

Combined Heat and Power Deployment Program

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FY 17-18

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Tarla T. Toomer, Ph.D.

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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

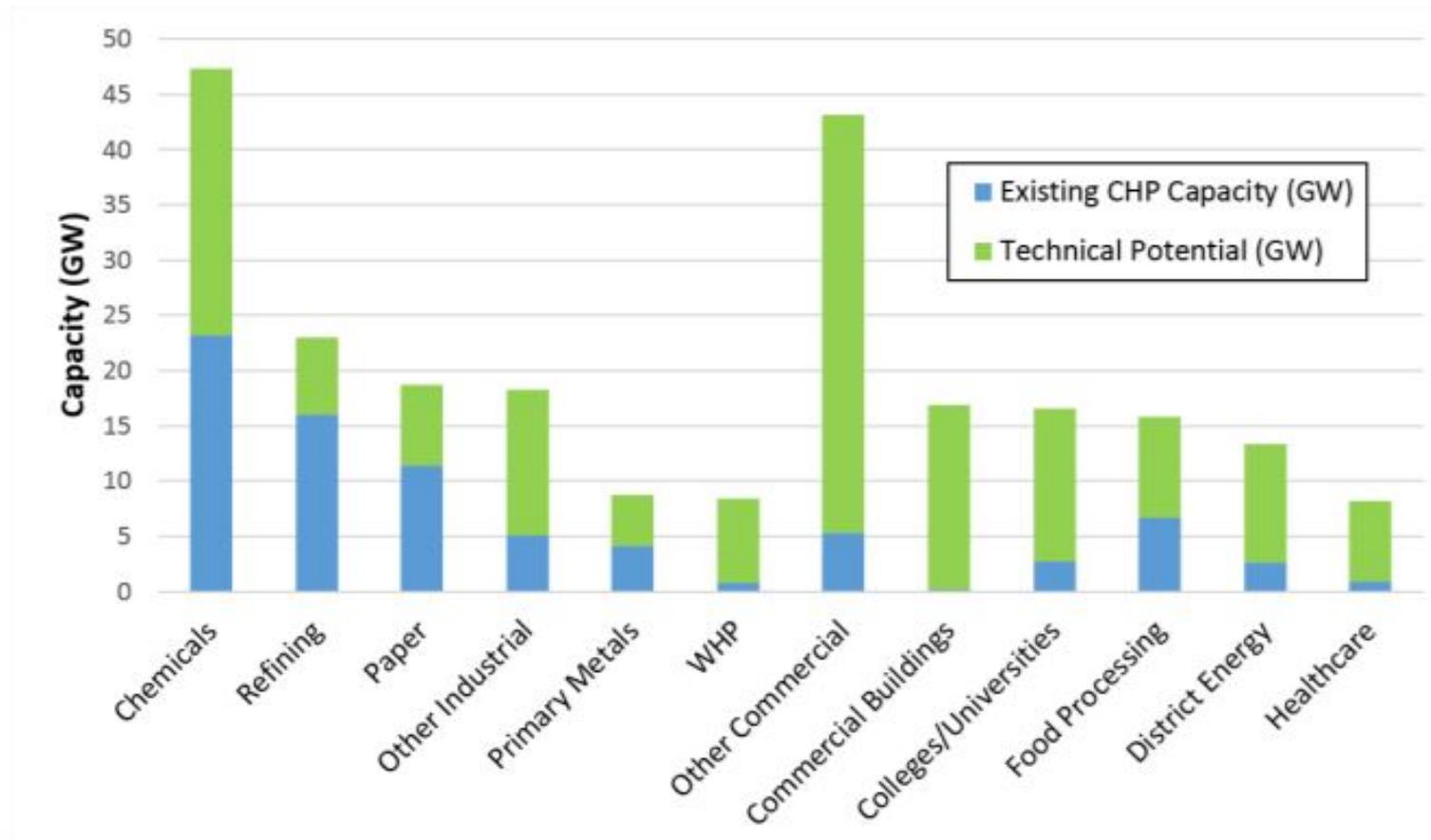
- Financial
 - Core business for capital investments versus operating expenditures
 - Lack of low-cost financing
 - Uncertain tax codes and accounting practices
 - Extensive utility regulations and practices with uncertain and often confusing interconnection standards and utility rates such as standby 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**

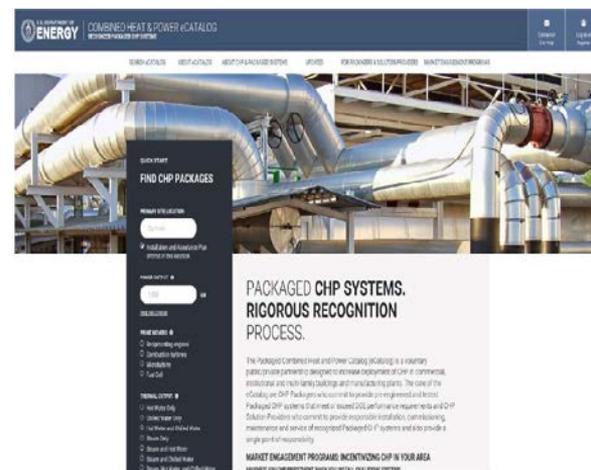
- Collaborating with Partners to support consideration of CHP and other distributed generation solutions for critical infrastructure resiliency planning at the state, local, and utility levels

- **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:**

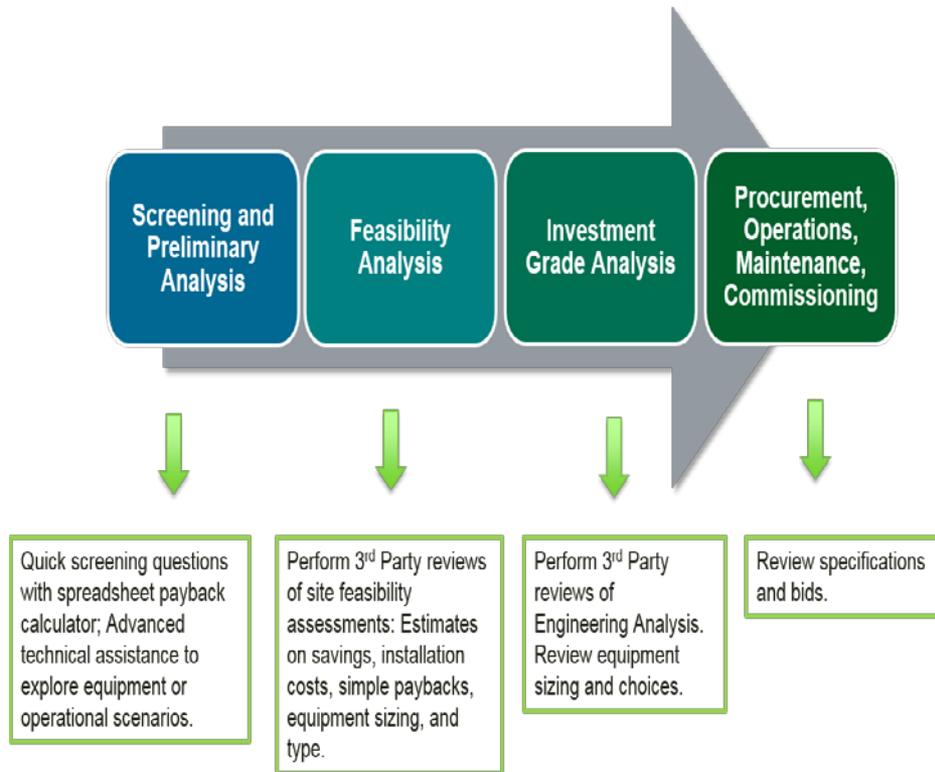
- Support of emerging technologies and innovative grid and CHP applications
- Provide field validation of CHP technical and market opportunities
- Provide public-private partnerships that will produce and disseminate CHP best practices and opportunities for economic, safety, and security
- Research emerging 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 shows the homepage of the 'Better Buildings' CHP Planning Tool for Critical Infrastructure (CI). The header includes the 'Better Buildings' logo and the title 'CHP Planning Tool for Critical Infrastructure (CI)'. A navigation bar contains links for 'Home', 'Policy Makers', 'Utilities', 'Take Action', and 'Resource Library'. The main content area is titled 'Introduction' and contains several sections of text and links:

- The CHP Planning Tool for Critical Infrastructure**
The Combined Heat and Power(CHP) Planning Tool for Critical Infrastructure provides information and resources on how distributed generation, with a focus on CHP, can help communities meet resiliency goals and ensure critical infrastructure remains operational regardless of external events. The tool includes analysis capabilities to help policymakers, utilities, and organizations determine if CHP is a good fit to support resiliency goals for critical infrastructure in their specific jurisdiction or territory.
- With the tool, state and local policy makers and utilities can get up to speed on the role of CHP and CI in resiliency planning. Policy makers can use the tool to learn how to determine where CHP can be a good fit for critical infrastructure in their territories, and how to incorporate CHP into their resiliency plans. Through the tool, utilities can also gain an understanding of how CHP for CI can help utilities engage with customers and provide support to local grids. The tool provides users with a variety of background resources:
- [Critical Infrastructure \(CI\) 101](#)
This section provides general background information on the different critical infrastructure sectors defined by the Department of Homeland Security (DHS) and their National Infrastructure Protection Plan (NIPP), and why energy resilience for individual critical infrastructure facilities is important. It also provides critical infrastructure resiliency planning specific to the energy sector.
- [Combined Heat and Power \(CHP\) 101](#)
This section provides a general overview of CHP technologies, benefits compared to separate heat and power generation, and the historical and current market for CHP.
- [Microgrids 101](#)
This section provides details on microgrid basics, from technology configurations to potential ownership models. It also highlights the role that CHP can play in supporting microgrids and how microgrids can support resiliency in critical infrastructure operations.
- [Applying CHP in Critical Infrastructure 101](#)
This sections highlights CHP's role in increasing the resiliency of critical infrastructure, as well as detailing CI sectors conducive to CHP deployment. It also provides information on how to value the reliability benefits of CHP when compared to traditional backup generation.
- The CHP for Resiliency Accelerator**
The CHP for Resiliency Accelerator is a collaborative effort with states, communities, utilities, and other stakeholders with the goal of supporting and expanding the consideration of CHP solutions to keep critical infrastructure operational regardless of external events. This tool incorporates examples of how Accelerator Partners have:
 - ⇒ Examined the perceptions of CHP among resiliency planners,
 - ⇒ Identified gaps in current technologies or information relative to resiliency needs, and
 - ⇒ Developed plans for communities to capitalize on CHP's strengths as a reliable, high-efficiency, low-emissions source of electricity and thermal energy for critical infrastructure.

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

The screenshot shows the 'CHP Planning Tool for Critical Infrastructure (CI)' website. At the top left is the 'Better Buildings' logo with 'U.S. DEPARTMENT OF ENERGY' below it. To the right is the title 'CHP Planning Tool for Critical Infrastructure (CI)'. Below this is a navigation bar with links for 'Home', 'Policy Makers', 'Utilities', 'Take Action', and 'Resource Library'. The main heading is 'Identify and Evaluate Opportunities for CHP in CI'. The current page is 'Step 5: Individual Site Screening for CHP'. The text describes the fifth step as evaluating a prioritized portfolio of sites using the CHP for Resiliency Screening Tool. It lists inputs for the tool: location, sector classification, annual electric use, annual fuel use, fuel price, electric price, and resiliency value. A legend explains the 'stoplight' results: green for strong economic driver and high need, yellow for moderate driver and value, and red for weak driver and low value.

Better Buildings
U.S. DEPARTMENT OF ENERGY

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:

Green: 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.

Yellow: 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.

Red: 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 includes the U.S. Department of Energy logo and the text "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".

FOCUS YOUR RESULTS

ELECTRIC CAPACITY RATING (kW)

Specify a range

800 kW

< 50K > 2,000K

Help Me Choose

NOTE: Results assume max 120% of individual unit size for max relevance and 70% for minimum

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

Show (2) More +

GRID CONNECTION TYPE

Grid Parallel
 Grid Island w/ Black Start & Manual Transfer
 Grid Island w/ Black Start & Auto Transfer

EFFICIENCY RATING

UPDATES

AVUS 1200NGG NO LONGER SUPPORTED

Please note this package has been discontinued by the vendor partner. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullam-

SEE ALL

DISPLAYING: 9 of 1,200 systems >

SORT BY Relevance

Show Only Available Near 21671 Show Only Assurance Plan Offered

2G[®] Avus 800NG

Output: 800 kW
Prime Mover: 1 x Reciprocating Engine
Thermal Output: HW
Assurance Plan: Yes
Grid Interconnection: Islandable
Fuel: Natural Gas

ER815MF HW

Output: 815 kW
Prime Mover: 1 x Reciprocating Engine
Thermal Output: HW
Assurance Plan: Yes
Grid Interconnection: Islandable
Fuel: Natural Gas

Capetone C800S

Output: 800 kW
Prime Mover: 1 x Microturbine
Thermal Output: HW
Assurance Plan: No
Grid Interconnection: Parallel
Fuel: Natural Gas

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