Resilience and Reliability with CHP

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U.S. DOE CHP Deployment Program
CHP Technical Assistance Partnerships
Power Outages are Costly

U.S. 2018 Billion-Dollar Weather and Climate Disasters

Western Wildfires, California Firestorm Summer–Fall 2018
Rockies and Plains Hail Storms August 6–7
Southwest/Southern Plains Drought 2018
Colorado Hail Storm June 18–19
Texas Hail Storm June 6
Southern and Eastern Tornadoes and Severe Weather April 13–16
Central and Eastern Tornadoes and Severe Weather July 19–22
Northeast Winter Storm March 1–3
Central and Eastern Severe Weather May 13–15
Northeastern and Eastern Winter Storm January 3–5
Hurricane Florence September 13–16
Central and Northeast Severe Weather May 1–4
Southeastern Tornadoes and Severe Weather March 18–21

This map denotes the approximate location for each of the 14 separate billion-dollar weather and climate disasters that impacted the United States during 2018.
CHP: A Key Part of Our Energy Future

- 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
  - Dehumidification

CHP provides efficient, clean, reliable, affordable energy – today and for the future.

Source: www.energy.gov/chp
How Does CHP Increase Resilience?

- **For end users:**
  - Provides continuous supply of electricity and thermal energy for critical loads
  - Can be configured to automatically switch to “island mode” during a utility outage, and to “black start” without grid power
  - Ability to withstand long, multiday outages

- **For utilities:**
  - Enhances grid stability and relieves grid congestion
  - Enables microgrid deployment for balancing renewable power and providing a diverse generation mix

- **For communities:**
  - Keeps critical facilities like hospitals and emergency services operating and responsive to community needs
CHP: Proven to be Resilient

Hurricane Harvey
- University of Texas Medical Branch (UTMB)
- Texas Medical Center (TMC)
- Southwest Energy Data Center
- Lake Charles Manuf. Complex
- DeBakey VA Medical Center

Hurricane Irma & Maria
- Hospital De La Concepcion PR
- Wyndham Hotel St. Thomas
- Univ. of Florida Shands Medical Center
- Matosantos Commercial Corp
- Captain Morgan Diageo Rum Distillery
- Plaza Extra East Supermarket St. Croix

Superstorm Sandy
- South Oaks Hospital
- Princeton University
- Salem Community College
- Public Interest Data Center
- Bergen Counties WWTP
- Sikorsky Aircraft Corp.

Hurricane Ike & Katrina
- Mississippi Baptist Medical Center
- Louisiana State University
- University of Texas Medical Branch (UTMB)

CHP Systems Kept Facilities Operational Through Hurricanes
Project Snapshot: Texas Medical Center

- **Location:** Houston, TX
- **Application/Industry:** Hospital
- **Capacity:** 48 MW
- **Prime Mover:** Combustion turbine
- **Fuel Type:** Natural gas
- **Thermal Use:** Steam for heating and chilled water
- **Installation Year:** 2010

**Resilience Benefits**

- Provided critical services to hospital patients and staff throughout Hurricane Harvey
- Elevated CHP system design was able to withstand flooding given significant storm surge in the area
- Also provides $6-12 million in energy cost savings per year

Brays Bayou before and after flooding from Hurricane Harvey, photos courtesy of the Thermal Energy Corporation (TECO)
Resilience Planning with DOE CHP for Resiliency Accelerator

- The **DOE CHP for Resiliency Accelerator** includes resources and tools designed to assist with resilience planning efforts
  - Distributed Generation for Resiliency Planning Guide
  - CHP for Resilience Screening Tool
  - Issue Brief on Performance of DERs in Disaster Events
  - Partner Profiles

https://betterbuildingsinitiative.energy.gov/accelerators/combined-heat-and-power-resiliency
Distributed Generation (DG) for Resilience Planning Guide

- Provides information and resources on how DG (w/ a focus on CHP), can help communities meet resilience goals and ensure critical infrastructure remains operational regardless of external events.

https://resilienceguide.dg.industrialenergytools.com/
The CHP for Resilience Screening Tool

**Resiliency Screening**
- **Inputs:** User-defined critical infrastructure ranking criteria, as well as microgrid and load factor ranking assessments
- **Results:** Users receive a resiliency score, microgrid score, load factor score, historical CHP uptake, and combined total resilience score

**CHP Screening**
- **Inputs:** Resiliency score (from resiliency screening), site location, energy consumption data, and energy price data
- **Results:** Estimated CHP size and stoplight screening assessment (taking into account resiliency screening)

**Stoplight Screening Assessment**
- This site has a high potential for CHP, contact your CHP TAP for more information
- This site has medium potential for CHP, contact your CHP TAP for more information
- Limited CHP Potential

**Resiliency Screening Factors:** Government Continuity, Locational Ranking, Leverage/Scalability, Life Safety, Economic Impact, Microgrid, and Load Factor

Access the tool at the accelerator website under “Featured Resources”:
https://betterbuildingsinitiative.energy.gov/accelerators/combined-heat-and-power-resiliency
Thank You

Questions?

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https://betterbuildingssolutioncenter.energy.gov/chp/mid-atlantic-chp-technical-assistance-partnership

www.machptap.org