Resilience and Reliability with CHP

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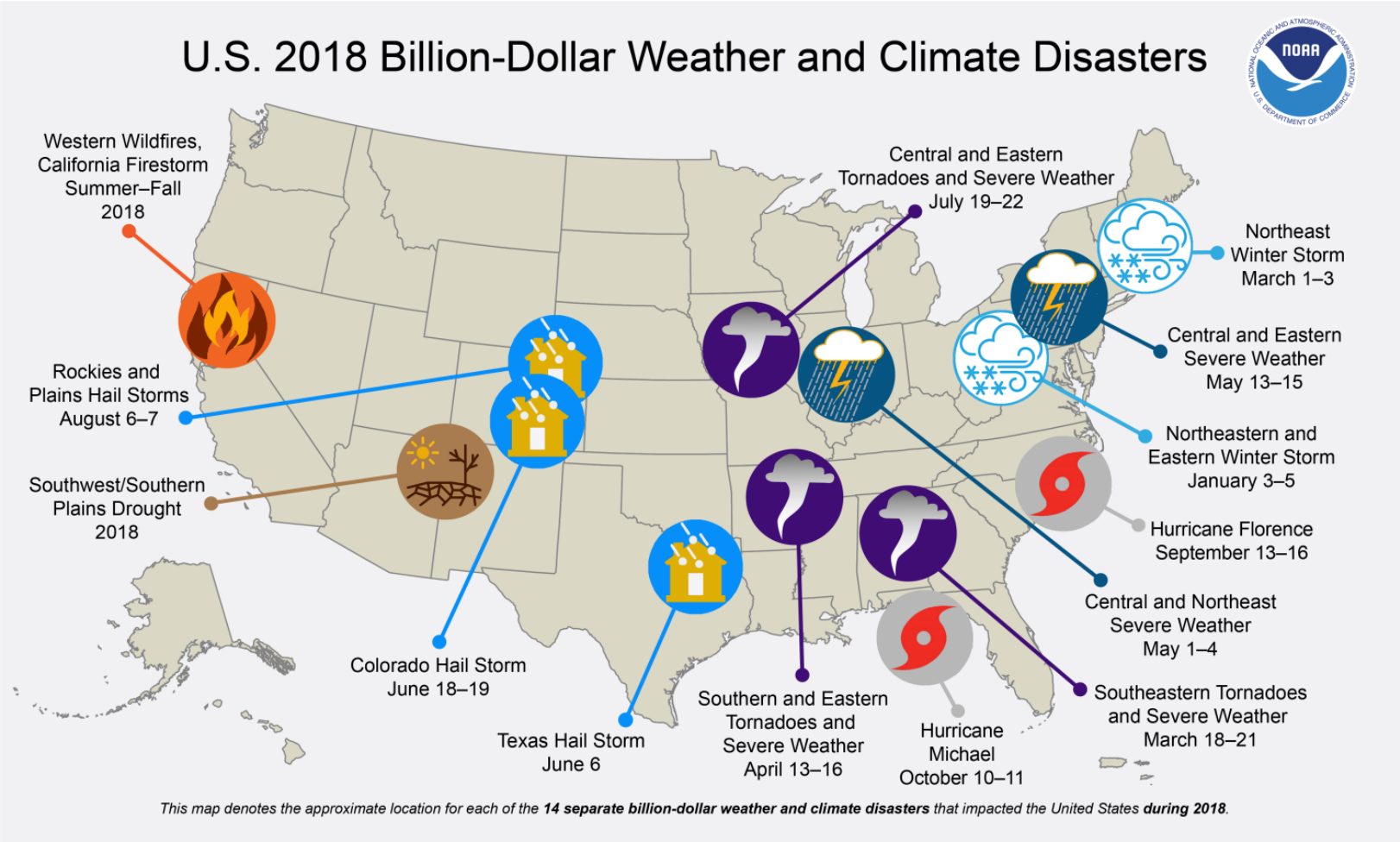
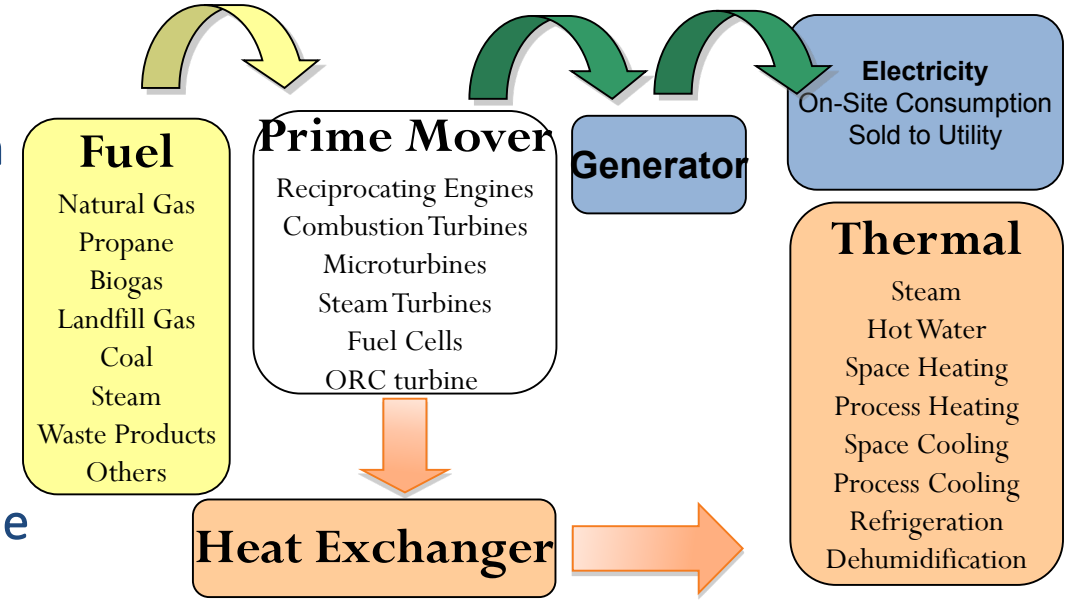
CHP Technical Assistance Partnerships

Power Outages are Costly



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

CHP Systems Kept Facilities Operational Through Hurricanes

Superstorm Sandy

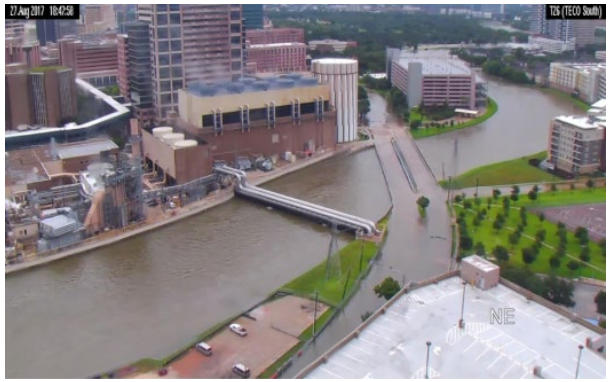
- South Oaks Hospital
- Princeton University
- Salem Community College
- Public Interest Data Center
- Bergen Counties WWTP
- Sikorsky Aircraft Corp.

Hurricane Ike & Katrina

- Mississippi Baptist Medical Center
- Louisiana State University
- University of Texas Medical Branch (UTMB)

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**

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

Table of Contents | Site Map

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.

With the guide, decision makers, state and local policy makers, and utilities can get up to speed on the role of DG and CI in resilience planning. Decision makers and policy makers can use the guide to learn how to determine where DG can b
organizations, what types of DG are best suited to certain types of CI applications, and
utilities can also gain an understanding of how DG for CI can help utilities engage with
users with a variety of background resources:

STEP 3: INDIVIDUAL SITE ASSESSMENT

The third step is to perform an individual site assessment for potential CI sites based on the conducive sub-sectors identified in Steps 1 & 2 above. The following tools can be used to screen individual CI sites for their potential to deploy CHP, solar + storage, and/or a microgrid for increasing energy resilience.

Users may choose to perform individual site screening assessments using the tools detailed (below), or learn more about individual DG technologies and the potential resilience benefits they may provide to individual CI sites (right).

→ Learn more about CHP for Resilience
→ Learn more about Solar + Storage for Resilience
→ Learn more about Microgrids for Resilience

Individual Site Assessment Tools

CHP Site Screening Tool	The CHP Site Screening Tool is an excel-based tool that can provide an individual site screening assessment for CHP based on a variety of user inputs and pre-determined metrics.	CHP Site Screening Tool
Solar + Storage Screening Tool	NREL's REopt model is used to optimize energy systems for buildings, campuses, communities, and microgrids.	REopt Tool
Microgrid Modeling Tools	The following microgrid modeling tools provide a variety of options for users looking to assess and optimize potential microgrid resources and	HOMER Energy DER-CAM RETScreen

POLICY AND PROGRAM APPROACHES FOR ENHANCING RESILIENCY THROUGH DISTRIBUTED GENERATION

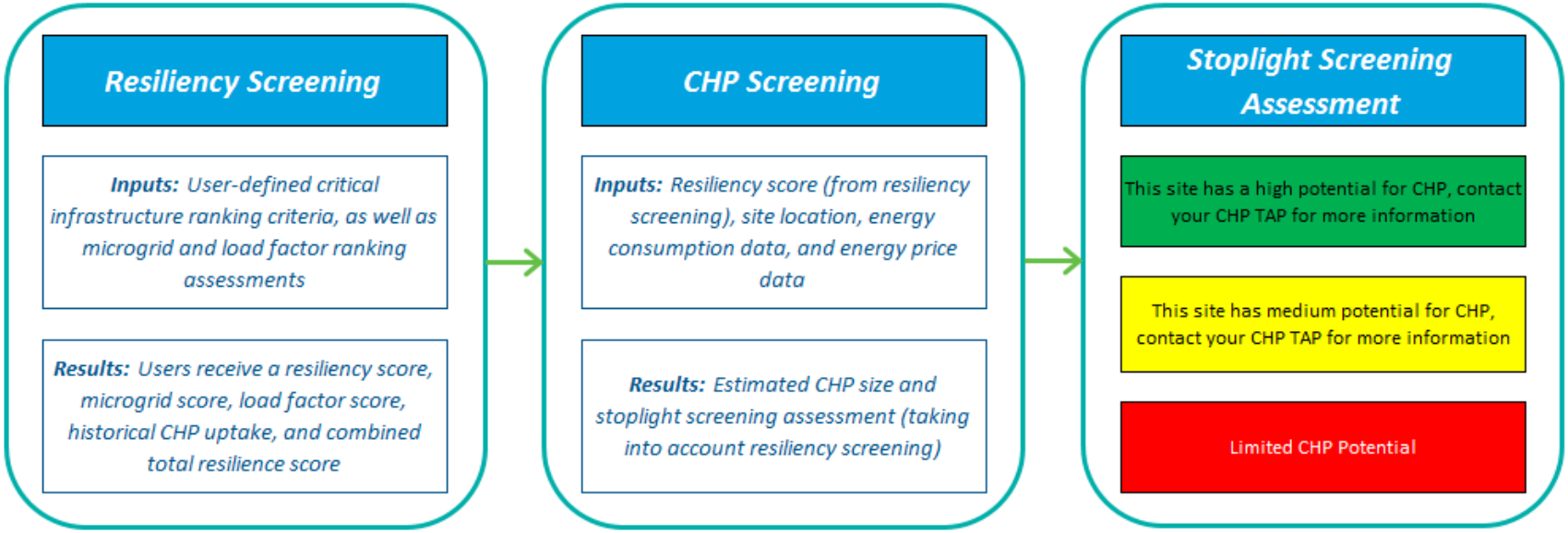
States most directly affected by natural disasters have become good models for how to approach policies that enhance energy resiliency. For example, a series of storms including hurricanes and flooding have exposed significant vulnerabilities to infrastructure along the Gulf Coast, motivating Texas and Louisiana to develop legislation that would protect critical facilities from future disruptions. Similarly, several East Coast states impacted by Superstorm Sandy including Connecticut, Massachusetts, New Jersey, and New York have since initiated state programs aimed at increasing resiliency.

Many existing state policies focus on allocating funding for implementing energy resiliency projects, which is a strong driver because it helps compensate facilities for the additional costs associated with designing systems that can continue operating during a grid outage. However, other approaches such as state energy assurance planning, resiliency roadmap exercises, and stakeholder education and awareness-building, can also be effective strategies. The American Council for an Energy-Efficient Economy (ACEEE) identified several Indicators for Local Energy Resiliency, which may help decision makers set goals, inform plans, and develop policies to increase the energy resilience of their communities.

The following section briefly summarizes how some leading states have specifically addressed distributed generation technologies in their policies to enhance resiliency in critical infrastructure. For additional information on various approaches to developing resiliency policies and programs, see Resilient Power: A Guide to Resilient Power Programs and Policy.

https://resilienceguide.dg.industrialenergytools.com/

The CHP for Resilience Screening Tool



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