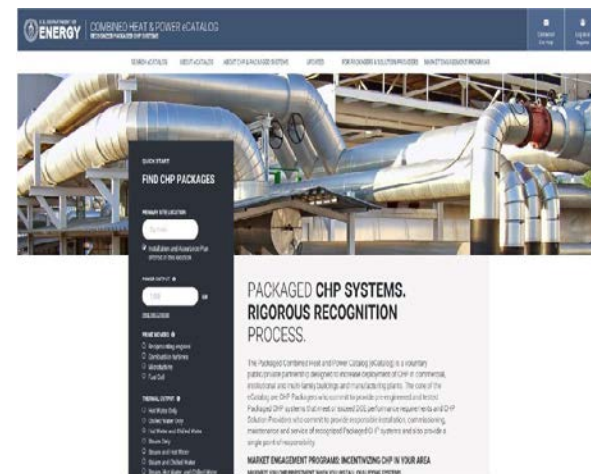
- Collaborating with Partners to support consideration of CHP and other distributed generation solutions for critical infrastructure resiliency planning at the state, local, and utility levels

- **Packaged CHP Catalog (eCatalog) (Under Development)**

- Increase CHP deployment in underdeveloped markets with standardized, pre-approved and warranted packaged CHP systems driven by strong end-user engagement via Market Mover Partners, such as cities, states, and utilities



www.energy.gov/chp



Technical Innovation: Regional CHP TAPs

- **Combined Heat and Power Technical Assistance Partnerships**

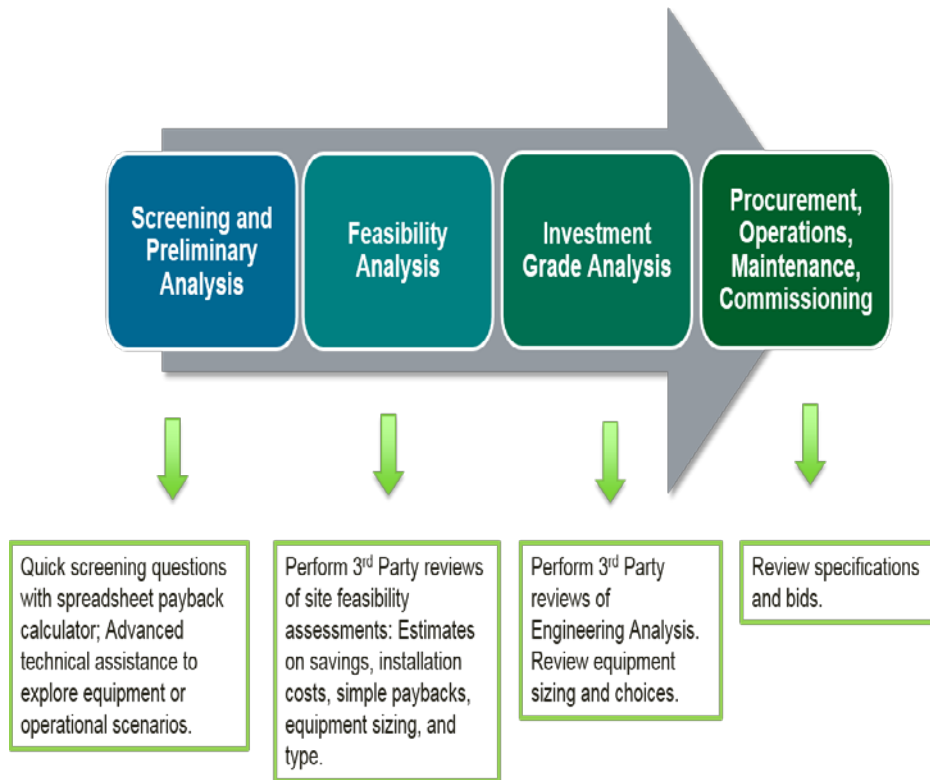
- The 2017 CHP TAPs FOA will continue to provide public-private partner support to leverage the effectiveness of multipliers. This continuation of public-private partner includes the implementation of a nationwide strategic adaptation plan.
 - **Nationwide Strategic Adaptation include:**
 - Support of emerging technologies and innovative grid and CHP applications
 - Provide field validation of CHP technical and market opportunities
 - Provide public-private partnerships that will produce and disseminate CHP best practices and opportunities for economic, safety, and security
 - Research emerging CHP applications (grid integration, hybrid systems, etc.)
 - Align partners to AMO and DOE's R&D, lab, and pertinent programs
 - Support U.S. industry, commercial sector and government facilities in expanding technology considerations to include applications that maximize security, resiliency, productivity and the ability to control U.S. energy generation

Results & Accomplishments: TAPs FY13-FY17

- Technical Assistance (1765)
 - Qualification Screenings (site assessments): 1421
 - Feasibility Studies (site and technology assessments): 42
 - Advanced Technical Assistance: 302
- End-User Education (308)
 - Webinars: 58
 - Workshops: 69
 - Presentations: 191
- Policy Maker Education
 - Activities (411)

Project Objectives: FY18-FY23

- CHP TAP Scope FY18-FY23:
- Build and establish strategic long term partnerships to educate end-users and regional market groups on benefits of CHP for their application
- Build and establish strategic long term partnerships with stakeholders to advance the policy landscape for CHP
- Increased engagement with policymakers



Technical Innovation: CHP for Resiliency Planning Tool

Goal: Guided experience to assess the built environment for CHP opportunities incorporating differing criteria for defining critical infrastructure and political, planning or utility priorities.

- How Does CHP Support CI Resiliency
 - ✓ Policymaker and utility resources
 - ✓ Output is knowledge, terms and facts, case studies, etc.
- ID the Potential for CHP
 - ✓ Look at and Prioritize CI buildings
 - ✓ Rank order by priorities (safety, energy independence, location, costs, availability)
 - ✓ High level ranking of buildings for further evaluation
- Evaluate Priority Applications
 - ✓ Portfolio analysis of most critical buildings
 - ✓ Screening tool with VG/G/Not CHP candidate
 - ✓ CHP TAPs to support with more in-depth Qualification Screening
- CHP Implementation Support
 - ✓ Steps to get DOE TAP support
 - ✓ Resources and tools for further decision making
 - ✓ Best practices and project profiles (see it in action)

The screenshot displays the homepage of the 'CHP Planning Tool for Critical Infrastructure (CI)'. The header features the 'Better Buildings' logo and a navigation bar with links to Home, Policy Makers, Utilities, Take Action, and Resource Library. The main content area is titled 'Introduction' and provides an overview of the tool's purpose: to help communities meet resiliency goals and ensure critical infrastructure remains operational. It includes sections for 'Critical Infrastructure (CI) 101', 'Combined Heat and Power (CHP) 101', 'Microgrids 101', and 'Applying CHP in Critical Infrastructure 101'. A 'The CHP for Resiliency Accelerator' section is also visible, detailing collaborative efforts with states, communities, and utilities to support and expand CHP solutions.

Results & Accomplishments: Resiliency Screens

- First level screening based on resiliency priorities and basic site data for CHP fit
- Need to input application (e.g., hospital), annual kWhs, and location at a minimum
- “Stoplight” results
 - Green – good potential
 - Yellow – needs further screening
 - Red – put on hold
- Step 6 - Contact CHP TAPs for technical assistance



CHP Planning Tool for Critical Infrastructure (CI)

[Home](#)[Policy Makers](#)[Utilities](#)[Take Action](#)[Resource Library](#)

Identify and Evaluate Opportunities for CHP in CI

Step 5: Individual Site Screening for CHP

The fifth step is to evaluate the prioritized portfolio of sites using the CHP for Resiliency Screening Tool. The CHP Site Screening Tool is intended to help energy managers, resiliency planners, and other interested parties conduct a high level, preliminary initial screening of the potential economic viability of CHP at the individual CI facility using basic site data – annual electricity usage, annual thermal loads, average electricity and fuel prices, annual hours of operation, and resiliency ranking. The tool is not intended to estimate the economic performance of a specific CHP project. It is intended only to give the user an initial understanding of whether CHP has the potential to provide economic savings at the facility. The tool focuses on determining whether the electricity and fuel costs can support a viable CHP installation based on a high level estimate of addressable energy loads and the value of energy resiliency at the site. The results are presented in a ‘stoplight approach’ to quickly help users of the tool determine how to move forward with more rigorous screening options if warranted.

CHP for Resiliency Screening Tool Inputs – Inputs for the CHP for Resiliency Screening Tool include facility and location information, basic energy use and facility operation data, applicable electricity and fuel prices, and the resiliency priorities determined in Step 4. All inputs are detailed below:

- Location (city, state)
- Sector classification for the facility (the 17 CHP conducive sub-sectors identified in Step 2)
- Annual electric use (kWh)
- Annual Fuel Use (MMBtu) – can use default based on facility type
- Fuel price (\$/MMBtu) – can input or use state average price
- Electric price (\$/kWh) – can input or select state average or utility average price
- Resiliency Value – internally transferred from Step 4

Results of the screening analysis are color coded:

A green highlighted result indicates a strong economic driver and/or high need for the resiliency benefits that CHP provides. The next step is to contact the local CHP TAP or similar resource to conduct a feasibility analysis of CHP at the site based on detailed site data on energy loads, operating conditions, and site-specific energy prices.

A yellow highlighted result indicates a moderate economic driver and value for the resiliency benefits that CHP provides. The next step is to contact the local CHP TAP or similar resource to conduct a more detailed screening analysis of the site that further evaluates potential economic and resiliency drivers.

A red highlighted result indicates a weak economic driver and low resiliency value. Further analysis of these sites can be put on hold unless there are additional factors that support further analysis.

Technical Innovation: eCatalog (Under Development)

- National scale source for commercially available CHP systems
- Initial NYSERDA data shows ~25% reduction in install time and cost
- Based on leading NYSERDA work
- End-user search for system size and type and connected to packagers and installers
- DOE experts review systems technical requirements

The screenshot displays the U.S. Department of Energy's Combined Heat & Power eCatalog interface. The header features the U.S. Department of Energy logo and the title "Combined Heat & Power eCatalog RECOGNIZED PACKAGED CHP SYSTEMS". Navigation links include "SHOP THE eCATALOG", "ABOUT THE eCATALOG", "ABOUT CHP & PACKAGED SYSTEMS", "UPDATES", and "FOR PACKAGERS & SOLUTION". User account options like "Contact or Get Help", "My Tasks", and "My Account" are also present.

The main content area is divided into several sections:

- FOCUS YOUR RESULTS:** Includes filters for "ELECTRIC CAPACITY RATING (kW)" with a slider set to 800 kW, "PRIME MOVERS" (Reciprocating engines, Combustion turbines, Microturbines, Fuel Cells), "THERMAL OUTPUTS" (Steam Only, Hot Water Only, Hot Exhaust Only, Chilled Water Only, Steam and Hot Water, Steam and Chilled Water), "GRID CONNECTION TYPE" (Grid Parallel, Grid Island w/ Black Start & Manual Transfer, Grid Island w/ Black Start & Auto Transfer), and "EFFICIENCY RATING".
- UPDATES:** A section titled "AVUS 1200NGG NO LONGER SUPPORTED" with a note stating the package has been discontinued by the vendor partner.
- DISPLAYING:** Shows "9 of 1,200 systems" with a "SORT BY" dropdown set to "Relevance".
- Filters:** Includes checkboxes for "Show Only Available Near 21671" and "Show Only Assurance Plan Offered".

The results section displays three CHP systems:

- Avus 800NG:** Output: 800 kW, Prime Mover: 1 x Reciprocating Engine, Thermal Output: HW, Assurance Plan: Yes, Grid Interconnection: Islandable, Fuel: Natural Gas. Status: HIGH MATCH.
- ER815MF HW:** Output: 815 kW, Prime Mover: 1 x Reciprocating Engine, Thermal Output: HW, Assurance Plan: Yes, Grid Interconnection: Islandable, Fuel: Natural Gas. Status: HIGH MATCH.
- C800S:** Output: 800 kW, Prime Mover: 1 x Microturbine, Thermal Output: HW, Assurance Plan: No, Grid Interconnection: Parallel, Fuel: Natural Gas. Status: PARTIAL MATCH.

Project Objectives: Program Field Verification

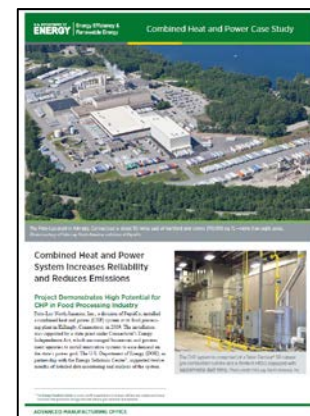
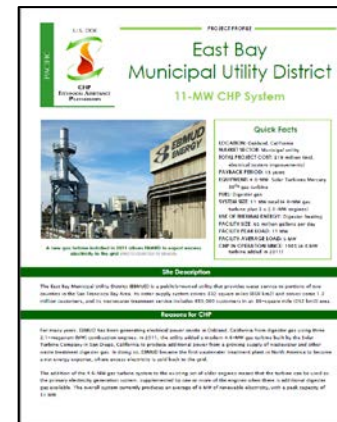
- **Data Verification**

- DOE CHP Installation Database: energy.gov/chp-installs

- Most comprehensive listing of combined heat and power installations in the U.S.
 - Minimum collection of capacity, operation year, location, technology, fuel, and application for each site
 - Contains information on sales to utility, thermal use, equipment type, etc., where available
 - Page for each state, accessed by an interactive map
 - Downloadable Database with summary table files

- DOE Project Profiles Database: energy.gov/chp-projects

- More than 130 CHP Project Profiles compiled by the CHP TAPs can be searched by a variety of characteristics, including:
 - State
 - Market Sector
 - North American Industry Classification System (NAICs) Code
 - Technology/Prime Mover
 - Fuel
 - Thermal Energy Used
 - Year Installed



Path Forward

What will this effort help enable going forward?

- **Educate the marketplace to advance CHP adoption (without DOE support)**
- **TAPs coordinating with key Policymakers to:**
 - Streamline interconnection and standby rates
 - Develop incentive programs that support CHP
 - Educate key stakeholders on best practices on CHP adoption
- **Communicate the benefits and best practices**
 - Project profiles, install database highlight successes
- **Develop in-field CHP experts to advance CHP regionally**
 - TAPs educating regional staff to become CHP experts
 - TAPs educating electric and gas utilities on CHP expertise