

Joint Implementation Workshop: Energy Resilience with Distributed Energy Resources

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



U.S. Department of Energy
Energy Efficiency & Renewable Energy
(EERE)
Advanced Manufacturing Office (AMO)

Tarla T. Toomer, Ph.D.
CHP Deployment Program
Technology Manager
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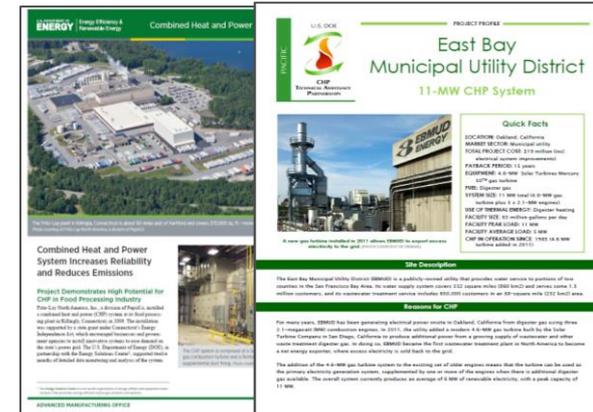
U.S. DOE CHP Deployment Program Mission & Scope

Mission

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

Scope

- **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



www.energy.gov/chp

U.S. DOE CHP Deployment Program Scope

- **Market Analysis and Tracking**
 - Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors.
- **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
- **Packaged CHP Accelerator (Newly Launched)**
 - Seeks to validate 20% or more reductions in installation times and total project costs across a variety of pre-engineered, technically validated packaged CHP systems.
 - These systems may be especially attractive for underserved markets for CHP, such as light manufacturing, commercial buildings, multi-family and institutional facilities.

DOE CHP Technical Assistance Partnerships (CHP TAPs)

- **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
- **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

Market Analysis and Tracking

- **Market Analysis and Tracking**
 - Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors.
 - Publications
 - CHP Technical Potential in the United States
 - CHP Technology Fact Sheet series
 - DOE CHP Installation Database
 - Provides information about CHP systems currently operating in the United States
 - Locations
 - organizations served
 - facility characteristics
 - CHP Project Profiles
 - Two-page summaries of “real world” examples of CHP projects
 - Electricity and Thermal energy to their owners/ operators.

Packaged CHP Accelerator (Newly launched)

- Validate packaged CHP technologies appropriate for commercial, institutional, multi-family, light manufacturing and government (civilian and military)
- Standardized, packaged CHP systems can overcome market barriers by limiting design errors, reducing uncertainty about performance, shortening project timelines, streamlining permitting, and reducing overall costs or installations
- CHP Supplier Partners
 - CHP system packagers and solution providers participating in the national *eCatalog* of packaged CHP systems
- CHP Engagement Partners
 - Utilities, federal agencies, states, cities or other market entities committed to promoting packaged CHP (via the *eCatalog*)

CHP Packaged System eCatalog (Under Development)

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

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Combined Heat & Power eCatalog
RECOGNIZED PACKAGED CHP SYSTEMS

Contact or Get Help

My Tasks

My Account

SHOP THE eCATALOG
ABOUT THE eCATALOG
ABOUT CHP & PACKAGED SYSTEMS
UPDATES
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 v

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 Interconecion:	Islandable
Fuel:	Natural Gas

HIGH MATCH
PROGRAM
★

2G

ER815MF HW

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

HIGH MATCH
PROGRAM
★

2G

C800S

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

PARTIAL MATCH
PROGRAM
★

7

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CHP for Resiliency Accelerator Partner Profiles

- Summary of individual partner achievements throughout the accelerator and future plans
- Short profiles containing:
 1. Partners' approach to resiliency planning
 2. Program or project implementation related to CHP/DG
 3. Lessons learned and future plans
 4. Additional resources and information



Key Accomplishments & Results
COMBINED HEAT AND POWER FOR RESILIENCY ACCELERATOR

Introduction
The Combined Heat and Power (CHP) for Resiliency Accelerator worked collaboratively with states, communities, utilities, and other stakeholders to support and expand the consideration of CHP solutions to keep critical infrastructure facilities operational every day and night regardless of external events. Over the course of two years starting in May 2016 and ending in August 2018, partners examined the perceptions of CHP among resiliency planners, identified gaps in current technologies or information relative to resiliency needs, and helped develop plans for communities to capitalize on CHP's strengths as a reliable, high efficiency, lower emissions electricity and heating/cooling source for critical infrastructure.



The Role of CHP in Resilience Planning and Project Implementation
Natural and man-made disasters, like Hurricane Maria and Superstorm Sandy, focus attention on securing critical infrastructure (CI) for national or regional security, economic continuity, and/or public health and safety. Virtually every community in the U.S. has facilities that fall within the definition of critical infrastructure, needing uninterrupted electricity and heating or cooling services. States and municipalities spend considerable time planning for and reinforcing their critical facilities and seeking resources to install the best economic solution; however, a key technology solution – combined heat and power – is often overlooked.

CHP has proven effective in ensuring uninterrupted electric service through multiple major disasters in hospitals, schools, places of refuge, and other CI. CHP systems simultaneously generate electricity and produce thermal energy, maintaining needed power, hot water and space conditioning services on-site at high efficiency. More than 25 partners including six state agencies, six cities, seven utilities, and six nonprofit organizations and solution providers committed to establishing a dialogue on the use of CHP in resilience planning for critical infrastructure. As a collaborative effort the partners examined perceptions of CHP among resiliency planners and developed resources for communities to use to capitalize on CHP's strengths as a reliable and high efficiency energy source.

CHP for Resiliency Accelerator Deliverables
A number of public resources were developed to help stakeholders pursue CHP as part of a resilience strategy. The resources listed below respond to the information needs identified by partners during the course of the collaboration, and are meant to assist and encourage continued commitment to increasing community resilience with distributed generation (DG) and CHP. All resources will reside on the Better Buildings Solution Center.

- ▶ **Distributed Generation (DG) for Resiliency Planning Guide:** This guide provides information and resources on how DG, with a focus on CHP, can help communities meet resilience goals. If used in combination with a surveying of critical infrastructure at a regional level, this guide also provides tools, utilities, and organizations determine if a region, territory, or organization.
- ▶ **CHP for Resiliency Site Screening Tool:** This excel-based tool provides a multi-site screening assessment for CHP based on a variety of resiliency factors, user inputs and pre-determined metrics. It is comprised of two steps: a resiliency screening and a CHP screening. In the first step, users enter basic information that are used to rank and prioritize critical facilities that may be potential CHP candidates by their resiliency value. In the second step, users can enter more detailed information about the priority sites to conduct a preliminary economic screening of the viability of CHP at the selected facilities.
- ▶ **Distributed Energy Resource (DER) Disaster Matrix and Issue Brief:** This issue brief explores how different types of distributed energy resources (DERs) are impacted by various types of weather-related disasters to assist stakeholders in evaluating the technology options best able to meet their resiliency priorities. It examines the capabilities and performance characteristics of six distributed technologies in six types of weather events to help identify optimal sources of resilient power.
- ▶ **CHP for Resiliency Webinar Series:** Regular webinars shared lessons learned and best practices in installing CHP and other DG for resiliency from experts in the field. Some topics included the technical and economic aspects of islanding and black start capability, policies that impact CHP resiliency projects, hybrid CHP systems and how CHP can be integrated with other DERs, and metrics and frameworks for valuing resiliency.

Recognizing Partner Success
During the two year Accelerator, partners advanced through different phases of project implementation. Some examples of key milestones achieved by partners are highlighted below:

- ▶ **City of Boston:** The city is coordinating a pilot project for a multi-user CHP district energy microgrid to increase resiliency at the Raymond L. Flynn Marine Park (RLFMP). Several industrial and residential customers are located in this area, which is at increased risk of coastal and storm-water flooding, and the project will provide a case study and model approach for development of public-private partnerships to support resiliency with CHP and microgrid technologies.
- ▶ **Massachusetts DOER:** As part of the state's \$40 million Community Clean Energy Resiliency Initiative (CCERI), the DOER provided project implementation support to assist resiliency capabilities to clean energy technologies at hospitals. [H]ospitals, including [can we name a few?], received funding to install resiliency components (e.g. energy storage, switch gear, transfer switch, load controls, etc.) to onsite CHP systems.
- ▶ **Montgomery County, MD:** The County is leading implementation of two pilot projects to enhance resiliency of individual facilities and the electric system with CHP. The first project is a microgrid at the County's Public Safety Headquarters, which broke ground in 2017 and will include CHP, solar PV, fast charging electric vehicle stations, and cybersecurity controls. The second microgrid project will be installed at the Montgomery County Correctional Facility and is expected to be completed by the end of 2018. The county continues to work with partners to identify candidates for microgrids, including the local utility, Pepco, which recently proposed to serve the City of Rockville with a public purpose microgrid.
- ▶ **NYSEDA:** NYSEDA is encouraging deployment of CHP and microgrid solutions to increase energy resilience through multiple programs or initiatives, including a CHP incentive program (FON 2568), the packaged CHP system catalog, and NY Price. Based on its experience with these initiatives and observations of CHP in the marketplace, NYSEDA is exploring the combination of CHP with other DER technologies including energy storage and renewable energy, as the near-term pathway to greater installation of cost-effective resilient CHP.

Learn more at energy.gov/betterbuildings

ENERGY

The DG for Resilience Planning Guide

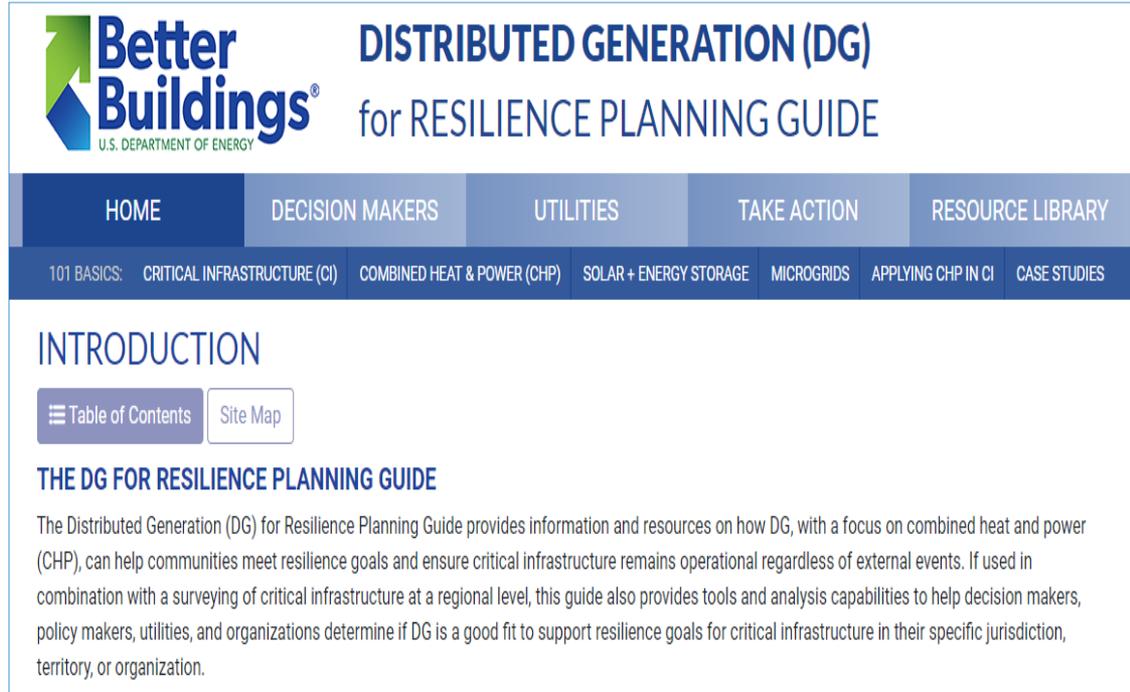
- Provides information and resources on how DG can assist communities meet resilience goals and ensure critical infrastructure remains operational regardless of external events.

1. Decision Makers and Utilities

- Provides background information and policy considerations for incorporating DG into resilience planning

2. Take Action

- Highlights opportunities for DG in critical infrastructure, and steps for performing site evaluations, reviewing existing policies, and developing new programs



The screenshot shows the homepage of the "Better Buildings Distributed Generation (DG) for Resilience Planning Guide". The header includes the "Better Buildings" logo (with "U.S. DEPARTMENT OF ENERGY" below it) and the title "DISTRIBUTED GENERATION (DG) for RESILIENCE PLANNING GUIDE". A navigation bar contains links for "HOME", "DECISION MAKERS", "UTILITIES", "TAKE ACTION", and "RESOURCE LIBRARY". Below this is a secondary navigation bar with links for "101 BASICS", "CRITICAL INFRASTRUCTURE (CI)", "COMBINED HEAT & POWER (CHP)", "SOLAR + ENERGY STORAGE", "MICROGRIDS", "APPLYING CHP IN CI", and "CASE STUDIES". The main content area features the heading "INTRODUCTION" with buttons for "Table of Contents" and "Site Map". Below this is the section "THE DG FOR RESILIENCE PLANNING GUIDE" with a paragraph of introductory text.

Better Buildings
U.S. DEPARTMENT OF ENERGY

DISTRIBUTED GENERATION (DG)
for RESILIENCE PLANNING GUIDE

HOME DECISION MAKERS UTILITIES TAKE ACTION RESOURCE LIBRARY

101 BASICS CRITICAL INFRASTRUCTURE (CI) COMBINED HEAT & POWER (CHP) SOLAR + ENERGY STORAGE MICROGRIDS APPLYING CHP IN CI CASE STUDIES

INTRODUCTION

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THE DG FOR RESILIENCE PLANNING GUIDE

The Distributed Generation (DG) for Resilience Planning Guide provides information and resources on how DG, with a focus on combined heat and power (CHP), can help communities meet resilience goals and ensure critical infrastructure remains operational regardless of external events. If used in combination with a surveying of critical infrastructure at a regional level, this guide also provides tools and analysis capabilities to help decision makers, policy makers, utilities, and organizations determine if DG is a good fit to support resilience goals for critical infrastructure in their specific jurisdiction, territory, or organization.

DG for Resilience Planning Guide here:

<https://resiliencguide.dg.industrialenergytools.com/>

The DG for Resilience Planning Guide

- Provides information and resources on how DG can assist communities meet resilience goals and ensure critical infrastructure remains operational regardless of external events.

3. Resource Library

- Provides resources related to energy planning, resilience planning, DG and CHP deployment, and individual project development

4. 101 Basics

- Provides critical infrastructure, DG technologies, and applying DG in CI for resilience purposes

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DISTRIBUTED GENERATION (DG)
for RESILIENCE PLANNING GUIDE

HOME DECISION MAKERS UTILITIES TAKE ACTION RESOURCE LIBRARY

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DG for Resilience Planning Guide here:

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CHP Project Resources

DOE Project Profile Database

East Bay Municipal Utility District
11-MW CHP System

Quick Facts

- LOCATION: Oakland, California
- WEBSITE: www.emud.org
- CONTACT: patrick.french@emud.org
- PROJECT START: 2011
- PROJECT STATUS: Operational
- CHP CAPACITY: 11 MW
- FUEL: Natural Gas
- TECHNOLOGY: Reciprocating Engines
- CO2 EMISSIONS: 10,000 tons per year
- ANNUAL ENERGY PRODUCTION: 100,000 MWh
- ANNUAL FUEL CONSUMPTION: 100,000 MMBtu
- ANNUAL COST: \$10 million
- ANNUAL SAVINGS: \$1.5 million
- ANNUAL EMISSIONS REDUCTION: 10,000 tons
- ANNUAL ENERGY EFFICIENCY: 85%

North Carolina State University
11 MW CHP & District Energy System

Project Overview

North Carolina State University completed a CHP project in the fall of 2011 as part of a major sustainability initiative with the University. The project included the installation of 11 MW of natural gas reciprocating engines, a 11 MW boiler, and a 11 MW steam turbine. The project also included the installation of a district energy system to deliver heat to the University's research and academic buildings. The project is expected to reduce the University's annual energy consumption by 100,000 MWh and reduce CO2 emissions by 10,000 tons per year.

Quick Facts

- LOCATION: Raleigh, North Carolina
- WEBSITE: www.ncsu.edu
- CONTACT: patrick.french@emud.org
- PROJECT START: 2011
- PROJECT STATUS: Operational
- CHP CAPACITY: 11 MW
- FUEL: Natural Gas
- TECHNOLOGY: Reciprocating Engines
- CO2 EMISSIONS: 10,000 tons per year
- ANNUAL ENERGY PRODUCTION: 100,000 MWh
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energy.gov/chp-projects

Low-Cost CHP Screening & CHP TAP Technical Assistance

DOE CHP Technical Assistance Partnerships (CHP TAPs)

- Northeast:** www.northeastchp.org (N, N.E., S.E.)
- Upper West:** www.upperwestchp.org (N.W., N.E., S.E.)
- Midwest:** www.midwestchp.org (N.W., N.E., S.E.)
- New England:** www.newenglandchp.org (N.E., S.E.)
- New York-New Jersey:** www.ny-njchp.org (N.E., S.E.)
- Mid-Atlantic:** www.midatlanticchp.org (N.E., S.E.)
- Southwest:** www.southwestchp.org (S.W., S.E., N.W., N.E.)
- West:** www.westchp.org (S.W., S.E., N.W., N.E.)
- Southcentral:** www.southcentralchp.org (S.W., S.E., N.W., N.E.)
- Central:** www.centralchp.org (S.W., S.E., N.W., N.E.)

DOE CHP Deployment Program Contacts: www.energy.gov/chp-contacts

energy.gov/CHPTAP

DOE CHP Installation Database (Known CHP Systems in U.S.)

U.S. DOE Combined Heat and Power Installation Database

Home | About | Download Data | Sign Up

Choose a State

Click a state below to view CHP data

TX

DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy | ICF

energy.gov/chp-installs

EPA dCHPP (CHP Policies and Incentives Database)

EPA dCHPP (CHP Policies and Incentives Database)

Environmental Topics | Laws & Regulations | About EPA

Combined Heat and Power (CHP) Partnership

Combined Heat and Power (CHP) Partnership Home

About Us

Discover CHP

Project Development

Energy Star CHP Awards

Webinars and Presentations

Documents and Tools

Frequent Questions

dCHPP (CHP Policies and Incentives Database)

dCHPP (CHP Policies and incentives database) is an online database that allows users to search for CHP policies and incentives by state or at the federal level. dCHPP has two primary purposes:

- Policy makers and policy advocates can find useful information on significant state/federal policies and financial incentives affecting CHP.
- CHP project developers and others can easily find information about financial incentives and state/federal policies that influence project development.

The [glossary](#) contains definitions for the policy and incentive types included in dCHPP.

Please select one or both of the search filters to return the desired results. To select more than one option in a search filter (e.g., New York and Texas in the "Search by State" filter), hold down the Control key on the keyboard while selecting the options. You can then sort the results by selecting the desired column heading. To start over, select "Reset Filters."

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

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