

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 beginning 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.



Photo Courtesy of the U.S. DOE CHP for Resiliency Accelerator, Better Buildings Solutions Center

The Role of CHP in Resilience Planning and Project Implementation

Natural and man-made disasters, like Hurricane Maria and Superstorm Sandy, focus attention on safeguarding 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.



University of Texas Medical Branch CHP System with installed floodwalls. Photo courtesy of UTMB Health

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 developed resources for communities to use to take advantage of CHP's strengths as a reliable and high efficiency energy source.

CHP for Resilience 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 Resilience 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 and analysis capabilities to help decision makers, policy makers, utilities, and organizations determine if DG is a good fit for critical infrastructure in their specific jurisdiction, territory, or organization.
- ▶ **CHP for Resilience 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 resilience 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 in order to assist stakeholders in evaluating the technology options best able to meet their resilience 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 Resilience Webinar Series:** Regular webinars shared lessons learned and best practices in installing CHP and other DG for resiliency from experts in the field. Topics included the technical and economic aspects of add islanding and black start capability, policies that impact CHP resilience 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 resilience 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 resilience with CHP and microgrid technologies.
- ▶ **Massachusetts Department of Energy Resources (DOER):** As part of the state's \$40 million Community Clean Energy Resiliency Initiative (CCERI), the DOER provided project



Aerial view of the Raymond L. Flynn Marine Industrial Park. Photo courtesy of the Boston Planning and Development Agency

implementation support to add resiliency capabilities to clean energy technologies at hospitals. Hospitals will receive funding to install resiliency components (e.g. energy storage, switchgear, transfer switch, load controls, etc.) to onsite CHP systems.

- ▶ **Montgomery County, MD:** The County is leading the implementation of two pilot projects to enhance resiliency of individual facilities and the electric system using 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.
- ▶ **NYSERDA:** NYSERDA is encouraging deployment of CHP and microgrid solutions to increase energy resilience through multiple programs or initiatives, including a CHP incentive program (PON 2568), the packaged CHP system catalog, and NY Prize. Based on its experience with these initiatives and observations of CHP in the marketplace, NYSERDA is exploring the combination of CHP with other DER technologies including energy storage and renewable energy, as the nearest-term pathway to greater installation of cost-effective resilient CHP.
- ▶ **City of Hoboken:** The City is undertaking a number of resilient energy projects, including the completion of an expanded feasibility study for the development of a citywide microgrid to connect and power critical and community facilities in an emergency. The study is

examining the potential for various DERs, including storage, CHP, thermal loops, and biodiesel fueled generators to provide redundant power at two potential project locations – one that would serve critical facilities as part of a commercial corridor redesign, and a second that would serve the Hoboken Housing Authority campus, nearby facilities, and public housing units.

- ▶ **Pennsylvania Public Utility Commission (PUC):** The PUC released a policy statement in April 2018 to encourage electric and natural gas distribution companies to incorporate CHP into their energy efficiency and resiliency planning efforts. A CHP stakeholder working group was created with the adoption of the policy statement to bring together utilities, commission staff, state agencies, and public advocates for dialogue and collaboration to advance the use of CHP in the state.
- ▶ **PSEG Long Island:** PSEG Long Island, a government-owned electric utility serving Long Island and portions of New York City, launched a CHP incentive program at the end of 2016 and modeled certain aspects of the program after NYSERDA's long-standing CHP offerings. The program helps PSEG Long Island reach its energy efficiency goals and improve the resilience of customers; systems above 50 kW must be black-start capable to participate.
- ▶ **Missouri Division of Energy (DE) and Spire:** Missouri DE and Spire, a natural gas utility, collaborated on several initiatives, including co-hosting two CHP summits focused on energy resiliency for critical facilities in Missouri. The meetings were an important education and outreach opportunity for attendees, which included stakeholders affiliated with hospitals, universities and colleges, correctional facilities, and nursing homes and assisted living facilities.

In addition to the individual partner accomplishments detailed above, the following partners studied feasibility of CHP at critical infrastructure sites to increase resilience in their jurisdictions:

- ▶ Bath Electric Gas & Water Systems
- ▶ City of Boston
- ▶ Massachusetts Department of Energy Resources (DOER)
- ▶ Maryland Energy Administration (MEA)
- ▶ Miami-Dade Water and Sewer Department
- ▶ Montgomery County, MD
- ▶ Nicor Gas
- ▶ NYC Mayor's Office of Recovery and Resiliency
- ▶ New York State Energy Research and Development Agency (NYSERDA)
- ▶ City of Pittsburgh
- ▶ PSEG Long Island
- ▶ TECO
- ▶ Tennessee Valley Authority (TVA)
- ▶ United Illuminating and Amity School District (Woodbridge, CT Partnership)

The following partners hosted meetings or workshops to advance a dialogue on resilience in their jurisdictions:

- ▶ Healthcare Without Harm (HCWH)
- ▶ International District Energy Association (IDEA)
- ▶ Missouri Department of Economic Development – Division of Energy
- ▶ New York State Energy Research and Development Agency (NYSERDA)
- ▶ Pennsylvania Public Utility Commission (PUC)
- ▶ Spire
- ▶ Utah Governor's Office of Energy Development

Additional Resources

- ▶ [Boston Community Energy Study](#) – A citywide assessment exploring the potential for district energy and microgrids through a combined geospatial, engineering, and financial analysis approach.
- ▶ [ONE PGH. Resilient Pittsburgh](#) – Strategy for the city of Pittsburgh focused on the environment, energy and sustainability, with the ultimate goal of enhancing resiliency throughout the city.
- ▶ [NY Prize](#) – A statewide competition that helps communities reduce costs, promote clean energy, and build reliability and resiliency into the electric grid through microgrid development.
- ▶ [NYSERDA CHP Program](#) – Incentive program to promote the deployment of CHP systems up to 3 MW, with a focus on pre-engineered, packaged CHP systems.
- ▶ [Rockefeller 100 Resilient Cities \(100RC\) Network](#) – Global network to help cities improve resilience to physical, social, and economic challenges by designing resilience roadmaps and collaboration.
- ▶ [Missouri Comprehensive State Energy Plan](#) – Planning document that addresses energy challenges, potential solutions, and an implementation roadmap for the state going forward.
- ▶ [The Regulatory Assistance Project – Regulatory Approaches to Grid Resiliency and Security](#) – White paper exploring regulatory approaches for utilities to enhance grid resiliency and security.
- ▶ [Hoboken Community Resilience Plan](#) – Plan to address vulnerabilities and mitigate against future disaster events through energy and environmental resilience initiatives.