

Combined Heat and Power Opportunities for Critical Infrastructure

**U.S. DOE Mid Atlantic Technical Assistance
Partnership**

October 10, 2018



CHP Technical Assistance Partnerships

DOE CHP Technical Assistance Partnerships (CHP TAPs)

- **End User Engagement**

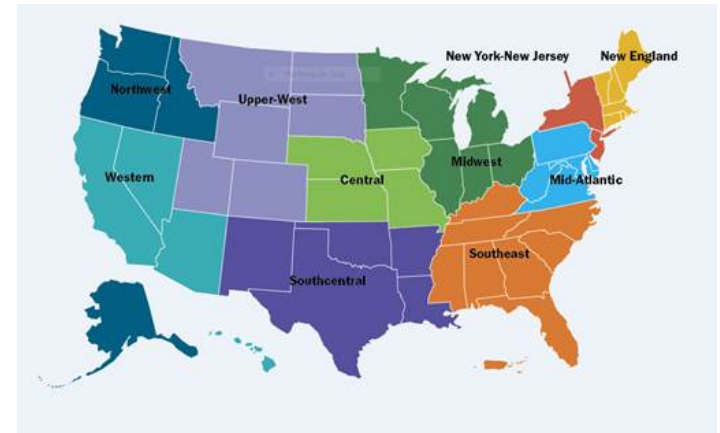
Partner with strategic End Users to advance technical solutions using CHP as a cost effective and resilient way to ensure American competitiveness, utilize local fuels and enhance energy security. CHP TAPs offer fact-based, non-biased engineering support to manufacturing, commercial, institutional and 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.

- **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.

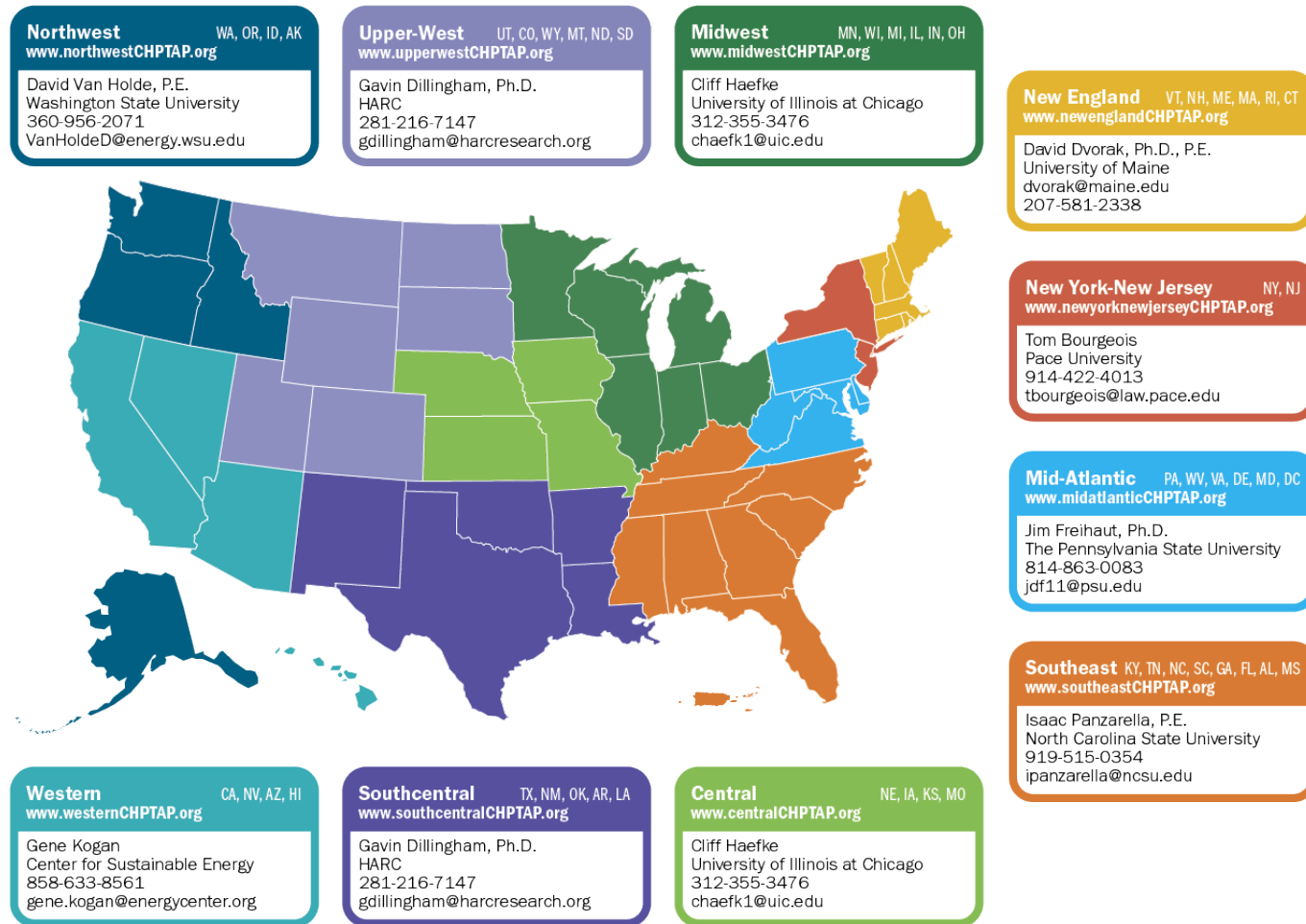


www.energy.gov/chp



CHP Technical Assistance Partnerships

DOE CHP Technical Assistance Partnerships (CHP TAPs)



DOE CHP Deployment
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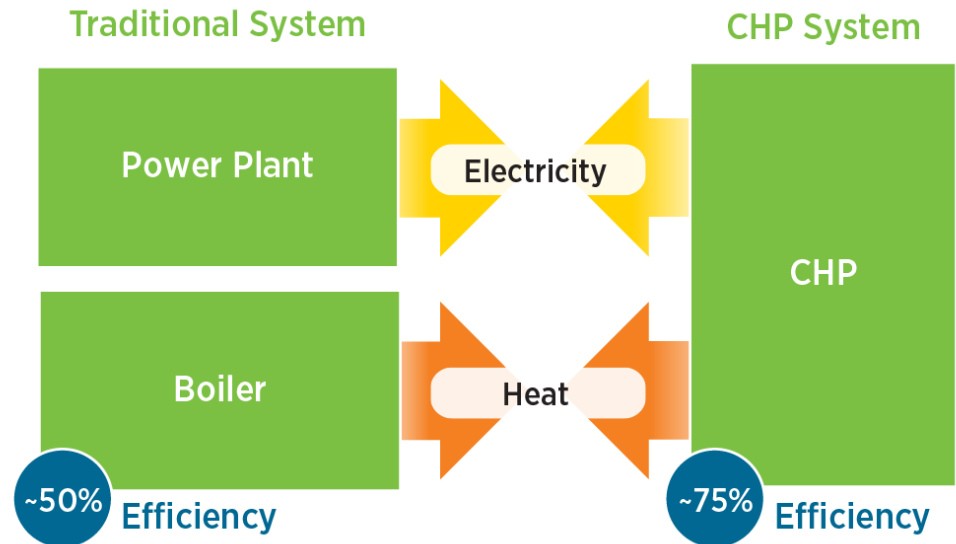
Combined Heat & Power Overview



CHP Technical Assistance Partnerships

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



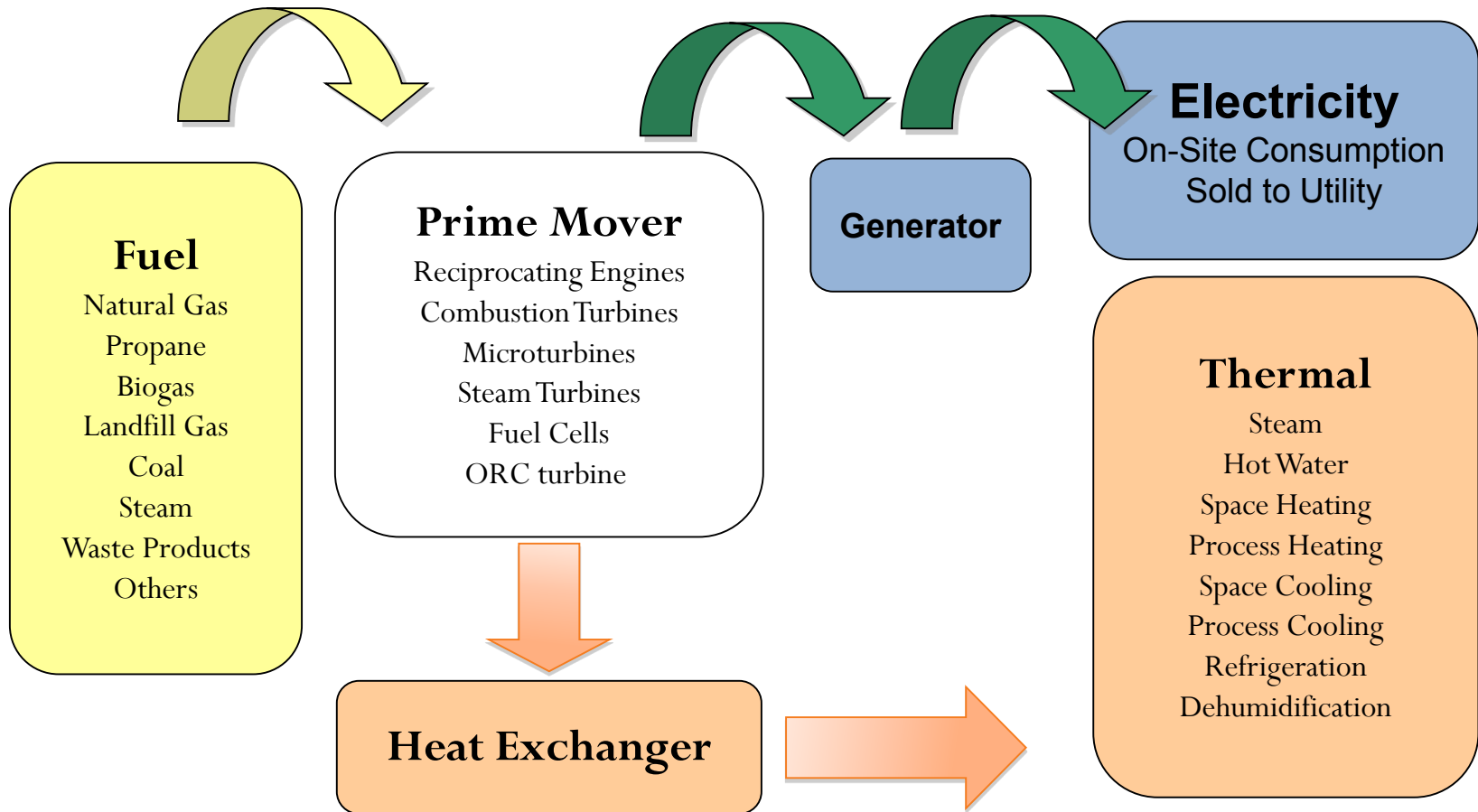
CHP provides efficient, clean, reliable, affordable energy – today and for the future.

Source: www.energy.gov/chp



CHP Technical Assistance Partnerships

CHP System Schematic

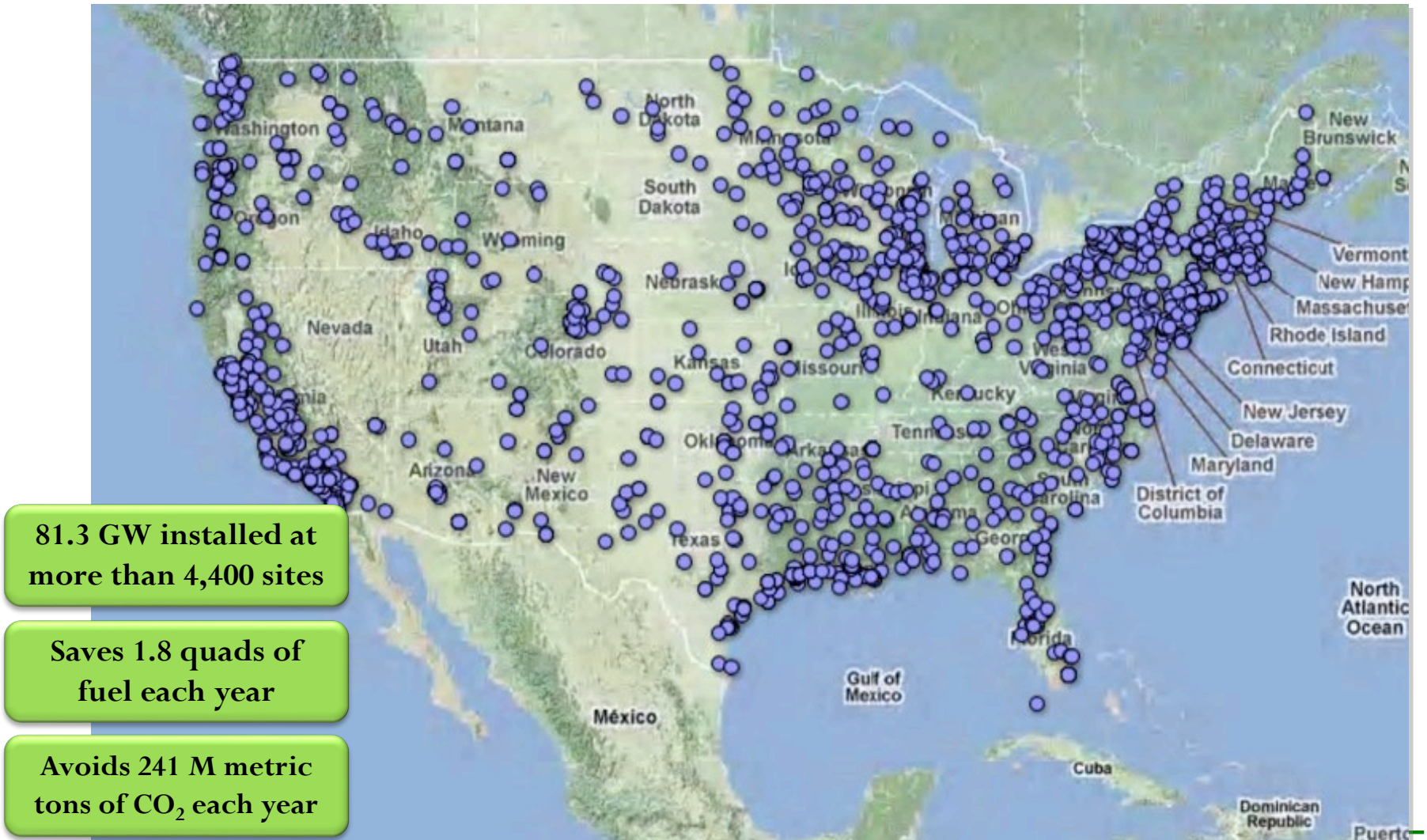


What Are the Benefits of CHP?

- CHP is **more efficient** than separate generation of electricity and heating/cooling
- Higher efficiency translates to **lower operating costs** (but requires capital investment)
- Higher efficiency **reduces emissions** of pollutants
- CHP can also increase **energy reliability** and enhance power quality
- On-site electric generation can **reduce grid congestion** and avoid distribution costs.



CHP Is Used Nationwide In Several Types of Buildings/Facilities



Source: DOE CHP Installation Database (U.S. installations as of Dec. 31, 2017)



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Slide prepared on 7-3-18

Critical Infrastructure and Resiliency



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Critical Infrastructure

“Critical infrastructure” refers to those assets, systems, and networks that, if incapacitated, would have a substantial negative impact on national security, national economic security, or national public health and safety.”

Patriot Act of 2001 Section 1016 (e)



Resiliency Planning

- Mitigate the effects of natural disasters
- Develop secure, resilient electrical power infrastructure
- Ensure critical infrastructure remains operational





Danbury , CT



Long Island, NY



Garden City, NY



Garden City, NY

DOE DG for Resilience Planning Guide

- Provides information and resources for decision makers, state and local policy makers, and utilities on:
 - Role of DG/CHP and CI in resilience planning
 - Best fit DG for CI applications
 - How to incorporate DG into Resilience Plans
- <https://resilienceguide.dg.industrialenergytools.com/>













































CHP Provides Energy Reliability and Resiliency Benefits

- CHP System operates on a daily basis
- CHP provides continuous benefits to host facilities
- Critical Infrastructure Applications:
 - Healthcare centers
 - Wastewater treatment plants
 - Police, fire, and public safety
 - Centers of refuge
 - Military



DER vulnerability to weather events

Natural Disaster or Storm Events	Flooding	High Winds	Earthquakes	Wildfires	Snow/Ice	Extreme Temperature
						
Battery Storage						
Biomass/Biogas CHP						
Distributed Solar						
Distributed Wind						
Natural Gas CHP						
Standby Generators						



Critical Facilities in Florida that Maintained Operations during Hurricane Irma with CHP



GRU South Energy Center / Shands Hospital



Miami-Dade South District WWTP



St. Josephs Hospital, Tampa



Eight Flags Energy Center, Fernandina Beach



Princeton University, NJ



Stony Brook Univ, NY



Fairfield, CT



Ewing, NJ

Resilient Critical Infrastructure in Superstorm Sandy

- Danbury Hospital (Danbury, CT) – 4.5 MW CHP
- Hartford Hospital/Hartford Steam (CT) – 14.9 MW CHP
- Fairfield, University (CT) – 4.6 MW CHP
- Stony Brook University (LI, NY) – 45 MW CHP
- Nassau Energy Corp. (LI, NY) – 57 MW CHP
- The Long Island Home (LI, NY) – 1.3 MW CHP
- NYU Washington Square Campus (NYC) – 13.4 MW CHP
- Bergen County Utilities Wastewater (Little Ferry, NJ) - 2.8 MW CHP
- Princeton University (NJ) – 15 MW CHP
- The College of New Jersey (NJ) – 5.2 MW CHP



Montgomery County Public Safety Headquarters (PSHQ)

- County Police and County Fire and Rescue Services
- Office of Emergency Management and Homeland Security (OEMHS),
- 1st District Police Station
- Department of Transportation

- Microgrid Development Project
 - 850 kW CHP
 - 2 MW Solar PV
 - Microgrid as a Service - Duke Energy



Summary

- DG can play a significant role in Critical Infrastructure Resilience
- CHP is a proven technology for Critical Infrastructure
- CHP provides a variety of benefits
 - Resiliency
 - High efficiency
 - Reduced emissions
 - Reduced grid congestion

Mid Atlantic CHP TAP can assist in determining if CHP may be right for your facility



Thank You

Questions?

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machptap.org

Visit our booth in the Lobby!



CHP Technical Assistance Partnerships

Appendix



CHP Technical Assistance Partnerships

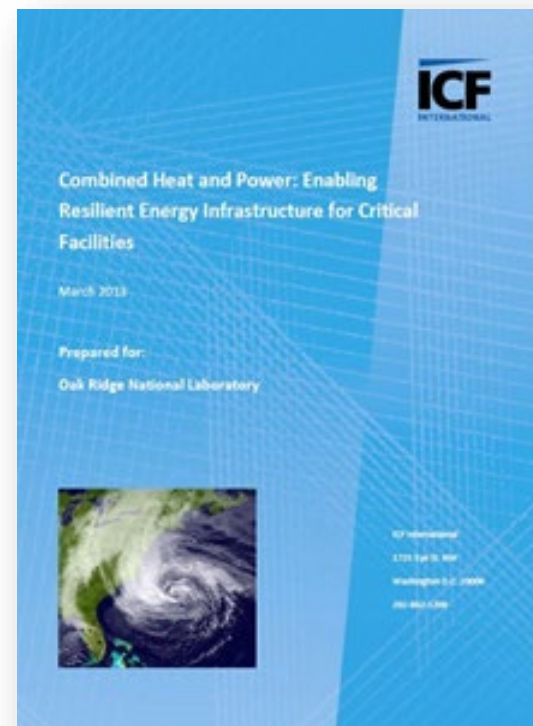
DG for Resilience Planning Guide

- Provides information and resources on how DG, with a focus on CHP, can help communities meet resilience goals and ensure critical infrastructure remains operational.
- 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.
- Assists decision makers, state and local policy makers, and utilities in getting up to speed on the role of DG and CI in resilience planning, what types of DG are best suited to certain types of CI applications, and how to incorporate DG into their resilience plans.
- <https://resilienceguide.dg.industrialenergytools.com/>



DOE Report - Combined Heat and Power: Enabling Critical Infrastructure

- Provides context for CHP in critical infrastructure applications.
- Contains 14 case studies of CHP operating through grid outages.
- Policies promoting CHP in critical infrastructure.
- Recommendations on how to design CHP for reliability



http://www.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_critical_facilities.pdf



CHP Technical Assistance Partnerships

Examples of State CHP Policy Implementation for Resilience

Following Superstorm Sandy in 2012,

- New Jersey created the Energy Resilience Bank which is operated by New Jersey's Economic Development Authority to provide a grant/loan product that covers 100% of the cost of implementing resilient CHP systems. There are ten hospitals in NJ approved to move forward with projects.
- The New York State Energy Research and Development Authority (NYSERDA) CHP Program provides incentives for New York CHP installations. Following issues with some initial designs identified during the 2003 Northeast blackout, NYSERDA required that to qualify for incentives, future installations must have islanding capability so that the CHP system would operate and support operation during blackouts.
- Connecticut initiated a first in nation Microgrid Pilot Program, and conducted information and outreach webinars, explaining the central role of CHP in an economically successful microgrid.
- The Northeast CHP TAP contributed to NYC Mayor Bloomberg's June 11, 2013, report "A Stronger, More Resilient New York", "a comprehensive plan that contains actionable recommendations both for rebuilding the communities impacted by Sandy and increasing the resilience of infrastructure and buildings citywide."



More Example State CHP Policies

- After Hurricane Ike in 2008, to reduce power outage and losses during a natural disaster event, the Texas state legislature passed HB 1831 and HB 4409 in 2009. This legislation requires the state to identify all critical infrastructure assets conduct an economic feasibility analysis of CHP for all major renovations and new construction.
- The Louisiana legislature passed a similar law (Resolution No. 171) in 2012.
- In October 2015, the Missouri Department of Economic Development, Division of Energy, published the “Missouri Comprehensive State Energy Plan” which includes recommendations to incorporate CHP based on energy savings, meeting state energy goals, and providing energy security benefits.
- The Missouri Department of Economic Development, Division of Energy joined the US DOE CHP Resiliency Accelerator and identified hospitals as a target market sector for its outreach. The Illinois State Energy Assurance Plan supports the use of CHP in creating resiliency benefits for critical infrastructure and the grid as a whole.
- The Michigan Agency for Energy sponsored the “CHP Roadmap for Michigan,” research paper. This report models future CHP penetration given a number of different scenarios and possible policies including efficiency incentives, utility rate reform and resiliency benefits.

