Losing Ground: Innovations in Disaster Mitigation and Planning

11:00AM – 12:20PM **Breakout Sessions**

Session 1 *– Ottinger Hall 101*

Losing Ground: Innovations in Disaster Mitigation and Planning

Society is grappling with extreme events occurring with increasing frequency and greater severity. Local and State Governments face the challenges of planning physical infrastructure, social networks and programmatic responses to efficiently, effectively and equitably address response to and recovery from disasters. This panel will discuss innovations in tools, systems and protocols and describe best practices and exemplary case studies.

Moderator: Jessica Bacher, Esq., *Executive Director, Land Use Law Center*

Thomas G. Bourgeois, *Director of Distributed Energy Resource (DER) Policies, Land Use Law Center and Director, U.S. DOE's New York / New Jersey Combined Heat and Power Technical Assistance Partnership*
Bomee Jung, *CEO, Cadence OneFive Inc.*
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CHP and Microgrids: Community Assets for Energy Resiliency

Thomas Bourgeois
Director, NY/NJ CHP TAP
Director Policy Research, Land Use Law Center

U.S. Department of Energy
CHP Technical Assistance Partnerships

Agenda

- What Is Combined Heat and Power (CHP), and How Does It Work?
- Efficiency, Resiliency, and Environmental Benefits of CHP
- Local Planning Protecting Communities & Critical Infrastructure From Loss of Energy Services
- Microgrids, CHP, and Hybrid Systems Deliver Local Resiliency
- Example Projects

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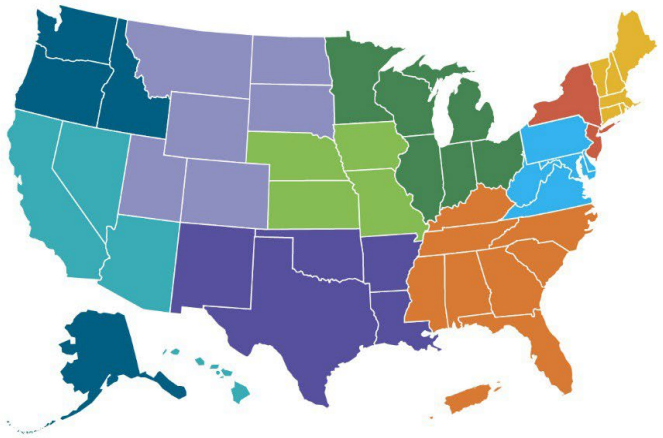

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US DOE CHP Technical Assistance Partnership Services

- **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

National Manufacturing Day 2019 at the University of Illinois at Chicago

CHP Technical Assistance Partnerships

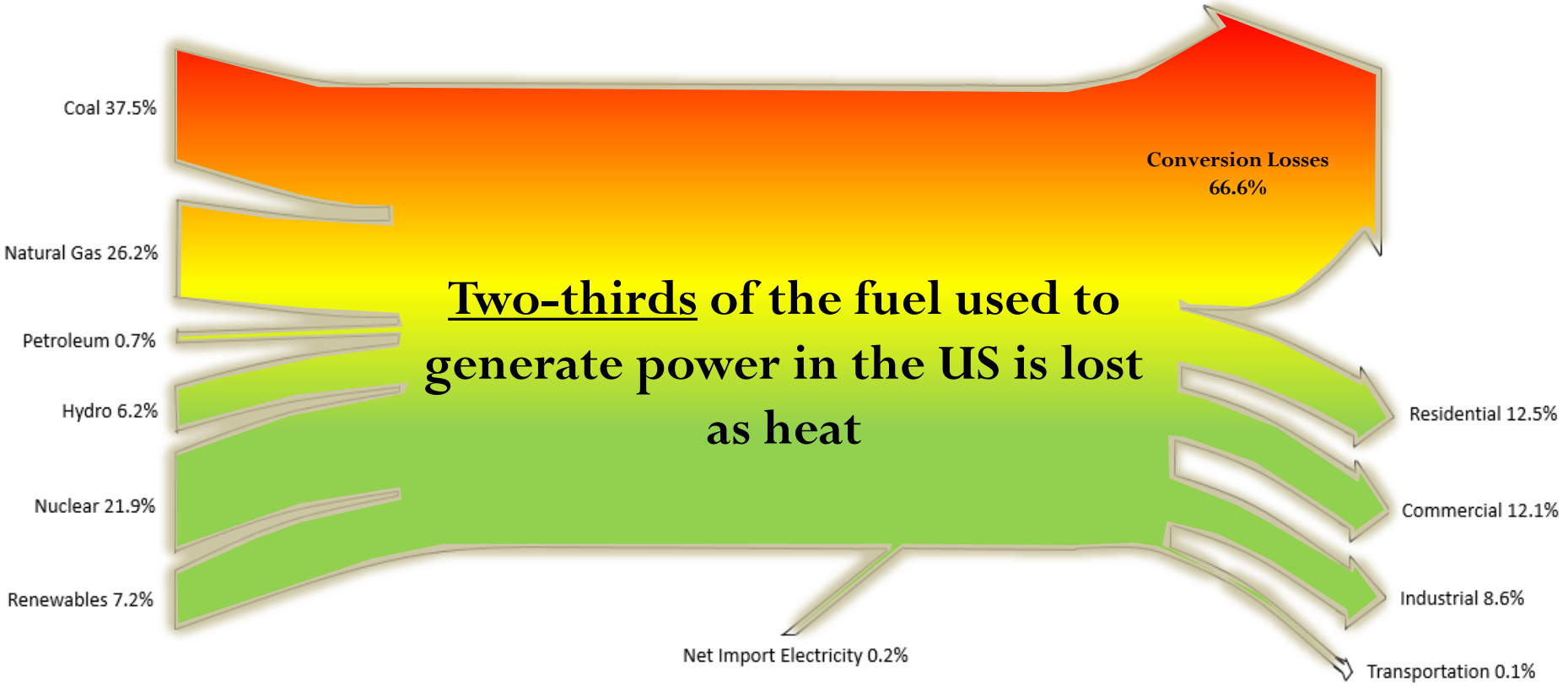
What Is Combined Heat and Power (CHP)?

- CHP is the concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy.
- A type of distributed generation, which, unlike central station generation, is located at or near the point of consumption.
- A suite of technologies that can use a variety of fuels to generate electricity or power at the point of use, allowing the heat that would normally be lost in the power generation process to be recovered to provide needed heating and/or cooling.

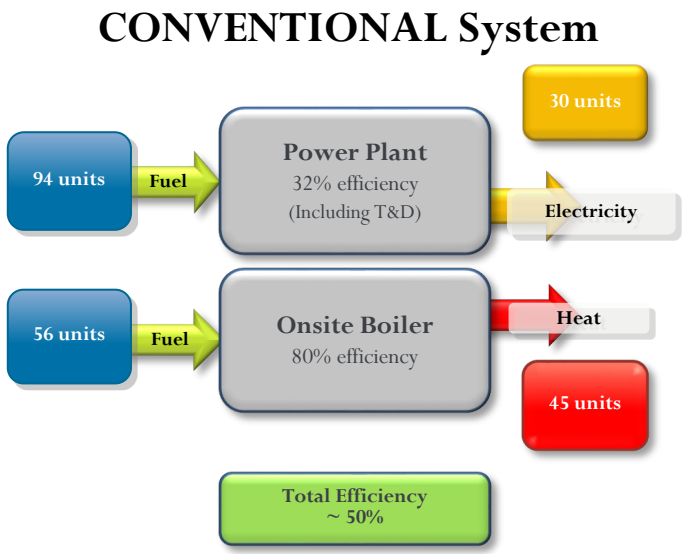
How Does CHP Work?

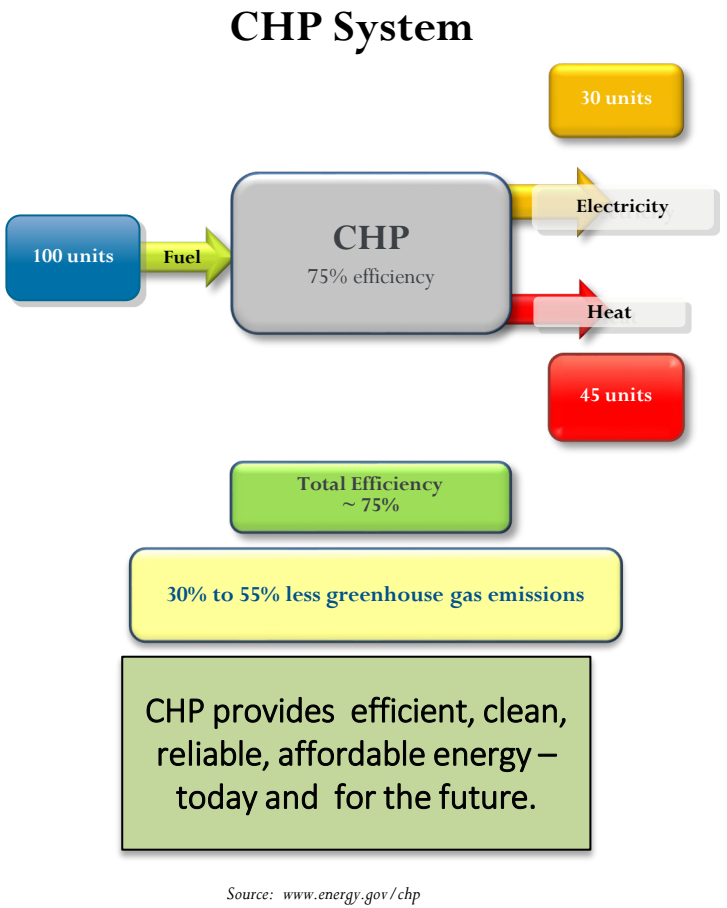
- CHP is a form of distributed generation, which is located at or near the energy-consuming facility.
- CHP can use a variety of fuels, both fossil and renewable-based.
- It is mostly used in industrial, large commercial, and institutional applications.
- Every CHP application involves the recovery of otherwise-wasted thermal energy to produce useful thermal energy or electricity.
- CHP can be configured either as a topping or bottoming cycle.

Why CHP?


Coal 37.5%
Natural Gas 26.2%
Petroleum 0.7%
Hydro 6.2%
Nuclear 21.9%
Renewables 7.2%
Net Import Electricity 0.2%
Conversion Losses
66.6%
Residential 12.5%
Commercial 12.1%
Industrial 8.6%
Transportation 0.1%
Two-thirds of the fuel used to generate power in the US is lost as heat

CHP: A Key Part of Our Energy Future





- Form a Distributed Generation (DG)
- An integrated system
- Located at or near a building/facility
- Provides at least a portion of the electrical load
- Uses thermal energy for:
  - Space Heating / Cooling
  - Process Heating / Cooling
  - Dehumidification

Source: www.energy.gov/chp

U.S. Department of Energy
CHP Technical Assistance Partnerships

What Are the Benefits of CHP?

- More efficient than separate generation of electricity and heating/cooling
  - Lower carbon and other pollutant emissions
  - Lower operating costs (but requires capital investment)
- Works with any fuel, including carbon neutral fuels
  - Efficiency becomes more important as fuels become scarce
- Increases energy reliability and resiliency
- Reduces grid congestion and avoid distribution costs
  - Complements intermittent renewable resources

CHP Resiliency

Resilience: the ability of an entity—e.g., asset, organization, community, region—to anticipate, resist, absorb, respond to, adapt to, and recover from a disturbance

Reducing the magnitude and duration of energy service reductions

Reliability: the ability of the electric power system to deliver the required quantity and quality of electricity demanded by end-users

Source: State Energy Resilience Framework, Argonne National Laboratory (2017)

Resiliency Is Particularly Important in Certain Sectors and Industries

Critical infrastructure

- Hospitals
- Wastewater treatment plants
- Emergency Services and Communications

“Vulnerable” Populations

- Nursing Homes, Senior Centers, Assisted Living
- Public Housing , LMI communities

Energy resiliency assets are increasingly important with more frequent and severe natural disasters.

Critical Infrastructures and Activities Requiring Resiliency

"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)

Applications:

- Hospitals and healthcare centers
- Water / wastewater treatment plants
- Police, fire, and public safety
- Centers of refuge (often schools or universities)
- Military/National Security
- Food distribution facilities
- Telecom and data centers
- Continuity of services

- Resiliency addresses life, health, safety matters
- It provides cooling and heating in emergencies
- It facilitates communication for first responders and emergency services
- It ensures adequate supplies of food and drink
- It allows financial transactions and avoids economic chaos

CHP verses Status Quo

Metric	CHP	Backup Generation
System Performance	• Designed and maintained to run continuously • Improved performance and reliability	• Only used during emergencies
Fuel Supply	• Natural gas infrastructure typically not impacted by severe weather	• Limited by on-site storage – finite fuel supply
Transition from Grid Power	• May be configured for “flicker-free” transfer from grid connection to “island mode”	• Lag time may impact critical system performance
Energy Supply	• Electricity • Thermal (heating, cooling, hot/chilled water)	• Electricity
Emissions	• Typically natural gas fueled • Achieve greater system efficiencies (80%) • Lower emissions	• Commonly burn diesel fuel

What Is a Microgrid?

- A microgrid is a self-sufficient energy system serving a specific area. It is a form of local energy serving nearby consumers, such as a hospital, college campus, neighborhood, business center, etc.

- The **traditional grid** connects homes, businesses, factories and office buildings to central power sources. This interconnectedness means that when part of the grid is out, service to large numbers of homes, buildings and industry may be affected.

- A **microgrid** generally operates while connected to the grid, but importantly, it can **disconnect and operate autonomously,** using local energy generation. This provides power (and thermal energy) during outages
- Microgrids may include a suite of distributed energy resources
  - Combined heat and power, solar PV, battery storage, etc.
  - Microgrids often run in parallel with, but are configured to operate isolated from the main grid
  - Microgrids enhance local and site reliability, delivering power and thermal energy **resiliency** during outages of extended duration.

Source: https://www.microgridknowledge.com/about-microgrids/article/11429017/what-is-a-microgrid


Princeton University, NJ


Stony Brook Univ, NY


Fairfield, CT

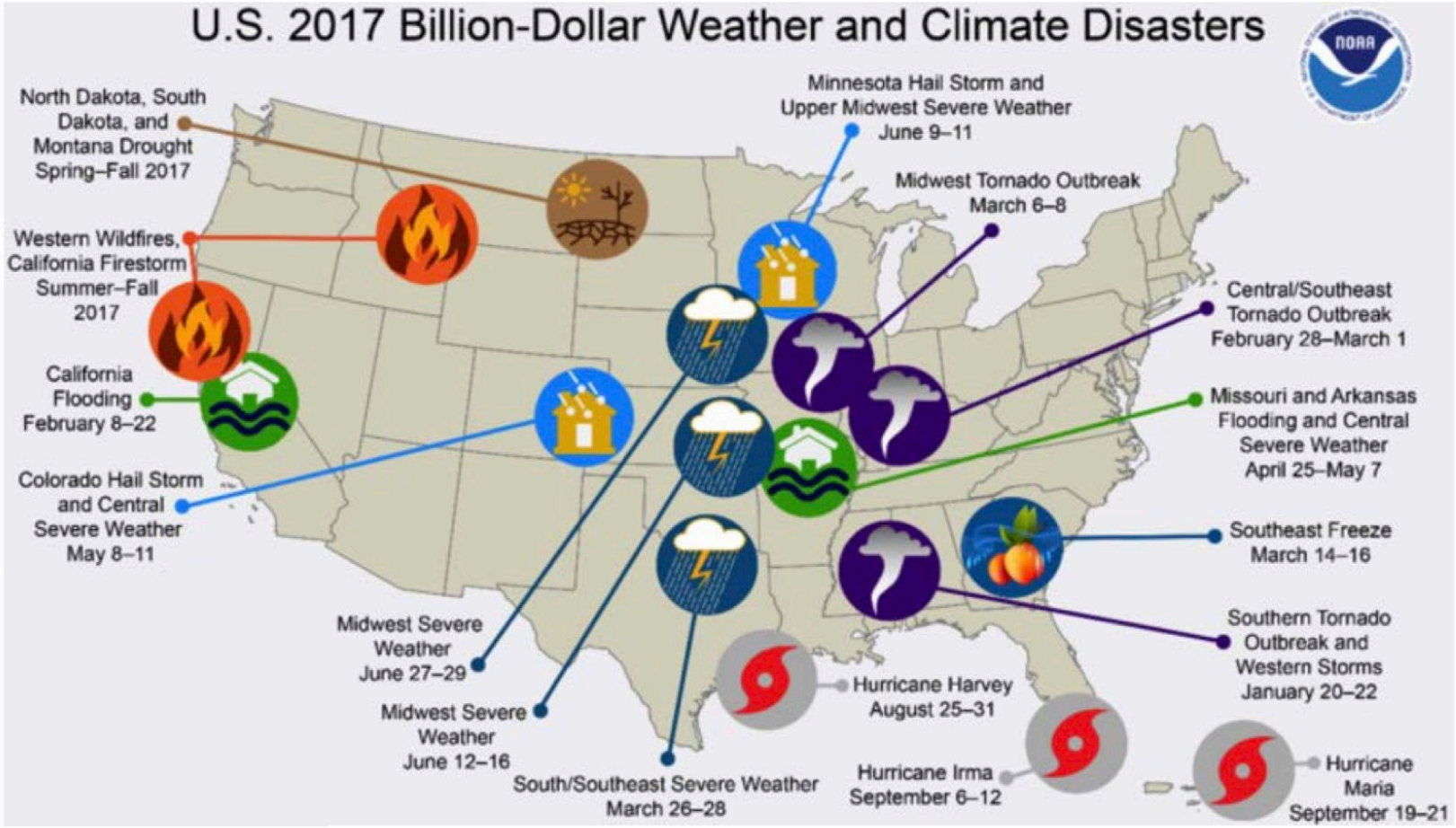

Ewing, NJ

Microgrids Are Resilient and Provide Power in Disasters

Hurricane Sandy

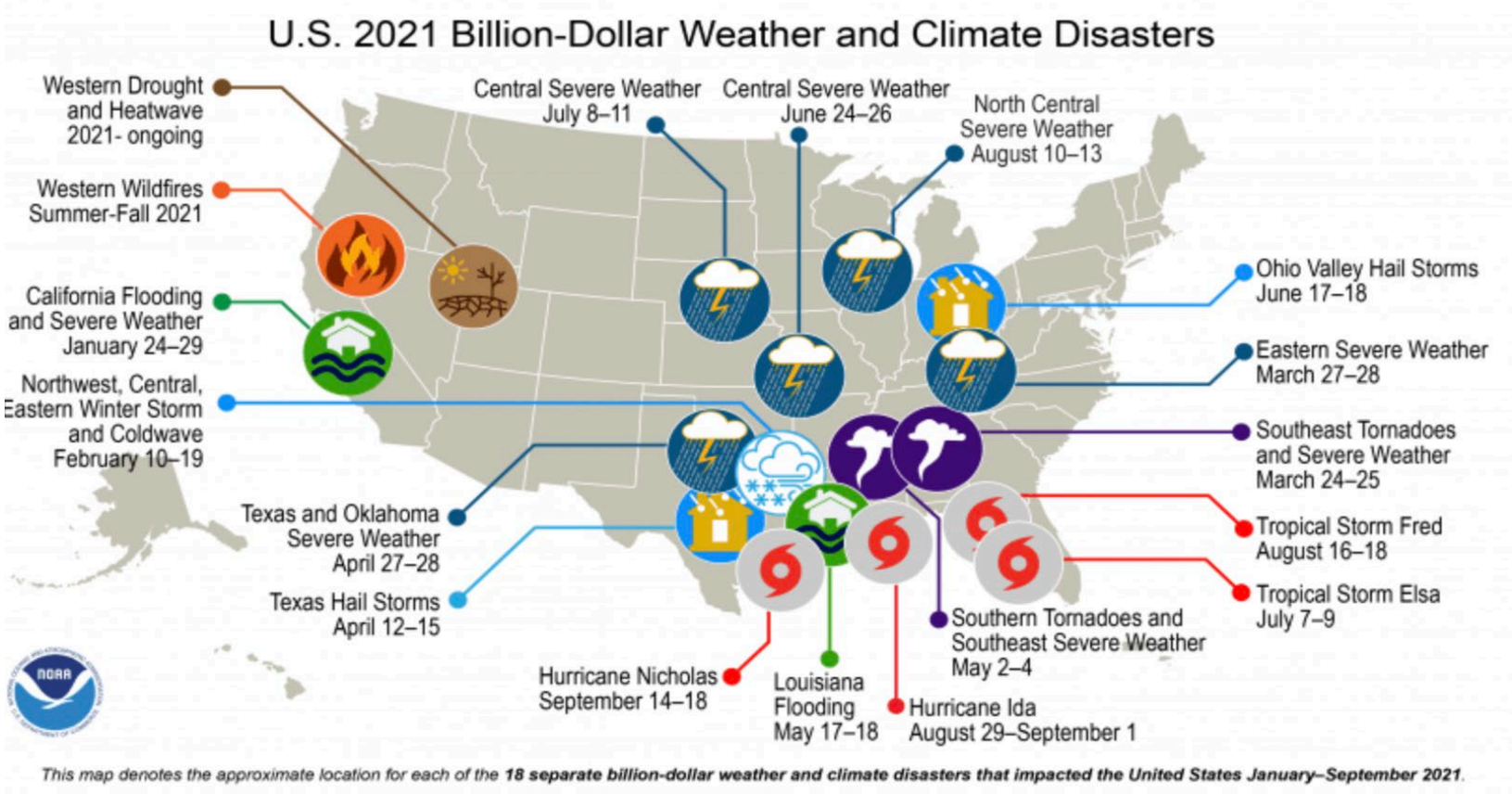
Hurricane Ian

Damages From Climate Disasters in 2017



$306 billion in damages

Damages From Climate Disasters in 2021



This map denotes the approximate location for each of the 18 separate billion-dollar weather and climate disasters that impacted the United States January-September 2021.

Image from the National Oceanic and Atmospheric Administration

Reliability, Resiliency, and Power Quality Benefits of CHP Microgrids

Reliability	Resiliency	Power Quality
• CHP systems located closer to loads than central generators, reducing likelihood of outages • Fast-ramping capabilities allow quick response to changes in grid-supplied power, flexibility to serve dynamic loads • CHP systems reduce stress on local distribution grid, extending life of grid components and reducing risk of outage caused by individual distribution equipment failure	• CHP systems operate near-continuously, can provide firm backup generation during outages • Island-capable systems can maintain heat/power service to loads within the microgrid network during outages, fulfill load shedding requests during high demand periods • During Hurricane Sandy in 2012, every islanding-capable CHP that received NYSERDA incentives stayed online	• CHP microgrids serving large, power quality-sensitive C&I customers such as data centers, and high-tech manufacturing provide high-quality power without service interruptions or voltage dips • By locating generation closer to loads, CHP and district energy systems prevent voltage fluctuation and other power quality issues that typically arise on the distribution system.

Microgrids and Implications for Land Use

- Microgrids require electric power and thermal energy connections across two or more buildings in proximity.
- Implications for land use include:
  - zoning, regulatory issues, permits, crossing right of way.
- Single Owner / Single Campuses (College campuses or hospitals) are ideal candidates
  - As many as 200 buildings may be connected underground
  - The Microgrid can provide
    - chilled water for cooling
    - Steam or low-to-moderate temperature thermal loops to heat the buildings
    - electric conduit to power the buildings

Examples of Land use Tools and Protocols for Facilitating Community Resiliency

- Land Use Practitioners Can Think Proactively about encouraging “complimentary uses”.
  - Data centers use great amount of electric power, generating extensive unwanted heat.
  - That heat can be “harvested” and transported to proximate buildings requiring space heat and hot water.
  - ‘Heat Maps’, widely used in Europe, make “visible” complementarities to “harvest” excess thermal energy (heating/cooling/ hot-water) or excess electricity – moving it to site in need

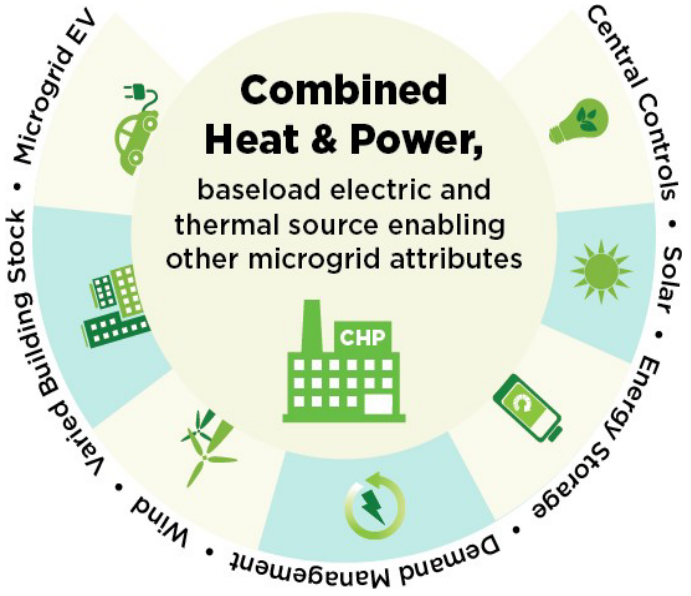
- Land Use Practitioners Can Coordinate “Stove-Piped” Agencies and Authorities.
  - When DOT is rebuilding roads, consider laying electric or thermal connections
  - When Mixed Use developments are proposed, consider the benefits of connecting users

Authorities Having Jurisdiction (Microgrid Example)

- DOB – permitting and electrical advisory board
- DOB OTCR – Office of Technical Certification and Research – for site specific approvals for compressor and duct burner – example: HRSG burner is from Holland
- FAA – for new stack light requirements
- Con Ed – Interconnection, new gas services (high and low pressure), new electric service, EO specs for high tension design, high tension maintenance, plant design and maintenance protocols
- DEC – state facility air permit
- FDNY – CO_2 systems, special TM-1 studies, Fire alarm, fire suppression, gas detection, gas vent dispersion studies and deflagration analysis studies
- NYSERDA – requirements for PON incentives
- DOT – rigging and large load transport (NYPD as well)
- DOH – Certificate of Need (CON)

Source NYU Langone Health - Richard Cohen V.P. Facilities Operations
NECHPI Annual Meeting, Metrotech, Brooklyn, NY, April 10, 2019
Northeast Clean Heat & Power Initiative, April 10, 2019

CHP Can Enable Other Microgrid Technologies



*A microgrid is a **group of interconnected loads and distributed energy resources** within clearly defined electrical boundaries that acts as a **single controllable entity** with respect to the grid.*

*A microgrid can **connect and disconnect** from the larger utility grid to enable it to operate in both **grid-connected** or **island-mode**.*

With a CHP system providing baseload electric and thermal energy, microgrids can add:

- Solar and wind resources
- Energy storage
- Demand management
- Central controls
- Electric vehicle charging

Flexible CHP systems can ramp up and down as needed to balance renewable loads and provide grid services

CHP Is a Resilient Anchor for Clean Microgrids

Ranking Criteria

Four basic criteria were used to estimate the vulnerability of a resource during each type of disaster event. They include the likelihood of experiencing:

1. *a fuel supply interruption,*
2. *damage to equipment,*
3. *performance limitations, or*
4. *a planned or forced shutdown*

○ *indicates the resource is unlikely to experience any impacts*

◒ *indicates the resource is likely to experience one, two, or three impacts*

● *indicates the resource is likely to experience all four impacts*

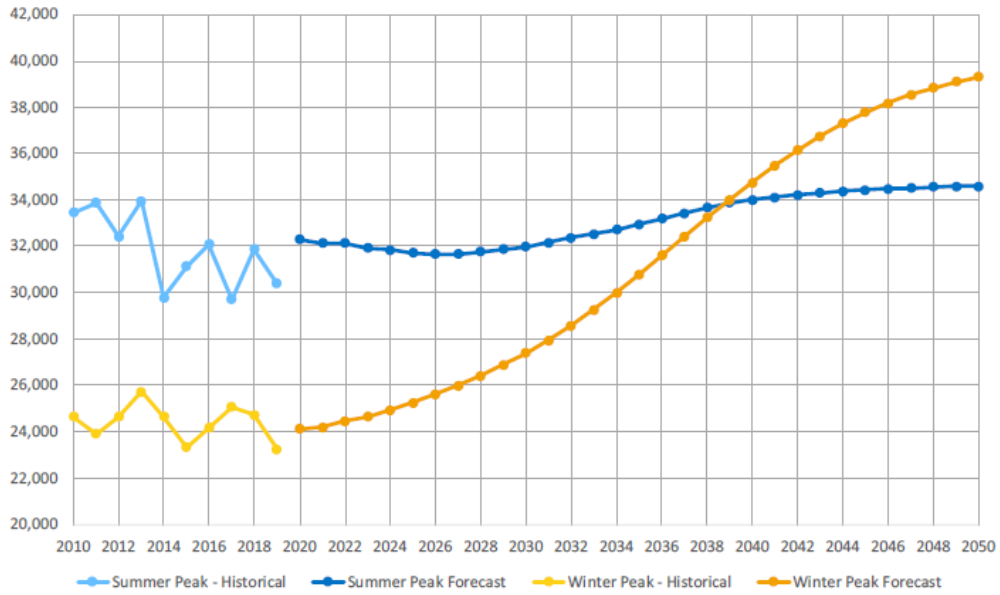
Natural Disaster or Storm Events	Flooding	High Winds	Earthquakes	Wildfires	Snow/Ice	Extreme Temperature
Battery Storage	◒	○	◒	●	○	◒
Biomass/Biogas CHP	◒	◒	◒	●	○	○
Distributed Solar	○	◒	◒	●	◒	◒
Distributed Wind	○	◒	◒	◒	◒	◒
Natural Gas CHP	○	○	◒	◒	○	○
Standby Generators	◒	○	◒	●	◒	○

- CHP provides efficient, resilient, baseload power and localized thermal energy
- CHP supports increased integration of renewable energy sources
- Storage adds additional flexibility and can help optimize CHP sizing and operation
- CHP supports the move toward a resilient, distributed, more renewable grid

CHP Assist Heat Pumps

- By providing both heat and power in mid winter when solar insolence in the northern hemisphere is at its lowest, CHP can provide a resilience component as well as offset oversizing of heat pumps and PV capacity to meet low duration cold weather events.

Figure I-4: NYCA Baseline Peak Forecast Comparison – Coincident Peak, MW



The 2020 NYISO forecast for summer and winter peak demands for the New York Control Area (NYCA) through 2050

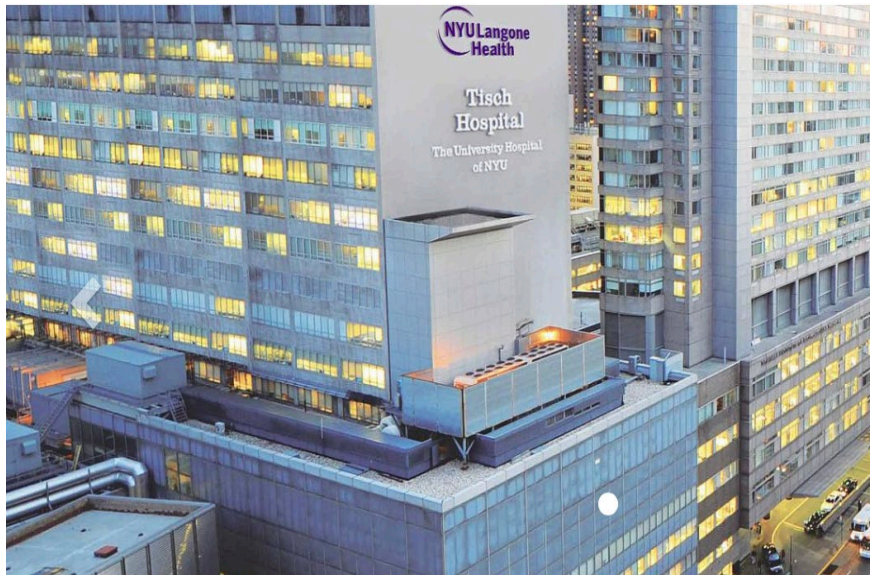
Pairing CHP With Renewable Storage: Case Study

United States Marine Corps Recruit Depot (MCRD) Parris Island, SC, installed a hybrid microgrid including a 3.5 MW natural gas-fired CHP system plus 5.5 MW solar photovoltaic arrays to provide secure and resilient energy. The site also incorporated an 8 MWh battery-based energy storage system, all of which are controlled by a microgrid control system capable of fast load shedding.

- CHP can be a resilient base load anchor for multi-technology microgrids, particularly those incorporating renewable generation sources like solar PV or wind.
- CHP paired with renewable DERs optimizes overall emissions reductions and resilience.
- Net-zero fueled CHP can decarbonize critical facilities that need dispatchable on-site power for long duration resilience and operational reliability

Examples of Sites Using Microgrid

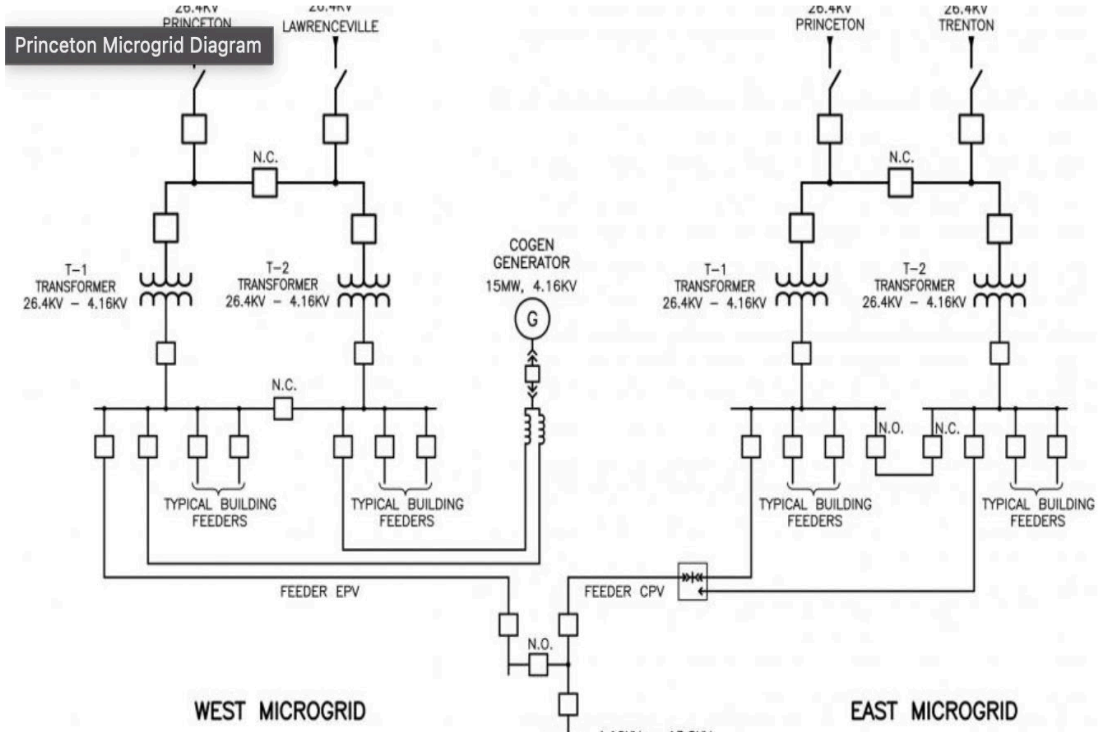
Wastewater treatment plants



NYU Langone

Princeton University's Microgrid

- Princeton University uses microgrid to generate and distribute power locally.
- When Hurricane Sandy hit New Jersey in 2012, Princeton's microgrid was able to generate power for campus and maintain steam.
- Steam offers heat and hot water.



Project Snapshot:

Medical Center

NYU Langone Hospital – Energy Center
New York, NY

Application/Industry: Hospital

Capacity: 11 MW

Prime Mover: Gas Turbine

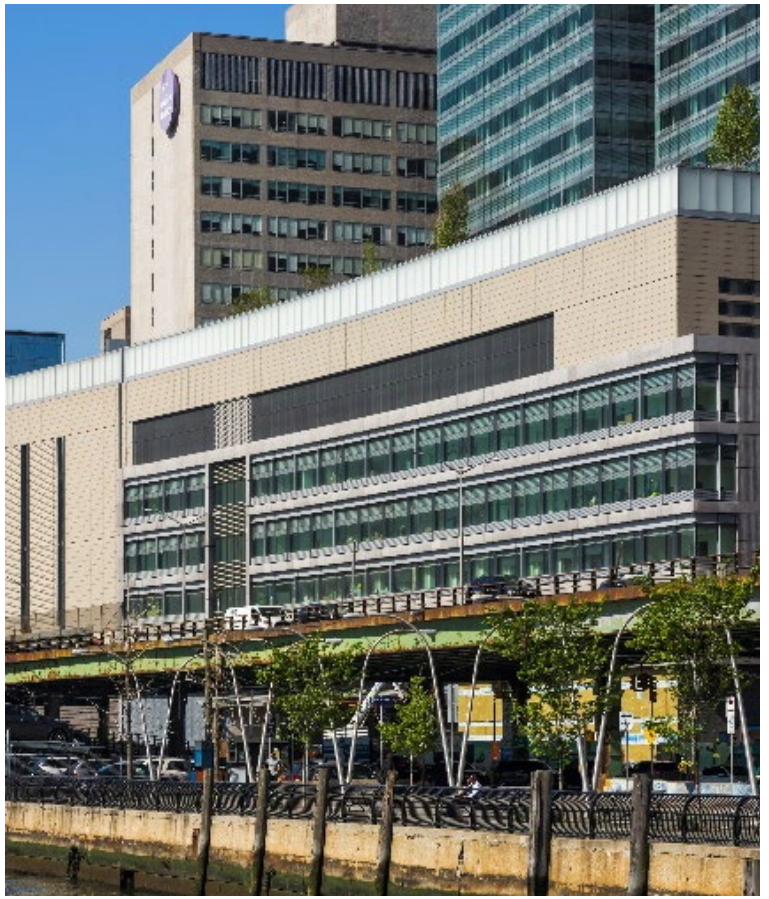
Fuel Type: Natural Gas

Thermal Use: heat, hot water, sterilization, and humidification

Energy Savings: NYU Langone plant saves $1,200-1,500/hour when operating

Installation Year: 2018

Highlights: designed to meet NYU Langone's dual objectives of insuring a highly resilient and reliable power source, while simultaneously ensuring their leadership in sustainability. USGBC PEER Platinum Level Certified



Project Snapshot:

Public housing

Kenmore Hall

New York, NY

- Kenmore Hall received financing from NYCEEC to install a cogeneration system that would provide resiliency benefits, including electronic power during a grid failure.

- Kenmore hall provides permanent supportive housing for very low-income individuals in NYC.

- This new system ensures that the building is better equipped to handle future events like Superstorm Sandy, providing a safer and more secure home for vulnerable families.

Kenmore Hall

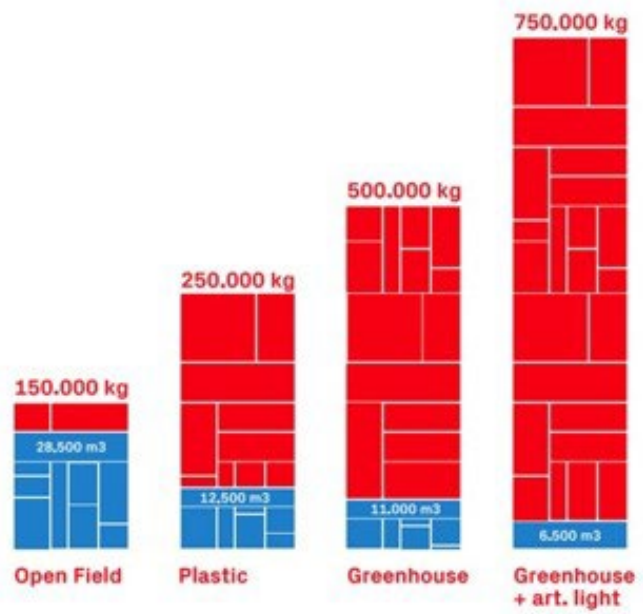
CHP and Microgrids for Sustainable & Resilient Communities

- Locally grown healthy food
- CHP for site resiliency, redundancy, & reliability
- Thermal storage for peak shaving
- Heat recovery for greenhouse, Carbon sequestration from engine feeds plants
- Goodwill toward community
- Educational program opportunities

Energy, Water, Food Nexus

It can be done,
it has been done

The high-tech greenhouse delivers 5 times the output while consuming nearly 78% less water.



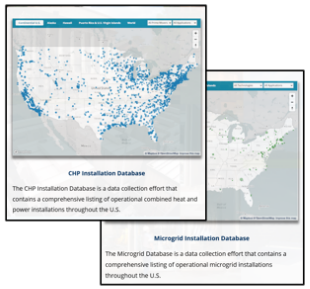
Tomato production on one hectare vs. water consumption (Dutch Greenhouse Delta 2021).

DOE CHP Resources

(betterbuildingssolutioncenter.energy.gov/chp)

- The CHP TAPs are available to guide clients through the follov

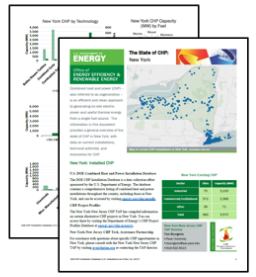
DOE CHP/Microgrid Installation Database



Packaged CHP eCatalog

DOE CHP Technologies Fact Sheet Series

State of CHP Pages



DOE Project Profile Database

DOE Policy / Program Profiles

DG for Resilience Planning Guide

CHP Issue Brief Series

U.S. Department of Energy
CHP Technical Assistance Partnerships

Summary

- CHP gets the most out of a fuel source, enabling
  - High overall utilization efficiencies
  - Reduced environmental footprint through low-carbon fuels
  - Reduced operating costs
- The National CHP eCatalog offers lower perceived risk of CHP in non-traditional markets, also reduced cost and lead time.
- An increasing number of CHP systems can run on low-carbon fuels including RNG and Hydrogen
- Incentives are a crucial part to CHP implementation
- CHP can be utilized in various market sectors and for different strategies including resiliency and reliability.
- The CHP TAPs can assist potential CHP projects at no-cost offering unbiased technical assistance and resources from initial screening through installation.

Next Steps

Contact your Regional CHP TAP for assistance if:

- You are interested in having a “no-cost” Qualification Screening performed to determine if there is an opportunity for CHP on-site.
- If you have an existing CHP plant and are interested in expanding the plant.
- If you need an unbiased 3rd Party Review of a CHP proposal.

Thank you. Questions?

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For more information about the TAPs:
https://betterbuildingssolutioncenter.energy.gov/chp/chp-taps

A program sponsored by

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy
www.energy.gov/chp

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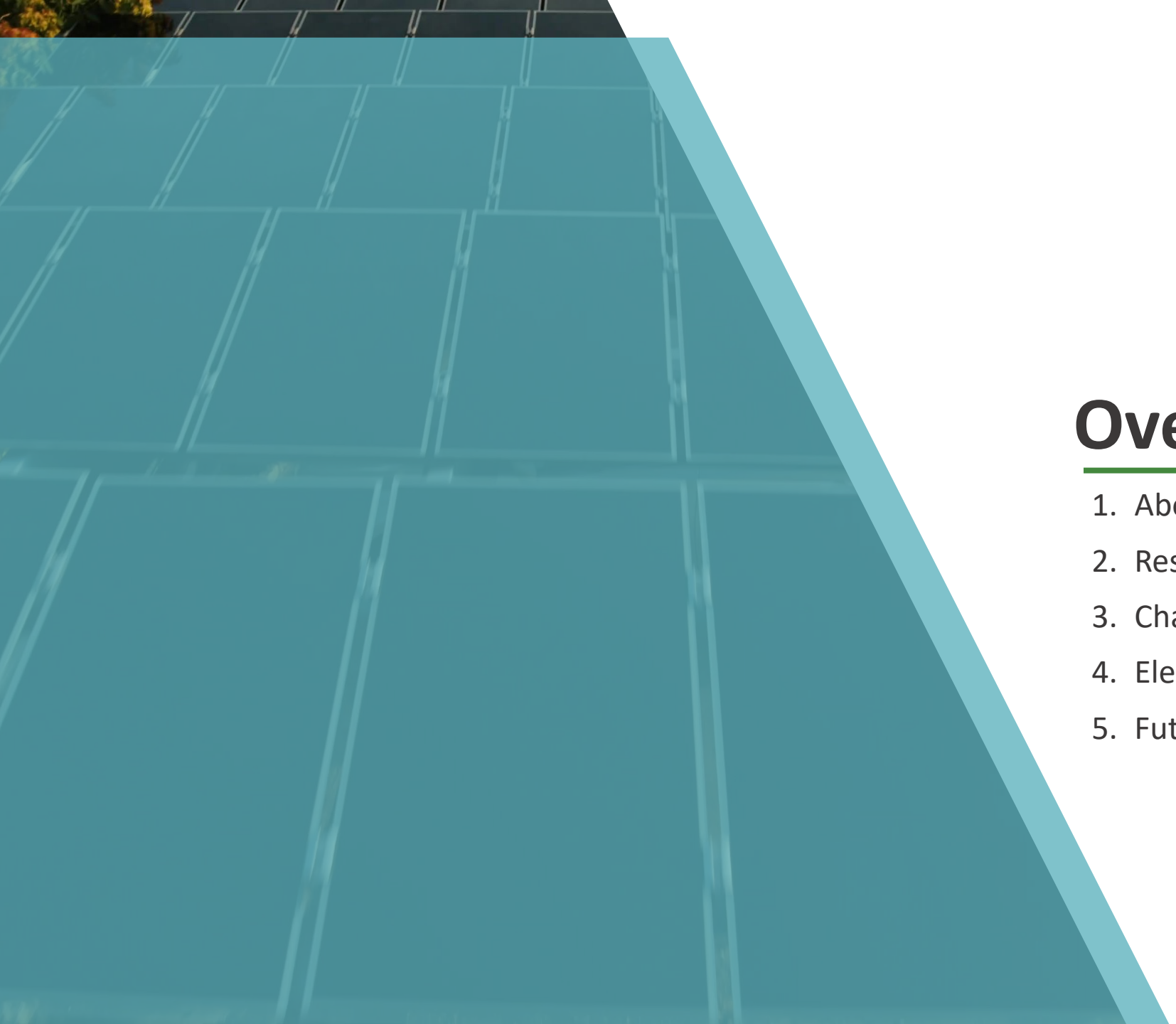
ENCOURAGING RESILIENCY & PROMOTING SUSTAINABILITY

December 8, 2022



Overview

1. About Environ
2. Resiliency Experience
3. Challenges & Hurdles to Development
4. Electrification?
5. Future Needs

About Environ

> Hospital Energy, the nation's leading energy firm for healthcare, announced it has rebranded as Environ Energy and has merged with Gotham 360, a renowned energy sustainability firm. Environ will offer best-in-class sustainability strategies and energy management expertise to organizations with large and complex energy needs.

– December 2021

environ

By the Numbers

- Consulting on energy since 1995
- Serving >10% of US hospitals
- Manages $2B of Energy Spend and over 100M+ Sq-ft

Resiliency Experience

- **NYU Langone Health:** Post-Superstorm Sandy, the new central plant facility was constructed above ground. It is an 11-megawatt cogeneration, combined cycle plant.
- **Hudson Yards:** The 18M square feet of commercial and residential space is served by a microgrid powered by two CHP plants, with four engines
- **NewYork-Presbyterian Hospital:** 8MW CHP system supporting critical healthcare loads with blackstart capability
- **Stamford Hospital:** 4MW of fuel cell supporting hospital complex
- New developments consist of multiple asset types including solar & renewables

CHP unit being lowered by crane into Hudson Yards

Challenges & Barriers to Development

- We want to encourage a more sustainable environment without sacrificing reliability
- Microgrids tend to be high capital cost investments requiring outside investment
- The rapidly evolving regulatory environment presents risks to investors
- Siting and Zoning codes are Unclear with respect to solar, leaving room for interpretation and presenting risk of NIMBY objections
- Renewable resources have low to zero emissions, but due to intermittency, natural gas generation is still required to maintain resiliency
  - The future of natural gas permitability or availability is often unknown

Additional Challenges & Hurdles to Development

- Interconnection costs to the utility for microgrids are highly variable, difficult to budget and deter investment
- Utility incentive programs can change quickly, be put on “hold” and be unreliable to developers who often work on planning two – three years in advance of building a project
- Consistent rules, pricing, standards, are essential to bring investment to development of sustainable resources delivered in a resilient way
- These concepts are not new, Pace published a document in 2013 “Guidebook on Community Microgrids – Smarter, Cleaner Greener” – these principles hold true today

Electrification of Buildings

- **Electrification of buildings presents a low carbon solution, but will it cost our communities resiliency?**

- **Are utilities ready to manage winter demand?**
  - Utilities tend to manage peak demand through the summer with demand response
  - Many summer demand response assets are not available in the winter
  - According to a study done by Urban Green, ***Grid Ready: Powering NYC's All-Electric Buildings***, building electrification poses no immediate risk to the grid, but this is an untested theory

- **What are the backup sources?**
  - If electricity is the primary fuel to heat our buildings, what technologies will we employ to ensure reliability of power in a blackout

Future Needs – Bust the Barriers

- Ambiguity in the rulemaking acts to deter & slow investment into the development of resilient buildings, resilient blocks, resilient neighborhoods.

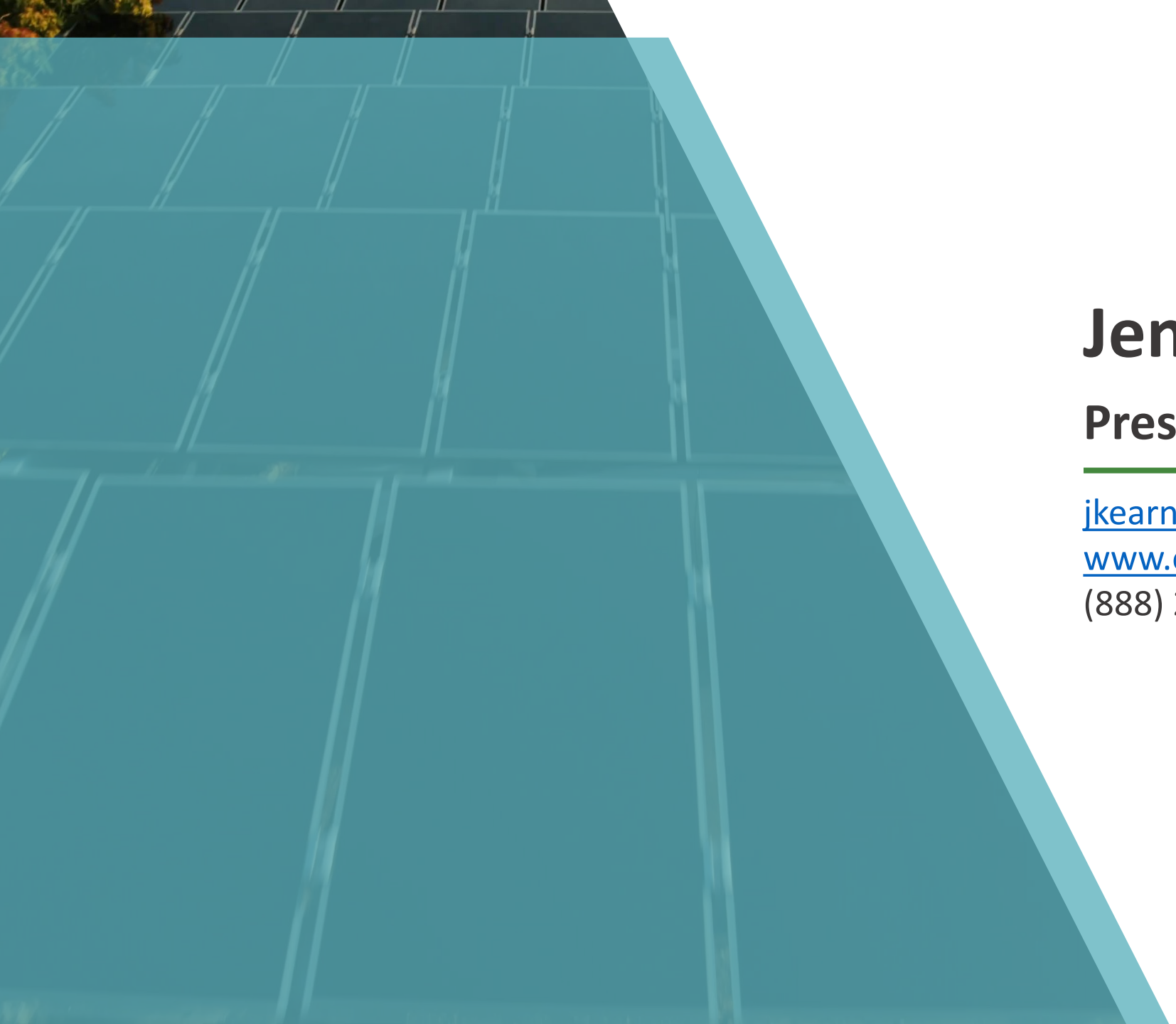
- Wherever possible, communities should seek to streamline local reviews and approvals, while fully maintaining all public health, environment and safety standards

- Promote a better understanding the regulatory framework to the community of architects, engineers & building owners doing the planning
  - Codes
  - Siting
  - Permitting
  - zoning and planning processes & protocols

Future Needs – Bust the Barriers

- **Incentives**
  - Developers and building owners need to know they can count on an incentive when a project is in concept
  - Planning, design & construction can take 4-7 years; programs need be funded for that amount of time

- **Simplification of interconnection**
  - The protocol to interconnect to the utility grid continues to be highly variable
  - Interconnection costs should be more defined and publicly known



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Tools for Building Resilient Communities

RESILIENCE IMPLEMENTATION AND STRATEGIC ENHANCEMENTS (RISE)

LOCAL ASSESSEMENT TOOL

EPA FEMA

January 2020

Table of Contents

Getting Started

- Gather the relevant documents
- Pull together your team
- Answer the question in the Worksheet and tally the results

Documents Needed to Complete the Tool

- Hazard/flood insurance rate maps (FIRM)
- Hazard mitigation plan
- Emergency operations plan
- Post-disaster recovery plans and studies
- Comprehensive/master plan
- Municipal zoning code
- Municipal Building Code
- Subdivision regulations
- Parks/Open Space Master Plan
- Context-appropriate environmental codes/regulations (for example, a coastal area plan).

Table 1. Preparing to Complete the Tool – Useful Resources

PERSON/ AGENCY/ ORGANIZATION	RELEVANT RESLIENCE GOAL AREA(S)	CAN ALSO HELP PROVIDE	STEERING COMMITTEE
Certified floodplain manager	All goal areas	• Hazard/flood insurance rate maps (FIRM) • Hazard mitigation plan • Emergency operations plan • Post-disaster recovery plans and studies • Municipal zoning code	X

PRIORITIZATION, ACTION PLANNING, AND IMPLEMENTATION WORKSHEETS

Use the results of the Resilience Goal prioritization; the inventory of local programs, policies, and codes; and the targeted examples to help set your action agenda for next steps. Fill in the following worksheets to get started.

Resilience Goal Prioritization Questions

Answer the following questions to help prioritize resilience goal areas and focus staff time and resources. Mark the number of topics you are interested in for each goal area in the tabulation table.

TOPIC QUESTION	Y/N	CONSIDER COMPLETING:
Does my community have a thorough understanding of the hazards it can expect to face, the potential range in severity of those hazards, and where they are most likely to occur?		Goal Area 1
Is information pertaining to coastal hazards and risk in my community (maps, plans, risk assessments) up to date?		
Does my community understand and consider our social and economic vulnerabilities?[1]		
Does my community protect lands in critical, flood-prone areas so that nature can perform its flood-reducing functions?		Goal Area 2
Does my community have dedicated funding sources for open space acquisition and management (for example bonds, sales taxes, or transfer taxes)?		
Does my community encourage growth away from sensitive environments to preserve land and reduce risk to people and structures that might locate in dangerous flood-prone areas?		
Has my community taken steps to reduce risk through a combination of proactive and protective land use laws, building codes, and planning policies?		Goal Area 3
Are there populations and/or places in my community that bear a disproportionate share of risk or vulnerability resulting from potential hazards?		
Has my community conducted a vulnerability assessment to identify current and projected vulnerable areas and associated risks to life and property and has it incorporated the results of that assessment into relevant plans (e.g. comprehensive plan, hazard mitigation plan, land use plans, etc.)?		
Has my community identified where growth can safely be accommodated now and in the future?		Goal Area 4

[1] Social vulnerability refers to the increased burden of hazard impacts on certain populations within the community, based on race, income, education, language spoken and more; economic vulnerability refers to the local or regional economy's ability to recover following an unexpected shock to the system.

GOAL 1: Ensure Comprehensive Understanding of Known Hazards and Their Potential Effects (Physical, Economic, and Social)

This goal area addresses the importance of recognizing the hazards that could affect your community and the people and places that are most at risk. Although this tool is geared towards communities that have already wrestled with resilience issues, it does not mean that all information pertaining to hazards and risk is complete and up-to-date. This goal ensures comprehensive understanding of key issues. A resilient community has a thorough understanding of the hazards it can expect to face, the potential range in severity of those hazards, and where they are most likely to occur. Potential impacts are investigated, mapped, and recognized. A resilient community recognizes that vulnerabilities are not limited to physical structures, and that social and economic vulnerability are equally important to address.

PRACTICAL APPLICATIONS

New York Rising Community Reconstruction Program: A recovery and resilience initiative to assist 124 communities severely affected by Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. The program directly engages residents and business owners through planning committees and public engagement events. At such meetings, community members coordinate with the state to develop reconstruction plans and identify projects to strengthen resilience. Thus far, 66 plans have been created. Each plan includes a thorough accounting of hazards, risks, and vulnerabilities. In most cases, projects will be implemented by local stakeholders, with support and technical assistance provided by the Governor's Office of Storm Recovery, which allocated over $700 million in federal funds to support the planning and implementation of such community-developed projects. *stormrecovery.ny.gov/community-reconstruction-program*

Louisiana Coastal Protection and Restoration Authority (CPRA) 2017 Coastal Master Plan: Updated every five years, the Coastal Master Plan is designed to respond to the loss of coastal land and the threats from storm surge events by identifying, funding, and completing projects that build or maintain land, reduce risk, and improve resilience. Since CPRA was created and the first Coastal Master Plan was released in 2007, it has completed or funded 135 projects, resulting in over 36,000 acres of land benefits, 282 miles of levee improvements, and over 60 miles of barrier islands and berms. In addition, the plan provides individual fact sheets for 24 parishes, detailing hazards and risks, the projected impacts of future land use change and flood depths, as well as the 2017 Coastal Master Plan projects for each parish. *coastal.la.gov/our-plan/2017-coastal-master-plan/overview/*

Understanding Key Challenges

- To what natural hazard events is your community most susceptible? What were the primary physical, economic, and social impacts of recent hazard events?

- Has your community been involved in the development of a Multi-Jurisdictional Hazard Mitigation Plan approved by the Federal Emergency Management Agency (FEMA)? Did you develop your own hazard mitigation plan? Document its name, date of plan, and URL, if available.

- Are there specific challenges you've faced in identifying your community's hazards and related community impacts?

Inventory Your Local Programs, Policies, and Codes

The strategies below assess your community's current capacity for comprehensive understanding of known hazards and their potential physical, economic and social effects. To inventory your policies, please read through the strategies described below and indicate if you are **currently using** this strategy, if you would **like to use** or implement this strategy, and provide any available local links or resources available to provide more information.

	STRATEGY	CURRENTLY HAVE/USE? (Y/N)	WOULD LIKE TO HAVE/IMPROVE? (Y/N)	YOUR LOCAL LINKS & RESOURCES
	Study, Adopt Plans, Educate			
1.1	Comprehensive plan has a hazard mitigation or resilience chapter/section			
1.2	Location of socially vulnerable populations (e.g. age, income and poverty, education, housing, race, disability, social isolation) is identified in comprehensive plan, relative to hazards/hazard-prone areas			
1.3	Waste facilities identified in hazard-prone areas			
1.4	Up-to-date flood hazard maps adopted. If "Yes", please provide the date maps were created/adopted in the "Links/Resources" column.			
1.5	Flood maps consider both historical events and projected flood lines and coastlines			

Targeted Resources

STRATEGY	Study, Adopt Plans, and Educate
1.1	**Integrating Hazard Mitigation into the Local Comprehensive Plan**: A fact sheet from FEMA with Planning Association. https://www.fema.gov/media-library-data/20130726-1908-25045-9918/factshe
1.2	**Community Based Vulnerability Assessment: A Guide to Engaging Communities in Understa to Disasters**: A step-by-step guide from to conducting a social vulnerability hazard assessment, by *http://www.mdcinc.org/sites/default/files/resources/Community%20Based%20Vulnerability%20Asse* **Social Vulnerability Index**: Tool developed by the CDC analyzes a variety of risk factors at a cens
1.3	**Fort Worth, Texas Floodplain Management Plan**: Waste Water Facilities are part of the critical fa *http://fortworthtexas.gov/files/FMP%202016-06-17.pdf*
1.4	**Adoption of Flood Insurance Rate Maps fact sheet**: FEMA explains the flood insurance program https://www.fema.gov/media-library/assets/documents/30451
1.5	**Fort Worth, Texas Floodplain Management Plan, "Open Channel Studies"**: *http://fortworthtexa* **FEMA Flood Insurance Study data**: *https://www.fema.gov/flood-insurance-study*
1.7	**Limit of Moderate Wave Action (LiMWA) Fact Sheet**: *https://www.fema.gov/media-library/assets/*
1.8	**Manasota Key North Beach Erosion Study Update**: *https://www.charlottecountyfl.gov/projects/Pr North-Beach-Erosion-Study-Update.pdf* **Florida Critical Erosion Reports**: Conducted by county by the Florida Department of Environment *http://www.dep.state.fl.us/beaches/publications/tech-rpt.htm#Critical_Erosion_Reports* **North Carolina Coastal Erosion Study**: *https://ncdenr.s3.amazonaws.com/s3fs-public/Coastal%20Management/documents/PDF/North%20Carolina%20Beach%20Erosion%20Stu f*
1.11 – 1.15	**Fort Worth, Texas Floodplain Management Plan**: *http://fortworthtexas.gov/files/FMP%202016-06*

Develop Action Plan

RESILIENCE STRATEGY	LEAD ROLE	SUPPORTING CAST	TIMEFRAME	NEXT STEPS	RESOURCES NEEDED
Example: A green infrastructure cost share or fee credit program is made available	Office of Stormwater Management	Planning Dept. Public Works Public Affairs Local environmental Groups	Mid-term: 6 months – 1 year	Research existing cost share/fee credit programs and produce a feasibility study Identify likely users or residents/ businesses who would be most interested Investigate funding support resources	Staff time to research best practices and determine feasibility Funds to support cost sharing/ fee credits

	STRATEGY	CURRENTLY HAVE/USE? (Y/N)	WOULD LIKE TO HAVE/IMPROVE? (Y/N)	YOUR LOCAL LINKS & RESOURCES
	Equity component · Quick-start strategy · CRS linkages			
6.9	Public-private partnerships are developed to promote renewable energy			
	Adopt Incentives			
6.10	Resources are devoted to promoting commercial/residential mitigation activities that can reduce flood insurance rates			
6.11	Financial incentive packages are available to assist businesses remaining in the community following a disaster			

	STRATEGY	CURRENTLY HAVE/USE? (Y/N)	WOULD LIKE TO HAVE/IMPROVE? (Y/N)	YOUR LOCAL LINKS & RESOURCES
	Equity component · Quick-start strategy · CRS linkages			
7.14	The current inventory of non-conforming structures located in the regulatory floodplain is maintained and frequently updated to prevent rebuilding in hazard areas, in the event of significant damage			
	Adopt Incentives			
7.15	Expedited development review/permitting is available for proposals that improve resilience in high hazard areas or for proposals located outside of high hazard areas			
7.16	A voluntary incentive program is available for strengthening buildings beyond code requirements			
	Enact Policies & Supportive Regulations			
7.17	Zoning and building codes are reviewed every five years and updated, if needed			
7.18	Code is amended or ordinances adopted to allow renewable energy on individual properties and in communal installations (microgrids)[44]			

Model Local Law Publication in Development

CRRA required DOS, in cooperation with DEC, to prepare model local laws that include consideration of future physical climate risk due to:

- sea level rise
- storm surges
- flooding

- A Variety of Models Provided
- Risks, Challenges, & Landscapes Vary
- Regulatory Culture Differs
- Administrative Capacity Varies

Model Local Categories

- Basic Land Use Tools
  (Zoning, Subdivision, Roads, Etc.)
- Wetlands & Watercourse Protection Measures
- Coastal Shoreline Protection Measures
- Management of Floodplain Development
- Stormwater Control Measures

BASIC TOOL

Elevated Buildings Provisions

- Provide an alternative way to measure height when an existing building in the 100-year floodplain is being elevated
- Allow elevation of existing homes even where it would create a non-compliance to height and setback (no variances), grant them Legal Non-Complying Status to allow future additions
- Require visual mitigation involving porches, stairs, raised front yards, or landscaping
- Require Non-Conversion Agreements

BASIC TOOL

Phased Reconstruction Moratorium

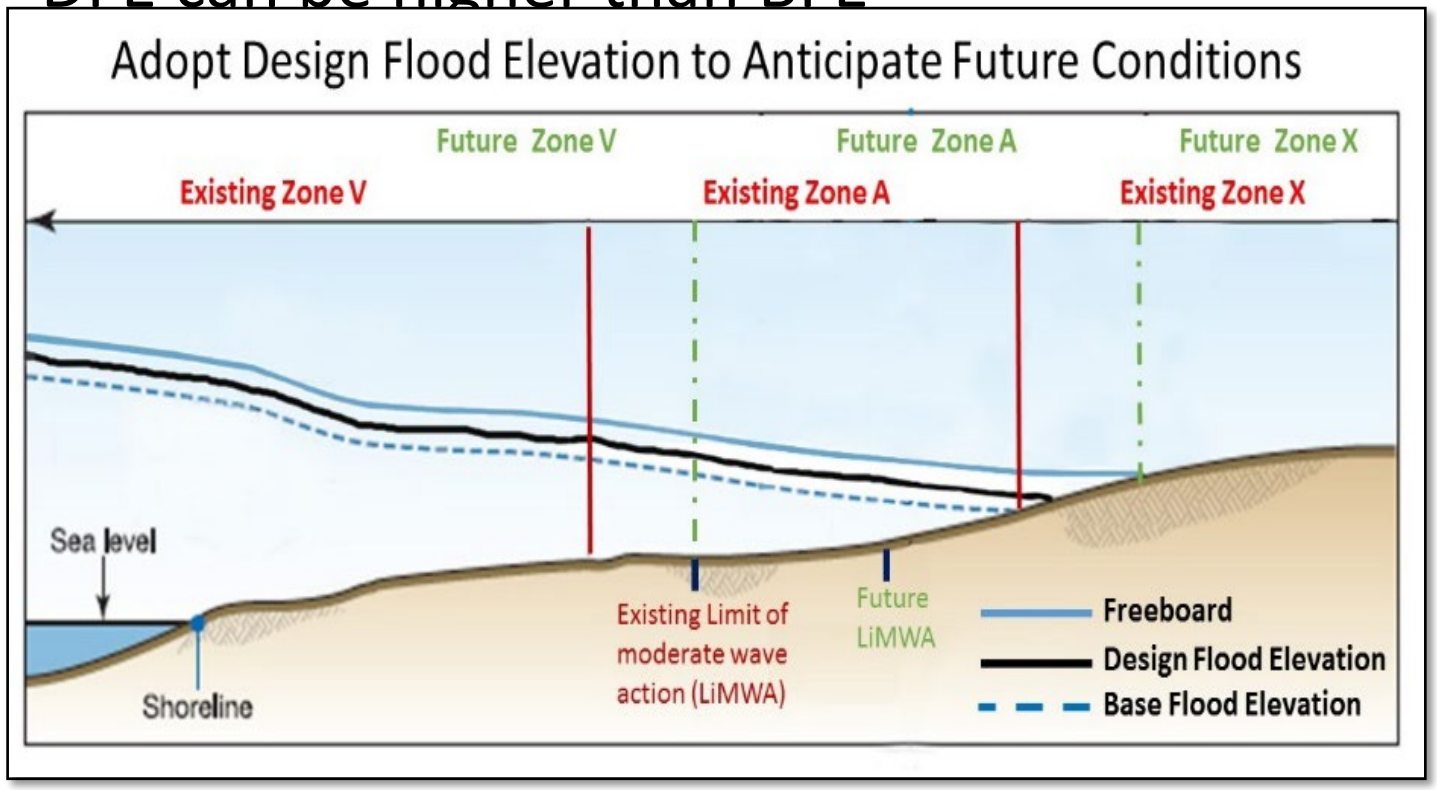
- Proactively sets priorities for Building Department services post-disaster
  - Building Permits & Inspections
  - Processing of land use applications (beware default approvals)
- Adopt now, activated by events
  - Disaster declaration
  - # structures damaged

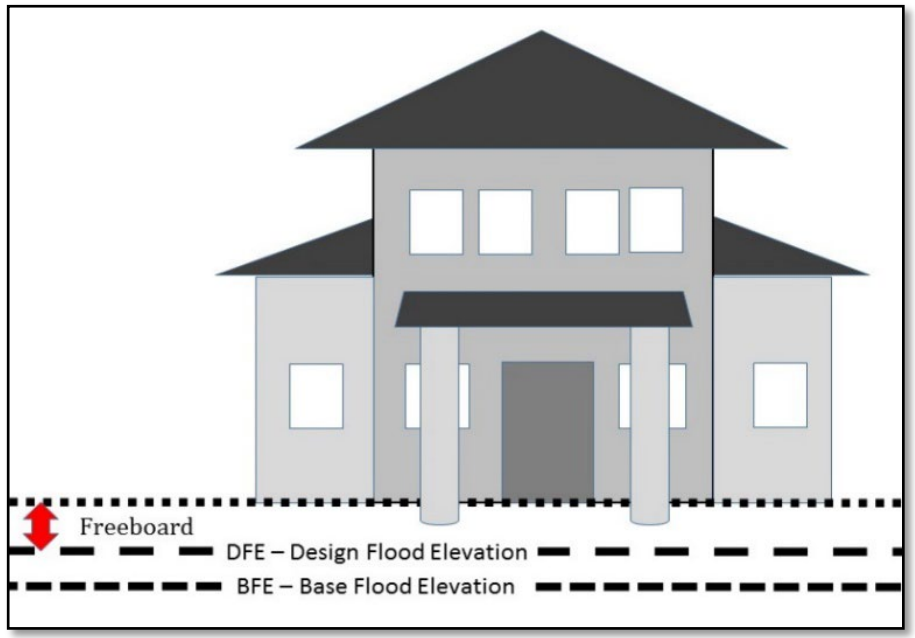
Breezy Point

FLOOD

Establish Design Flood Elevation (DFE)

- Current freeboard (2 ft.) based on BFE
- DFE can be higher than BFE





Examples of basis for DFE:

- 500-yr flood elevation
- Extra height added to BFE
- Historical deficiencies
- Climate-informed science (Predicted sea level, future conditions hydrology)

COASTAL

Shoreline Stabilization

Shoreline Stabilization techniques generally fall into three categories:

1. Natural
2. Nature-based
3. Structural

Shoreline protection alternatives analysis can promote the use of natural or nature-based methods through the site plan or special use permits process

STORMWATER

Stormwater Management and Erosion & Sediment Control

- Updated Sample Local Law for stormwater management and erosion & sediment control
  - Base Version: General Permit updates, green infrastructure practices from NYS SWDM. Will be required for MS4 Operators
  - Resiliency Version: Additional provisions that allow municipalities to require a more detailed green infrastructure site planning process & consider riparian buffers, etc.
- http://www.dec.ny.gov/chemical/41392.html

Not all Solutions need to be Regulatory

- Acquisition of property
- Zoning incentives
- Transfer of Development Rights
- Local home elevation programs
- Community Rating System
- Green infrastructure
- Public education

Green roof at Logan Gardens, a senior housing apartment building in Manhattan.


https://dos.ny.gov/model-local-laws-increase-resilience

NEW YORK STATE

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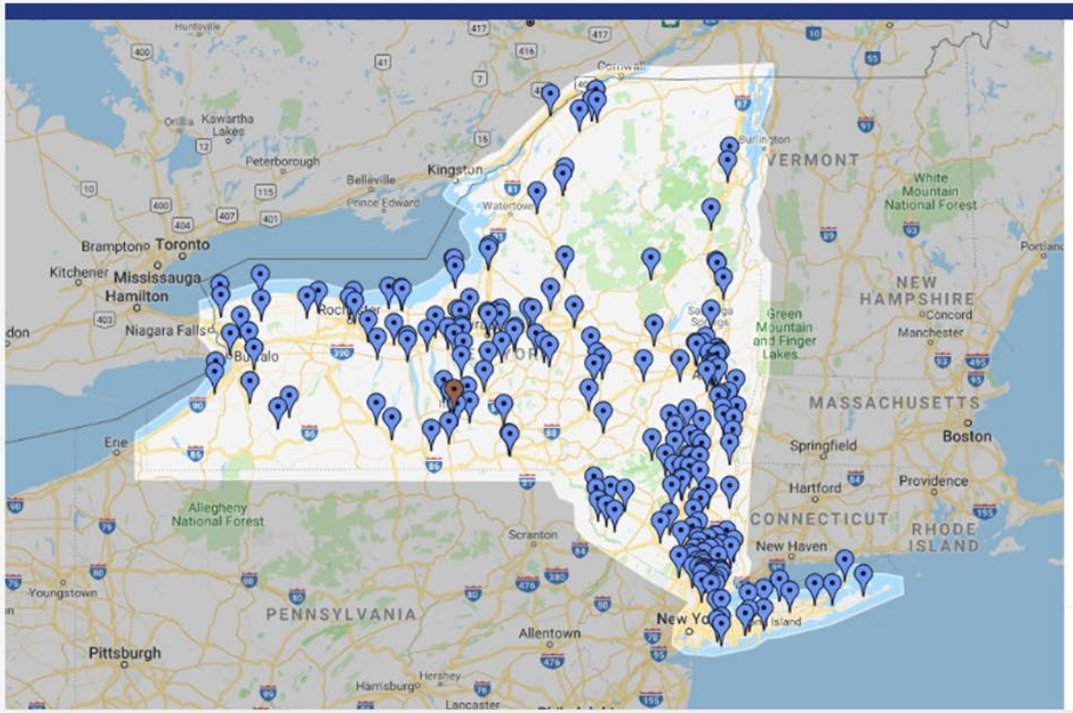
Climate Smart Communities

About Actions & Certification Support SIGN IN



State Support for Local Climate Action

Climate Smart Communities (CSC) is a New York State program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers free technical assistance, grants, and rebates for electric vehicles.

Registered communities have made a commitment to act by passing the CSC pledge. **Certified** communities are the foremost leaders in the state; they have gone beyond the CSC pledge by completing and documenting a suite of actions that mitigate and adapt to climate change at the local level.

› LEARN MORE

https://climatesmart.ny.gov/

7. Enhance community resilience to climate change.

PE7 Action: Climate Vulnerability Assessment

4 Points

UNPLANNED

Bronze Priority Silver Priority

• THIS ACTION HAS VARIABLE POINTS: 4, 8, 16 • COMPETITIVE FUNDING AVAILABLE

PE7 Action: Evaluate Policies for Climate Resilience

6 Points

UNPLANNED

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NYS Planning & Zoning Credits
Email Ann Marie McCoy at amccoy@law.pace.edu.

CM Credits
Please visit the Certification Maintenance section of APA's website (www.planning.org/cm) to claim credits.
The event will be posted to the APA website soon. We will add the information to our website (Https://law.pace.edu/annual-conference-2022) as soon as it is available.

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