Energy Resiliency as Part of Emergency Preparedness Strategies

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

OCTOBER 26, 2021

North Central Texas
Council of Governments

Welcome & Housekeeping

Please keep your line on mute until the end of the presentations.

We will have an open Q&A session at the end of all the presentations. Please type your question in the chat box or type in your request to speak.

The webinar slides and recording will be posted on the Conserve North Texas website under News/Events → Event Archive at the link below. Follow-up emails to come. http://conservenorthtexas.org/event-archive

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Agenda

- Welcome and Housekeeping
- Energy Resilience as Emergency Preparedness Strategy
- Marty Chester, FEMA, Supervisory Grants Management Specialist
- Gavin Dillingham, HARC, Program Director of Clean Energy Policy
- Eddy Trevino, SECO, Director
- Caley Johnson, NREL, Senior Transportation Market Analyst
- Q&A

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Energy Resilience as Emergency Preparedness Strategy

Background

NCTCOG has received funding through the State Energy Conservation Office (SECO) to work on energy management and efficiency projects within the region. As part of our scope of work, we're working on ways to incorporate energy efficiency and grid resiliency planning into hazard mitigation plans.

Winter storm Uri and summer heat waves are great reminders of the need to have different options available for energy resiliency.

Our Goal: Develop suggested language to go into the hazard mitigation plans and action tables and provide a menu of things that are achievable - ranging from what can be done with a more extensive budget and time to what can be done on a more limited budget and shorter timeline.

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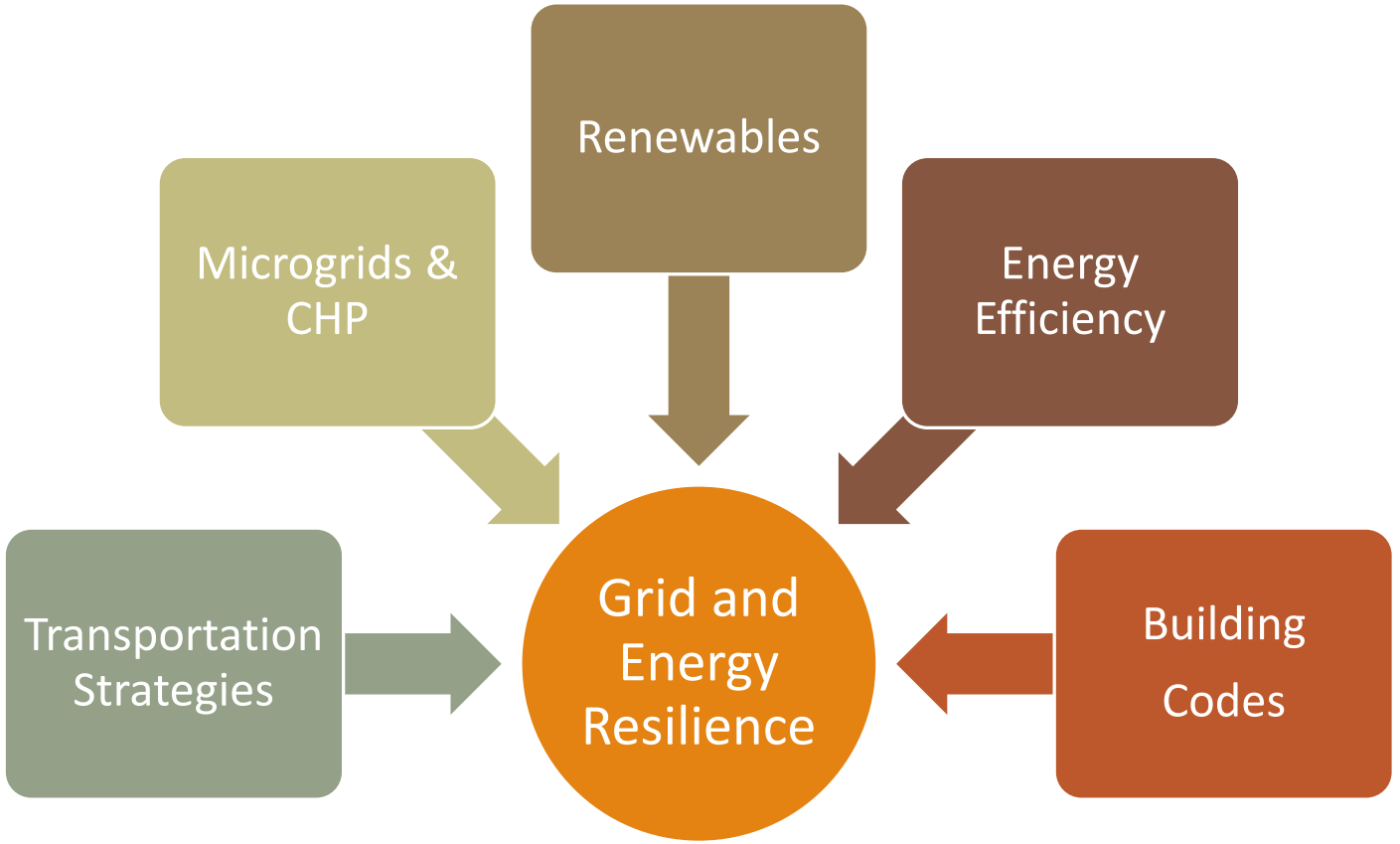
Energy Resiliency and Emergency Management



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Examples of Microgrid Projects

Bronzeville, IL Microgrid Project

Project:

- Reduces system outages from natural hazards
- Improves overall system performance, reliability, and resilience for customers within the service area, and potentially neighboring customer areas
- Improves energy security, resilience to future conditions, and sustainability.
- Provides grid modernization and “smart city” technologies to improve community livability.

Addressed (FEMA) Hazards:

- All hazards (Primary)
- Inland flooding
- Winter storms

Technology:

Solar, battery storage, control systems to island from main grid, ability to cluster with another nearby microgrid

Blue Lake Rancheria Tribe Microgrid

Project:

- Targets a low-income community facing impacts from future conditions
- Less frequent physical damage to system components, less frequent system outages from natural hazards, and better overall system performance and resiliency
- Lowers costs for meter readings and usage monitoring
- Provides social benefits associated with reliable electric power
- Allows for better business continuity following major disasters that would otherwise typically have caused outages for days/weeks

Addressed (FEMA) Hazards:

- All hazards (Primary)
- Inland flooding
- Wildfires

Technology:

Solar, battery storage, control systems to island from main grid

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Poll Questions

To participate in poll questions:

1. Go to PollEv.com
2. Enter NCTCOGENV444

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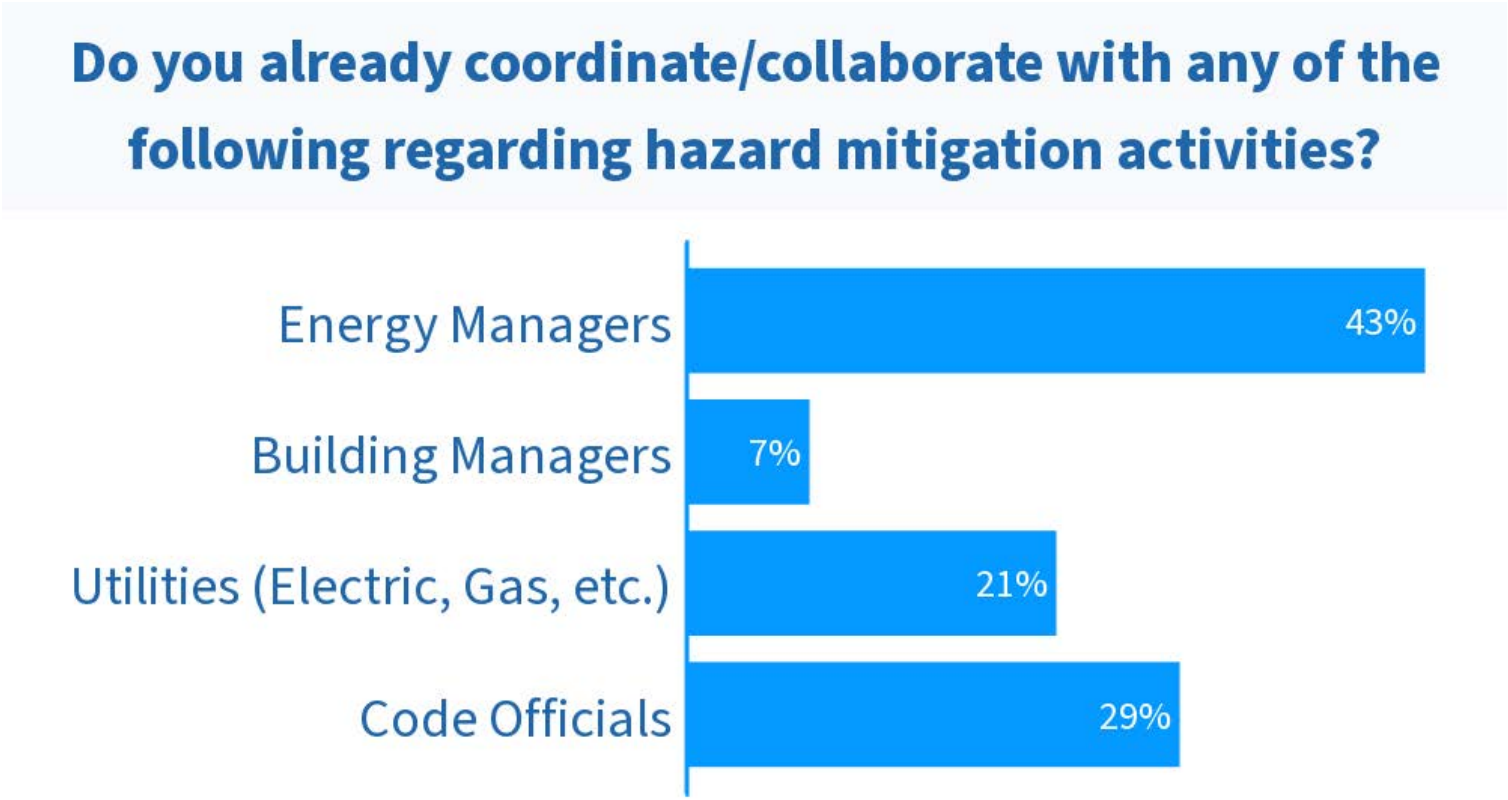
Poll Question



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Building Resilient Infrastructure and Communities (BRIC)

October 2021

FEMA

Legislation

- Disaster Recovery Reform Act (DRRA) Section 1234, which amends Section 203 of the Stafford Act
- Funded by a 6% set-aside from federal post-disaster grant funding
- Eligible applicants – states and territories with major disaster declarations in past seven years
- Will replace FEMA's existing pre-disaster mitigation (PDM) program

BRIC Highlights

The new grant program, Building Resilient Infrastructures and Communities (BRIC), will replace the existing Pre-Disaster Mitigation (PDM) program

This program seeks to shift the federal focus from reactive disaster spending toward research-supported, proactive investment in community resilience so when the hurricane, flood or wildfire comes, communities are better prepared

The BRIC program encourages a culture of resilience, increases state, local, tribal and territorial governments capacity, and promotes partnerships for funding larger infrastructure projects.

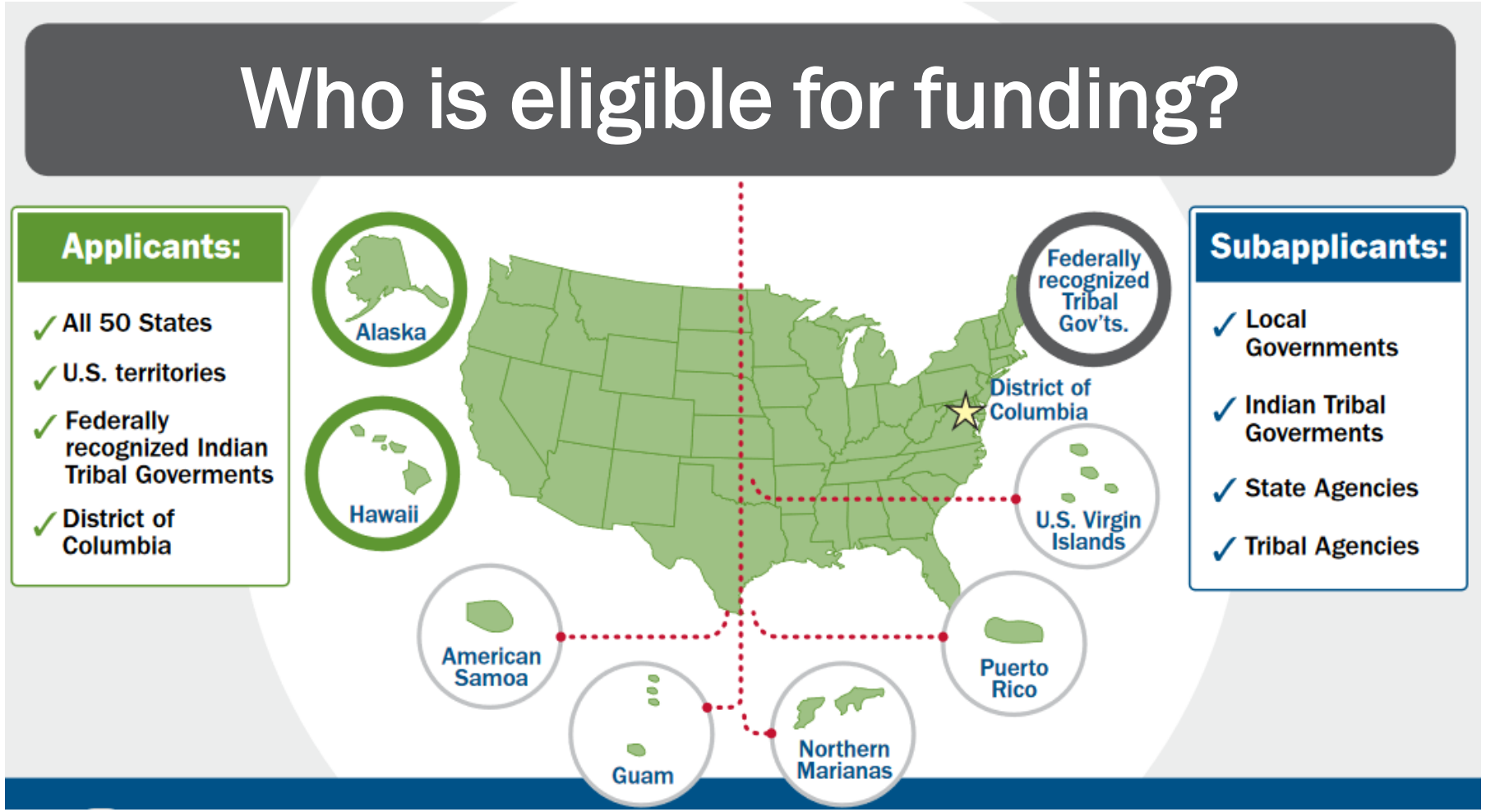
FY 2021 BRIC – Available Funding

$1 Billion

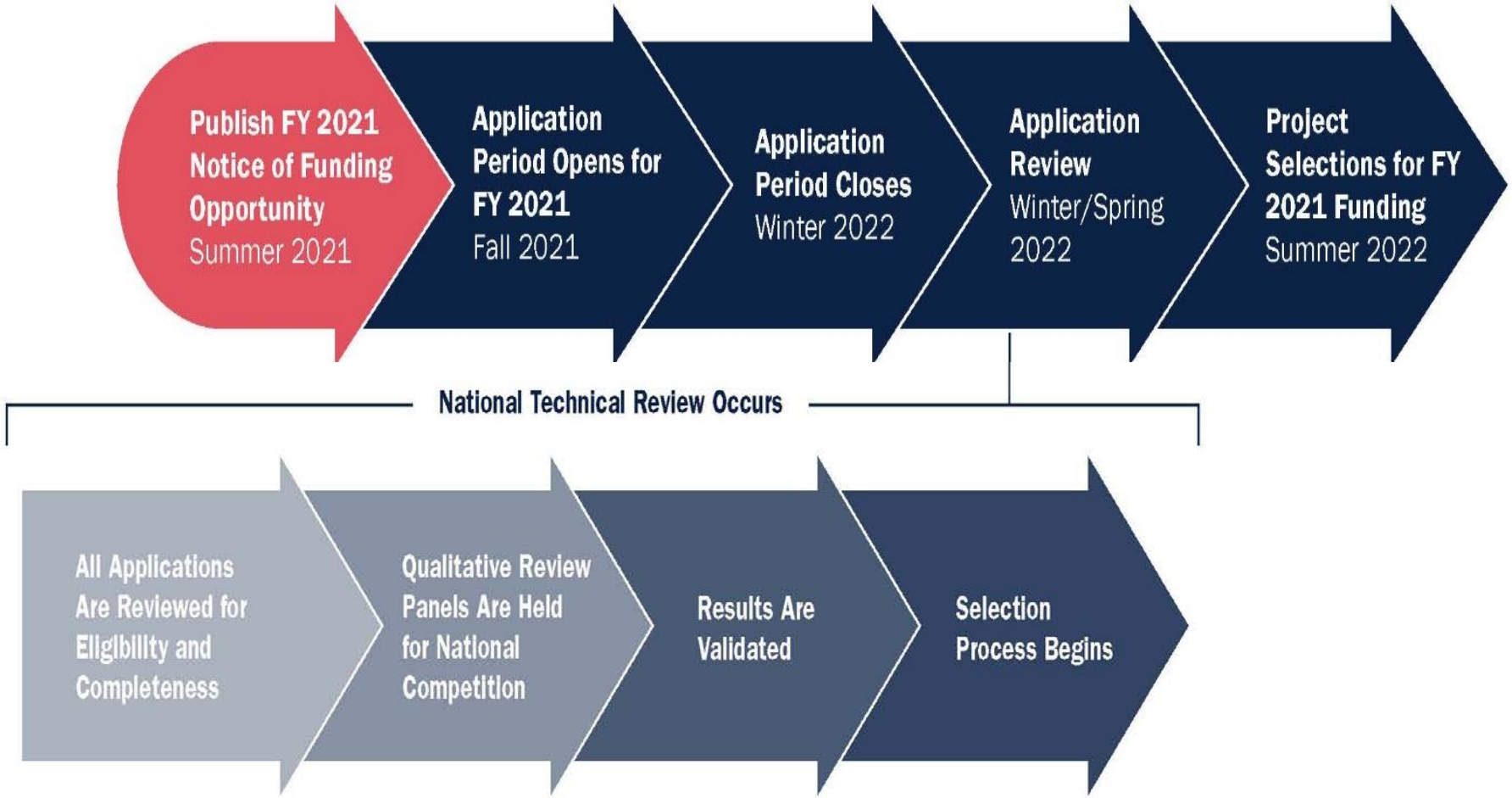
- State/Territory Allocation: $56 million (up to $1 million per Applicant)
  - All 50 states, the District of Columbia, and U.S. territories may apply under the State/Territory Allocation
  - Any funds not awarded from the State/Territory Allocation will be re-allocated to the national competition
- Tribal Set-Aside: $25 million
  - All Indian tribal governments (federally recognized) may apply under the Tribal Set-Aside
  - Any funds not awarded from the Tribal Set-Aside will be re-allocated to the non-financial Direct Technical Assistance for tribes or the national competition
- National Competition for Mitigation Projects: $919 million (estimated)

FEMA

BRIC Applicant and Subapplicant Eligibility



BRIC FY 2021 Cycle



BRIC Priorities

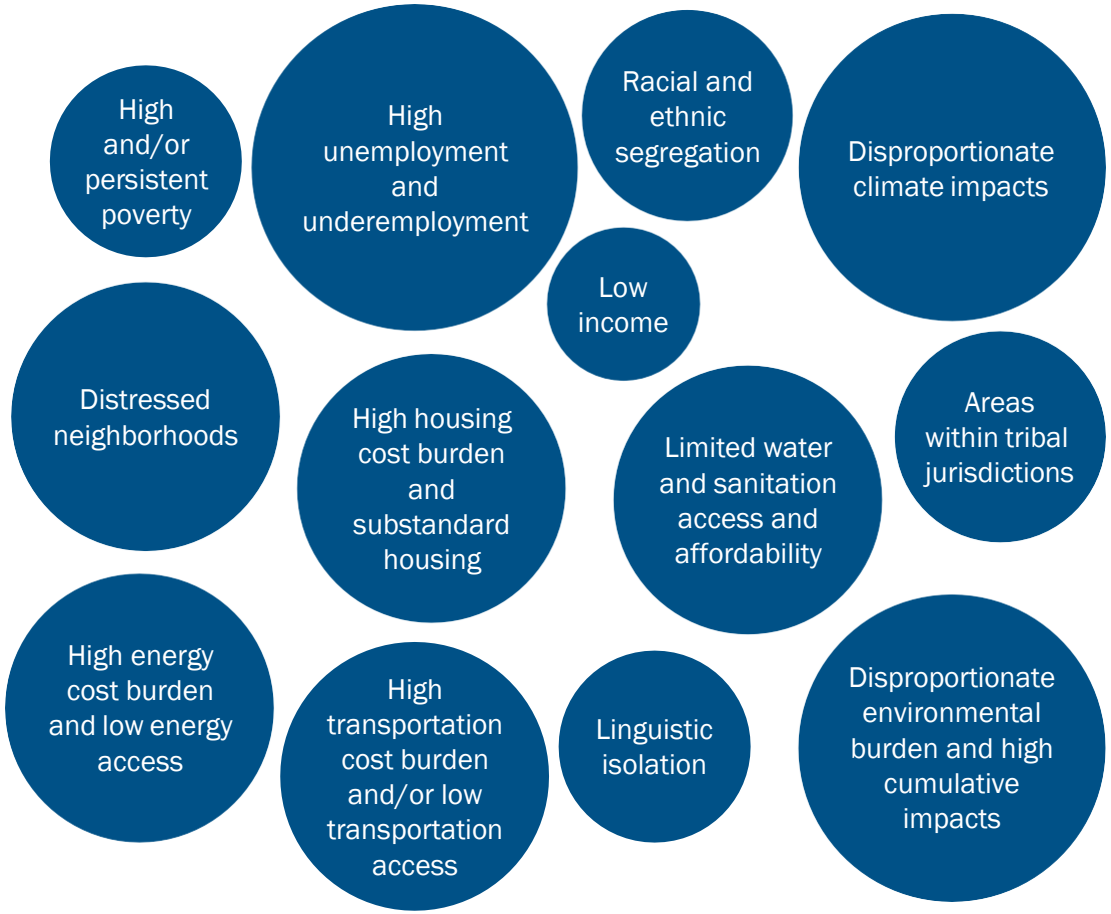
- Mitigate the risk to public infrastructure
- Incentivize resilient investments in disadvantaged communities, as referenced in EO 14008 (Tackling the Climate Crisis at Home and Abroad)
- Mitigate risk to one or more community lifelines
- Incorporate nature-based solutions
- Enhance climate resilience and adaptation
- Incentivize the adoption and enforcement of the latest published editions of building codes

BRIC encourages mitigation projects that meet multiple program priorities

Justice 40 Initiative

The BRIC Program is prioritizing assistance that benefits disadvantaged communities as referenced in Executive Order 14008 - Tackling the Climate Crisis at Home and Abroad (2021)

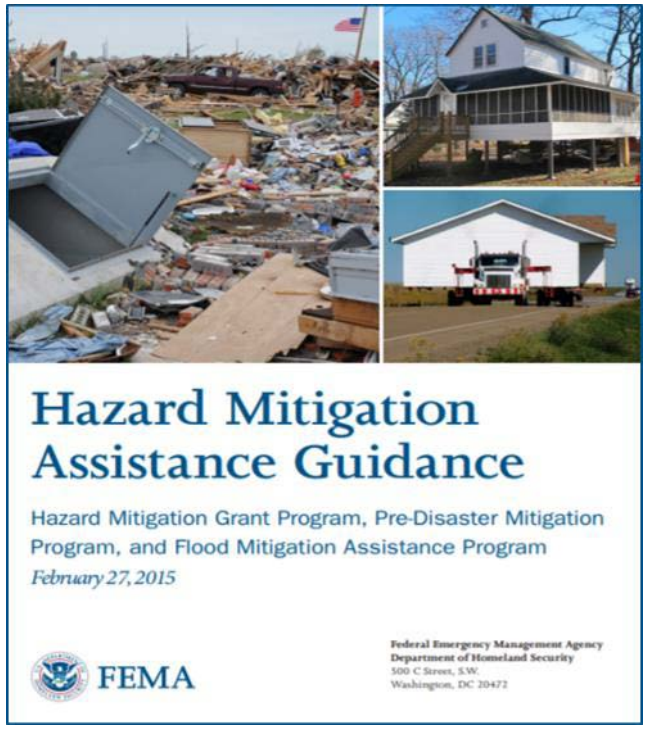
Disadvantaged communities may be characterized by:



FEMA

BRIC Eligible Activities

Existing Activities are Still Eligible



Expanded Eligibility Includes:

- Project scoping
- Building code activities
- Pre-award costs
- Additional activities for wildfire and wind implementation (DRRA Section 1205)
- Earthquake early warning (DRRA Section 1233)

Projects Must:

- Be cost-effective
- Reduce/eliminate risk and damage from future natural hazards
- Meet latest two consensus codes (i.e., 2018 or 2021 international building code)
- Align with Hazard Mitigation Plan
- Meet all environmental and historic preservation requirements

FEMA

Project Scoping

What Is Project Scoping?

- Provides states, federally-recognized tribes, and territories with resources to develop mitigation strategies and obtain data to prioritize, select, and develop complete mitigation project applications
- Project Scoping can help states and communities prepare projects for the full launch of BRIC in FY21 and beyond, including years with larger funding available.

What Activities Are Eligible For Project Scoping?

- Engineering design and feasibility studies for larger or complex projects
- Hydrologic and Hydraulic (H&H) studies
- Obtain staff or resources to develop cost-share strategy and identify potential match funding
- Evaluate facilities or areas to determine appropriate mitigation actions
- Incorporate environmental considerations early into program decisions
- Collect data for benefit cost analyses, environmental compliance and other program requirements
- Evaluation of potential solutions (i.e., alternative analysis)
- Project scoping across a wide variety of programs to incorporate sustainability, resilience and renewable building concepts

Cost Share Requirements

Cost Share:

Generally, FEMA will pay up to 75 percent of the total cost

BRIC:

- FEMA will pay up to 90 percent for small impoverished/economically disadvantaged rural communities
- FEMA will pay up to 100 percent for management costs
- *Non-federal cost share can be made up of cash, labor, in-kind or third-party donations*


Blue Lake Rancheria Tribe Microgrid

Elements of Good Mitigation Projects

- Risk Reduction
- Grant Implementation Approach
- Innovation in Project Planning and Implementation
- Populations Impacted
- Partnerships and Outreach
- Future Conditions
- Infrastructure and Community Lifelines

Example Infrastructure Projects

Photo of Texas County Memorial Hospital

Energy Support for Critical Infrastructure

Texas County Memorial Hospital, Houston, TX

Next Steps

How to Apply

For additional information on the Building Resilient Infrastructure and Communities (BRIC) Program, please contact Jasper Cooke of the Texas Division of Emergency Management at (512) 960-5167 or TDEM-Mitigation@tdem.texas.gov.

FEMA

Application Deadlines

- The Application period opens on September 30, 2021
- Applications must be received in FEMA GO at by January 28, 2022, at 3:00 PM Eastern Time (ET)

Technical Assistance

- Applicants experiencing technical problems outside of their control must notify FEMA by 3:00 PM ET on January 26, 2022

Additional Resources

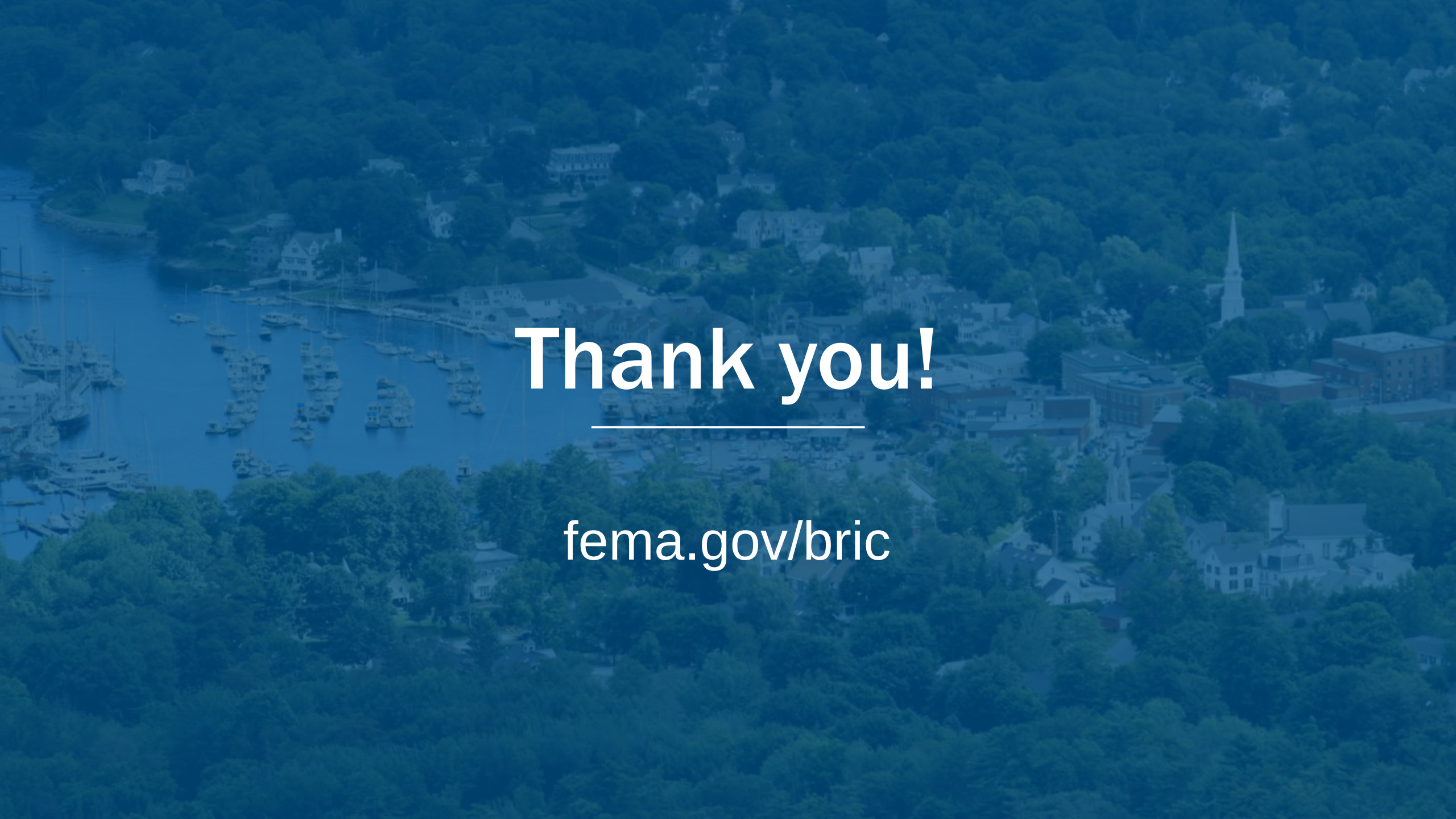
- Unified Hazard Mitigation Assistance Guidance & Addendum
- Property Elevation and Acquisition Job Aids:
  - Elevation Job Aid
  - Acquisition & Demolition Job Aid
  - Acquisition & Relocation
- HMA Cost Share Guide
- Benefit-Cost Analysis Toolkit
- Building Community Resilience with Nature Based Solutions: A Guide for Local Communities

- FEMA GO Helpline:
  femago@fema.dhs.gov
  1-877-611-4700
- BCA Helpline:
- BCHelpline@fema.dhs.go
  v 1-855-540-6744
- Feasibility and Effectiveness Helpline:
- FEMA-BuildingScienceHelp@fema.dhs.gov

Environmental and Historic Preservation:

- EHPHelpline@fema.dhs.gov
- 1-866-222-3580
- HMA Helpline:
  HMAGrantsHelpline@fema.dhs.gov
- 1-866-222-3580

FEMA



Thank you!

fema.gov/bric

It's Baked In: How CHP Can Maintain Operations During Extreme Weather Events

Gavin Dillingham, Director, Southcentral CHP TAP

Agenda

- CHP Overview
- Decarbonization and CHP
- CHP and Resilience
- Tools and Resources

CHP Overview

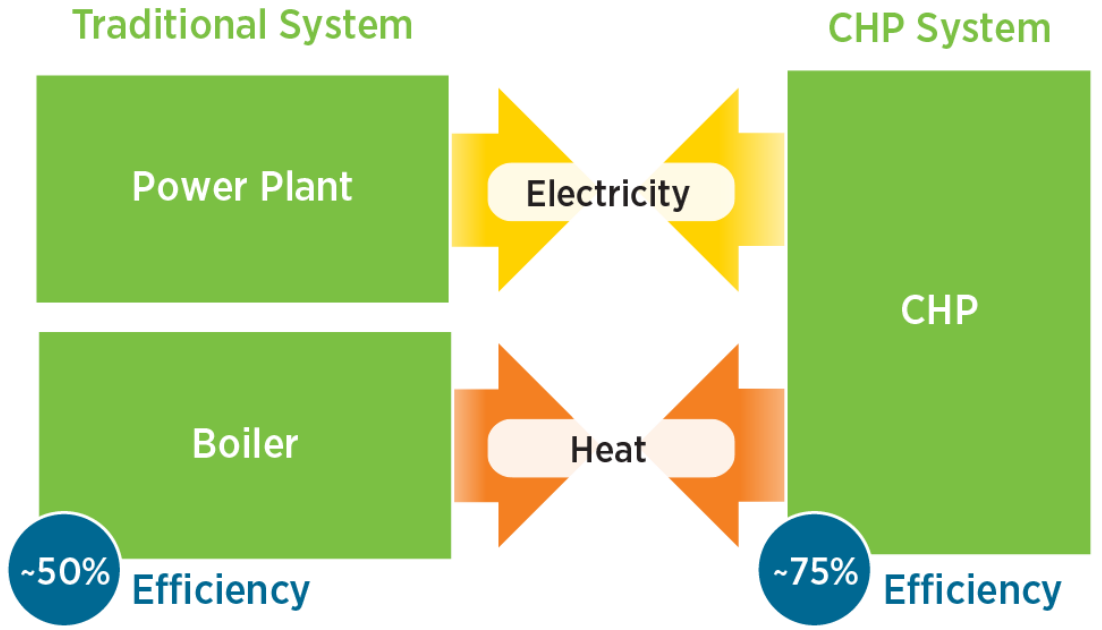
DOE CHP Technical Assistance Partnerships (CHP TAPs)

- **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: 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.

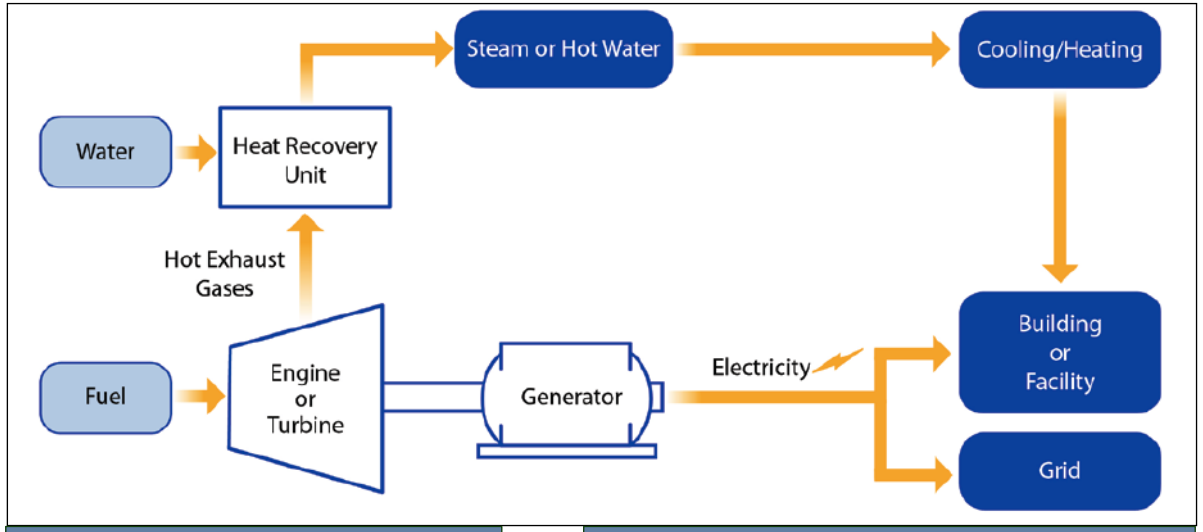
Source: www.energy.gov/chp

Defining Combined Heat & Power (CHP)

The on-site simultaneous generation of two forms of energy (heat and electricity) from a single fuel/energy source

Conventional CHP

(also referred to as Topping Cycle CHP or Direct Fired CHP)



Separate Energy Delivery:

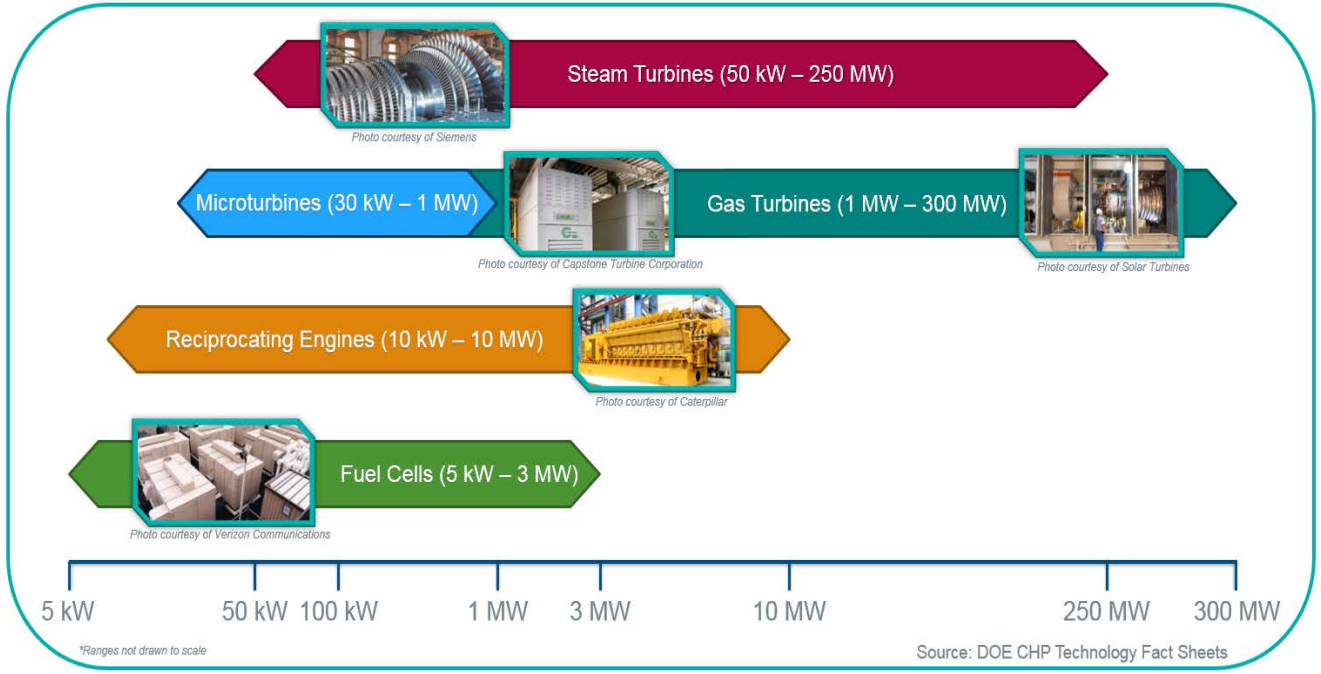
- Electric generation – 33%
- Thermal generation - 80%
- Combined efficiency – 45% to 55%

CHP Energy Efficiency (combined heat and power)
70% to 85%

Common CHP Technologies and Capacity Ranges

Five Common Prime Movers

- Reciprocating engines
- Gas turbines
- Microturbines
- Fuel cells
- Steam turbines



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)
- CHP can also increase **energy reliability and resiliency** and enhance power quality
- On-site electric generation can **reduce grid congestion** and avoid distribution costs.
- Higher efficiency **reduces emissions** of pollutants

Growing Utility Participation

Utility-Owned CHP for Grid Generation

- Build, own, and operate CHP at customer sites as part of resource planning

CHP as a Distribution System Resource

- Encourage customers to install CHP as non-wires alternative to enhance grid stability, alleviate grid congestion, or defer investments

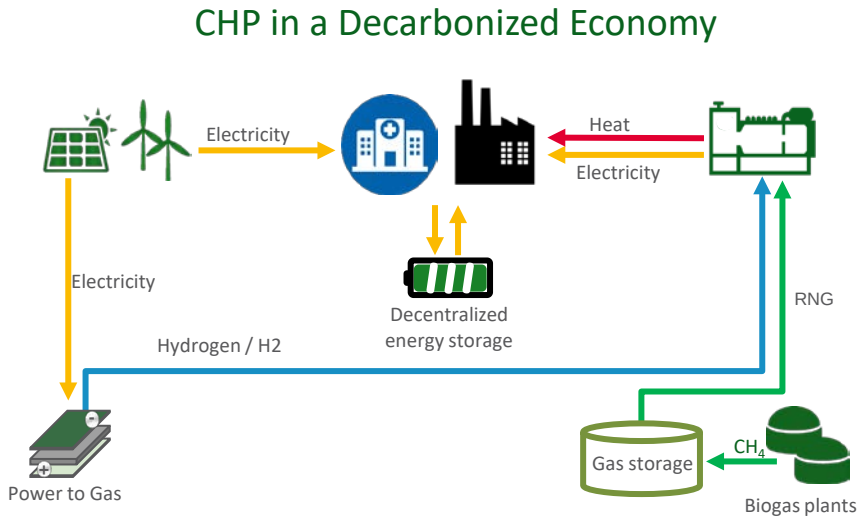
CHP in Utility Energy Efficiency Portfolio

- Encourage customers to install CHP to gain low-cost energy savings

Decarbonization and CHP

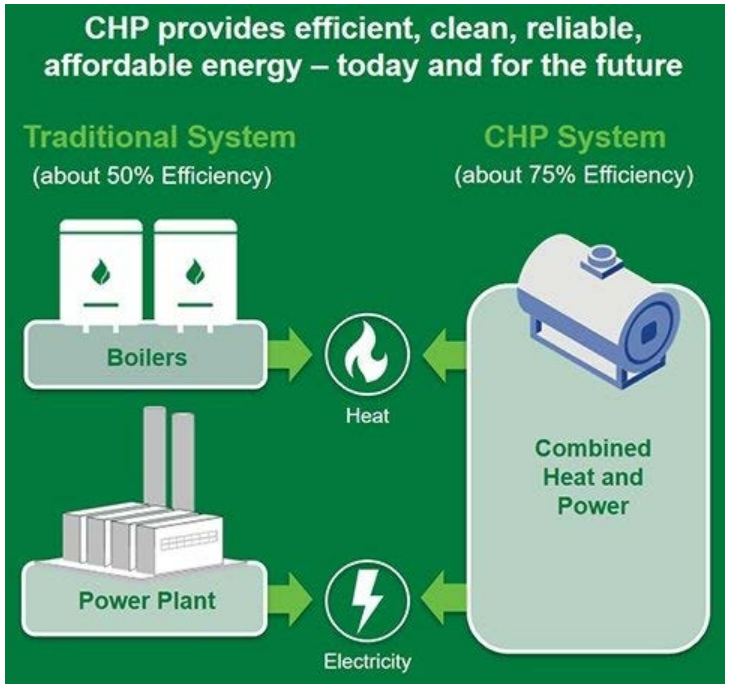
CHP and Decarbonization

- CHP is fuel flexible - CHP currently uses renewable fuels, low carbon waste fuels, and hydrogen where available, and **will be ready to use higher levels of biogas, renewable natural gas (RNG), and hydrogen in the future**
- **CHP is the most efficient way to generate power and thermal energy and can reduce CO_2 emissions now and in the future**
- Renewable/hydrogen fueled CHP can **decarbonize thermal end-uses in industrial and commercial facilities that are difficult to electrify**
- Renewable/hydrogen fueled CHP can **decarbonize critical facilities that need on-site power for long duration resilience and operational reliability**
- CHP's high efficiency **can extend the supply of renewable, low carbon, and hydrogen fuels**



High Efficiency and Reduced Emissions

- CHP's high efficiency means burning less fuel to meet the same electricity and heat needs
- Reduced carbon emissions compared to current grid
- Reduced conventional air pollutants
  - Carbon Monoxide (CO), Nitrogen Oxides (NOX), Particulate Matter (PM), Sulfur Dioxide (SO2), and Volatile Organic Compounds (VOCs)
- After treatment for emissions control
  - Diluent injection, lean premixed combustion, selective catalytic reduction, CO oxidation catalysts, catalytic combustion, and catalytic absorption systems



CHP and Long-Term Decarbonization

- Current CHP products routinely operate on biogas and hydrogen blends, and **all major manufacturers are introducing 100% hydrogen capability**
- Renewable/hydrogen fueled CHP can **decarbonize critical facilities that need on-site power for long duration resilience and operational reliability**
- Renewable/hydrogen fueled CHP can **decarbonize thermal end-uses in industrial and commercial facilities that are difficult to electrify**
- CHP's high efficiency **can extend the supply of renewable and low carbon fuels**

Low/Zero Carbon Fuel Feedstocks

- *Food Waste*
- *Animal manure*
- *Wastewater Treatment (WWTP)*
- *Landfill gas (LFG)*

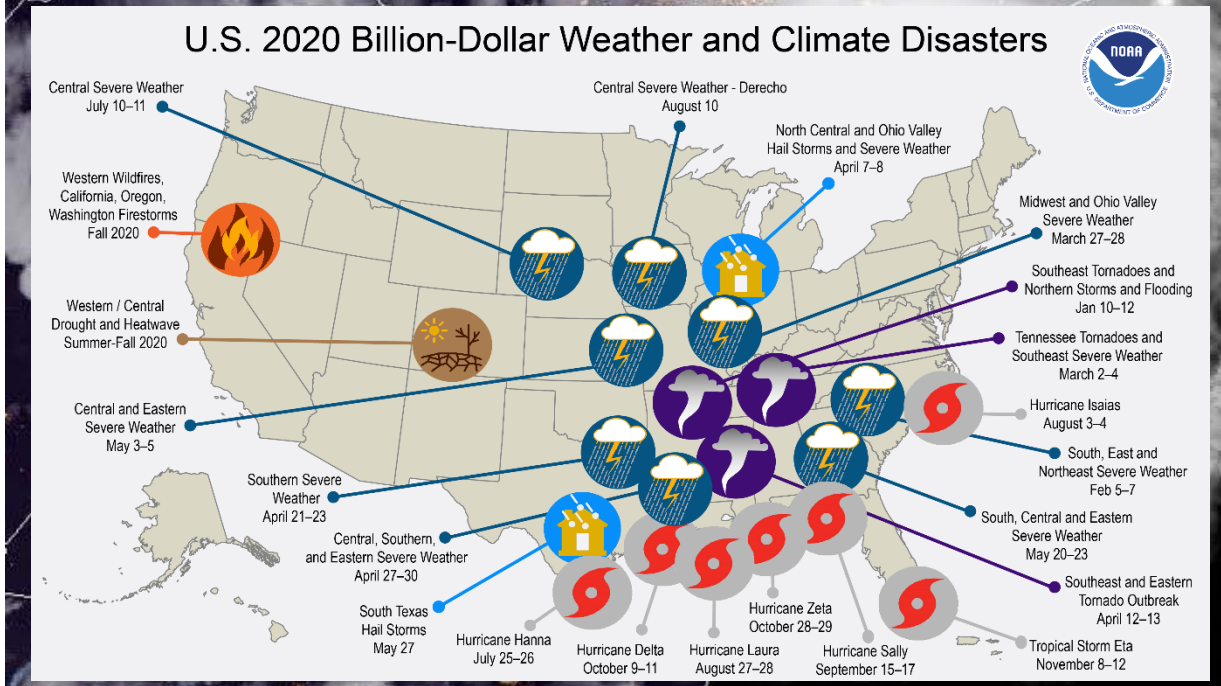
- *Agricultural residue*
- *Forestry and forest product residue*
- *Energy crops*
- *Municipal solid waste (MSW)*

- *Green Hydrogen from renewable electricity*
- *Blue Hydrogen from natural gas with carbon capture*

Source: AGA Foundation, Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment, 2019

CHP and Resilience

$1.1 Trillion – Extreme Weather Damage Costs in the Last 15 years. - NOAA



Extreme Temperatures

Increased Fire Risk

Water Temperature

Flooding

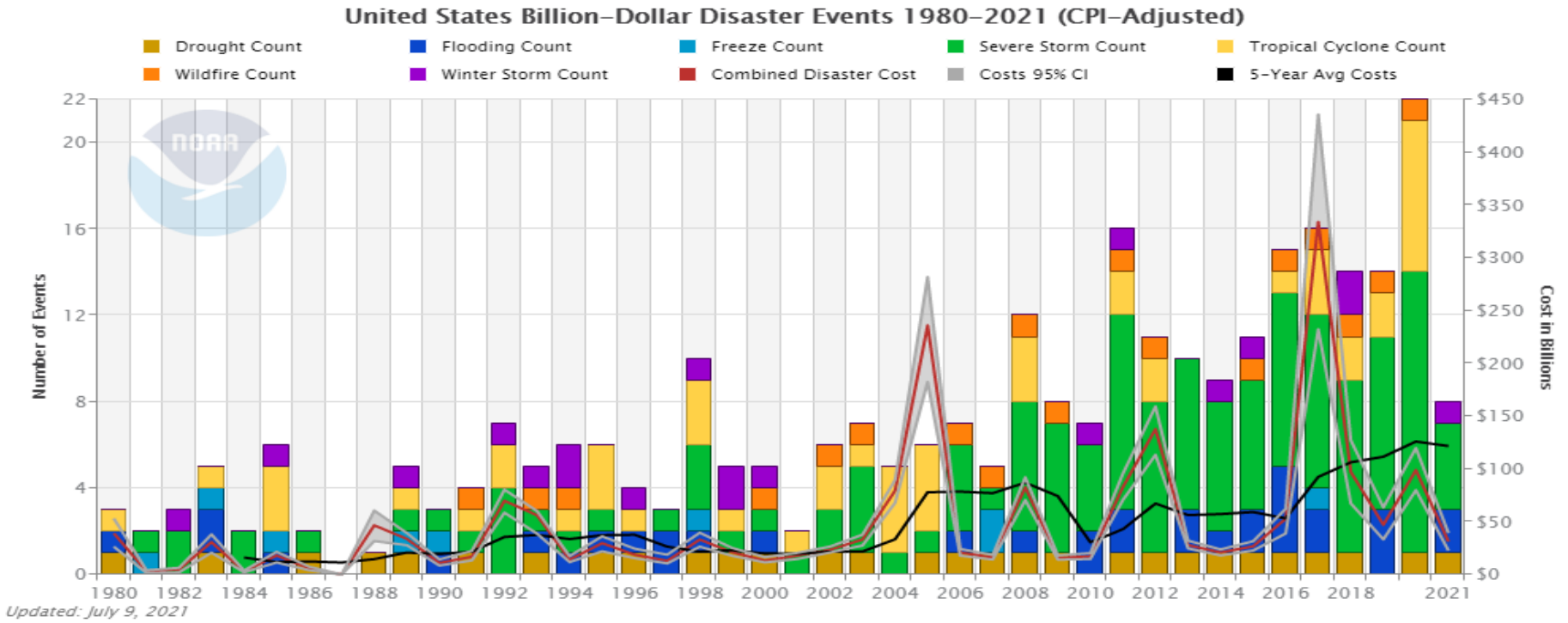
Water Availability

Hurricanes

019 Report

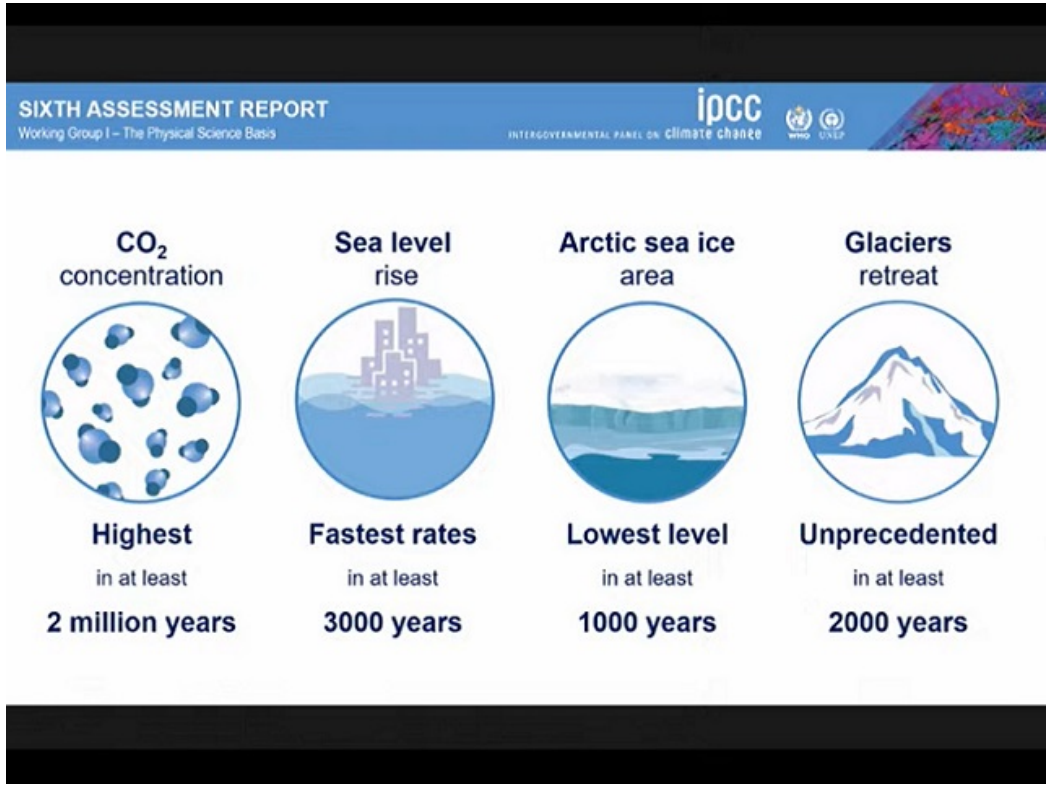
CIRA RAMMB

Billion-Dollar Disasters in United States



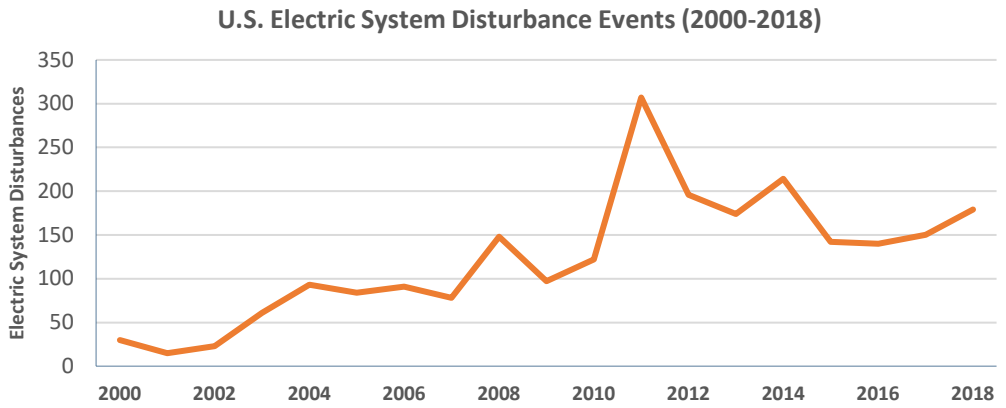
Source: NOAA National Centers for Environmental Information

IPCC reports climate change is widespread, rapid and intensifying

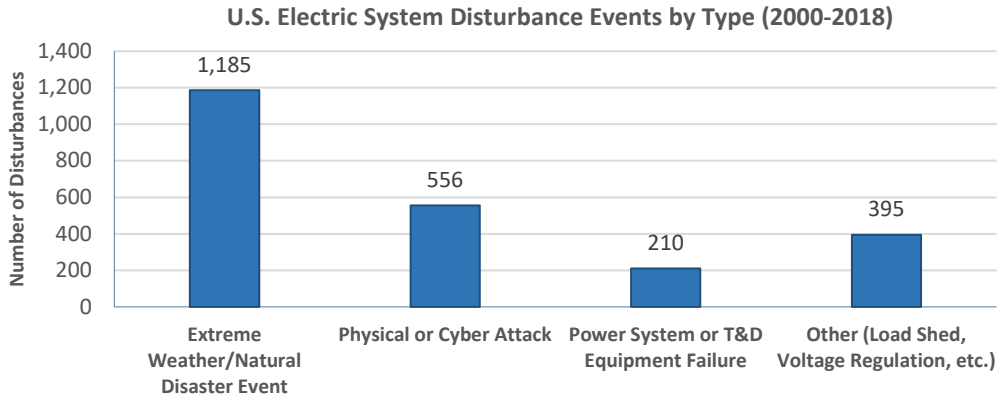


Electric System Disturbances

- ***Electric system outages are increasingly frequent...***

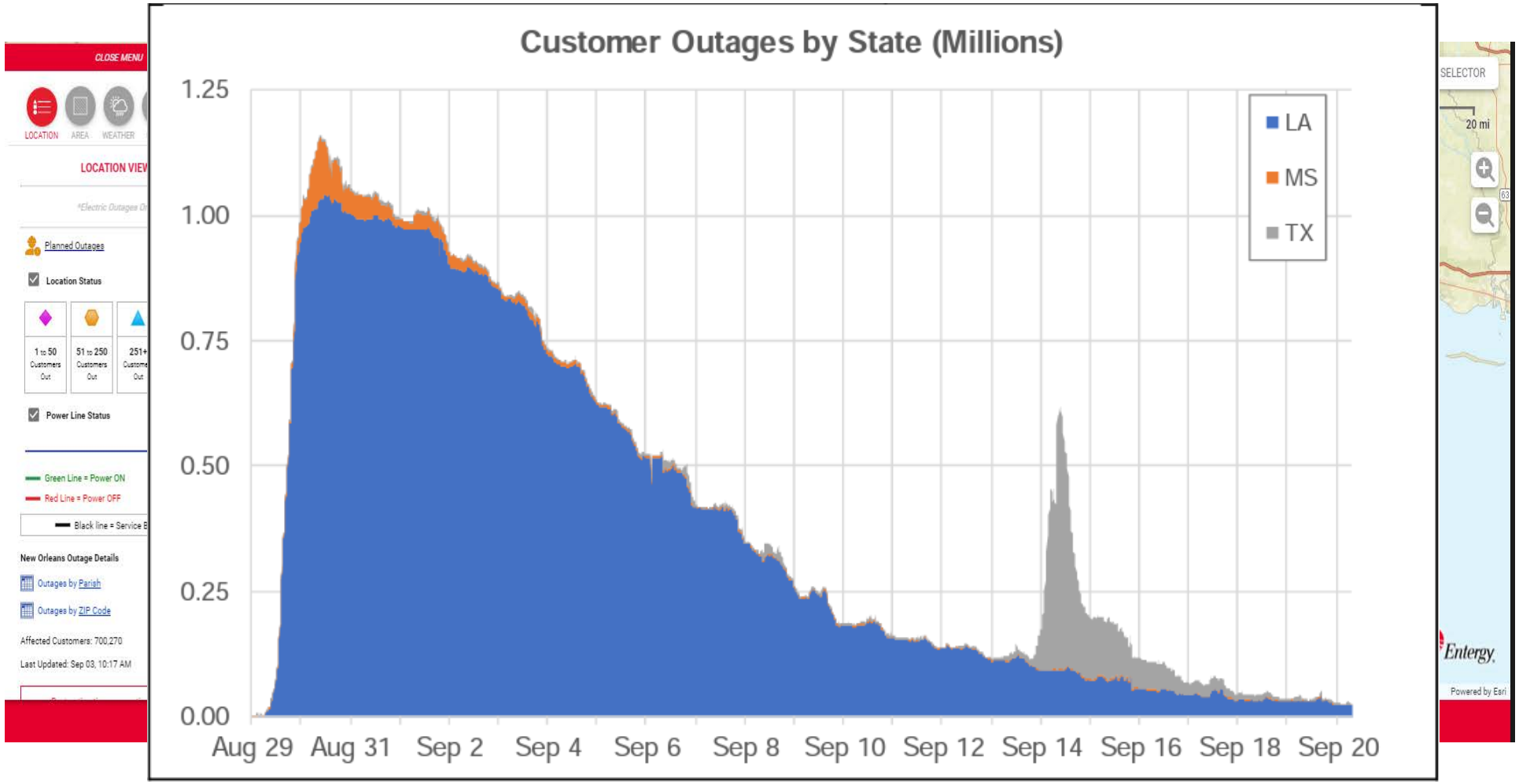


- ***And outages are increasingly caused by natural disasters and storm events***

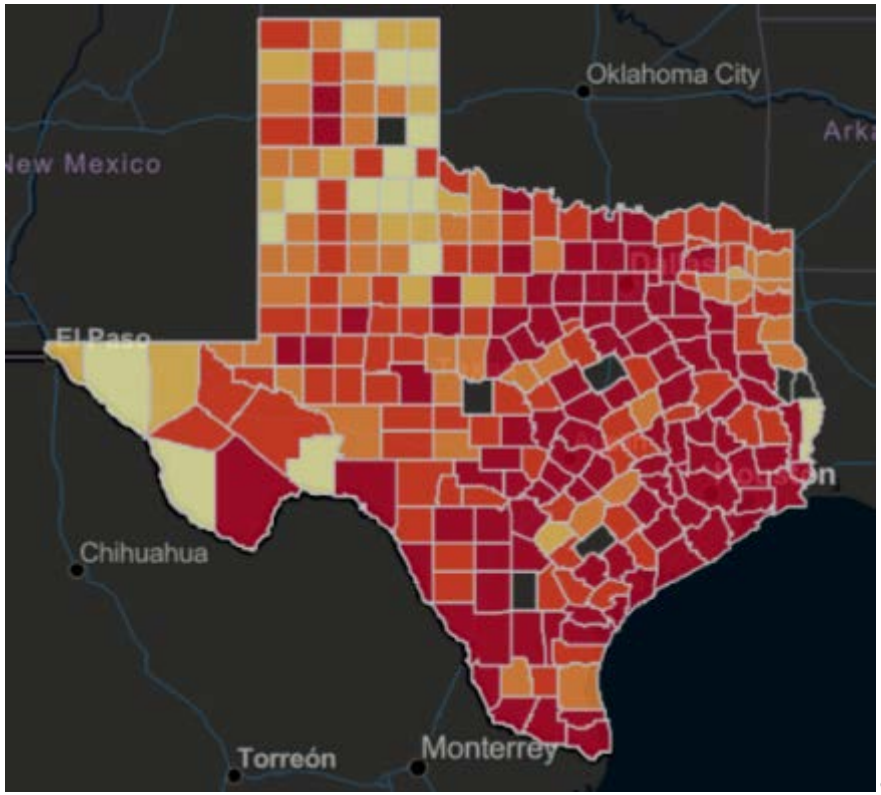


Source: U.S. DOE Office of Cybersecurity, Energy Security, and Emergency Response, Electric Disturbance Events (OE-417) Annual Summaries

Hurricane Ida



Winter Storm Uri



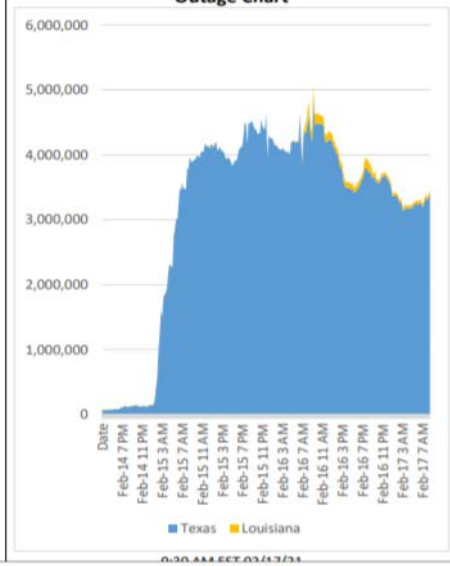
which affected the region over the weekend.

Texas and Louisiana Customer Power Outages
as of 9:30 AM EST 02/17/2021

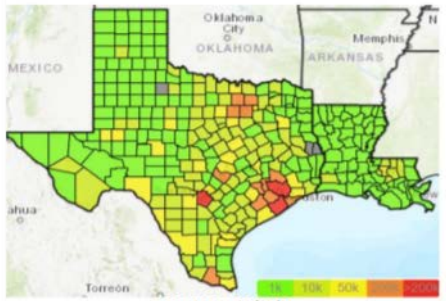
State	Current Outages	% of State Without Power	Peak Outages	% Restored from Peak
Texas*	3,341,984	28%	4,893,204	32%
Louisiana	45,706	2%	211,496	78%
Total	3,387,690	-	-	-

*Total outages, including both controlled outages and storm-related outages. Outage information for Pedernales Electric is unavailable as of 9:45 AM EST on February 17 and is not included in the Texas total.

Outage Chart



Outage Map



9:30 AM EST 02/17/21

CHP Increases 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 vs. 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

Source: DER Disaster Matrix, Issue Brief, U.S. DOE CHP for Resiliency Accelerator. 2018; Natural Gas Systems: Reliable & Resilient, The Natural Gas Council. 2017; Case Studies of Natural Gas Sector Resilience Following Four Climate-Related Disasters in 2017, ICF Prepared for SoCalGas. 2018.

Distributed Energy Resources Disaster Matrix

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	◒	○	◒	●	◒	○

Source: https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/DER_Disaster_Impacts_Issue%20Brief.pdf

Rice University
Houston, Texas

RICE UNIVERSITY

Project Snapshot:
Zero Carbon Campus Goal

Application	College/University
Capacity	7.4 MW
Prime Mover	Gas Turbine
Fuel Type	Natural Gas
Thermal Use	Heating cooling, & chilled water
Installation Year	1989, 2018

Project Highlights: Rice has been utilizing CHP since the 1980s to meet campus energy needs. The use of CHP to reduce emissions is a key component of the campus's goal to become a Zero Carbon Campus.

Southcentral CHP TAP - https://chptap.lbl.gov/profile/188/RiceUniversity-Project_Profile.pdf

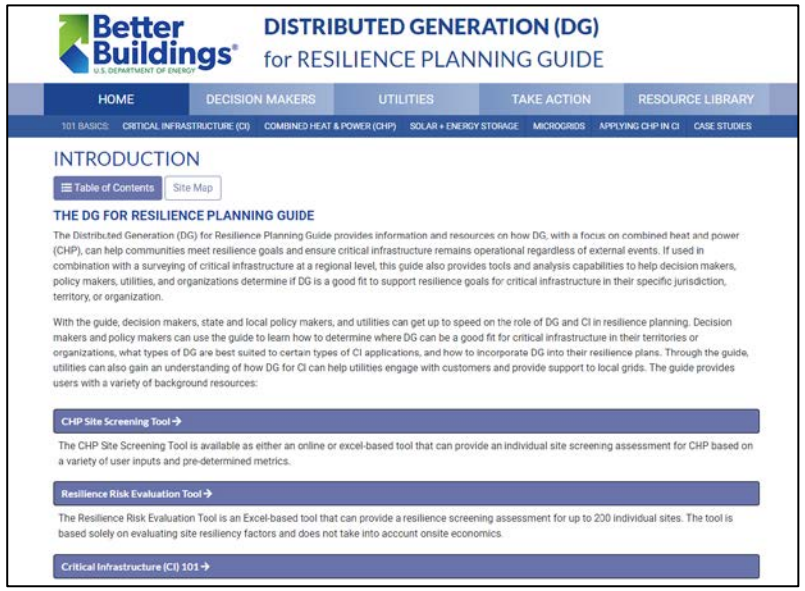
The Central Plant at Rice University houses the 7.4 MW CHP system, which produces 8,000 tons of chilled water and 130,000 lb/hr of steam

Project Testimonial

"Through the years we have seen the value of our CHP system shift from being an isolated physical campus asset to a shared virtual asset by participating in electrical grid curtailment programs."
- Mark Gardner, Manager of Energy Strategy
Rice University

CHP Resilience Resources

DG for Resilience Planning Guide



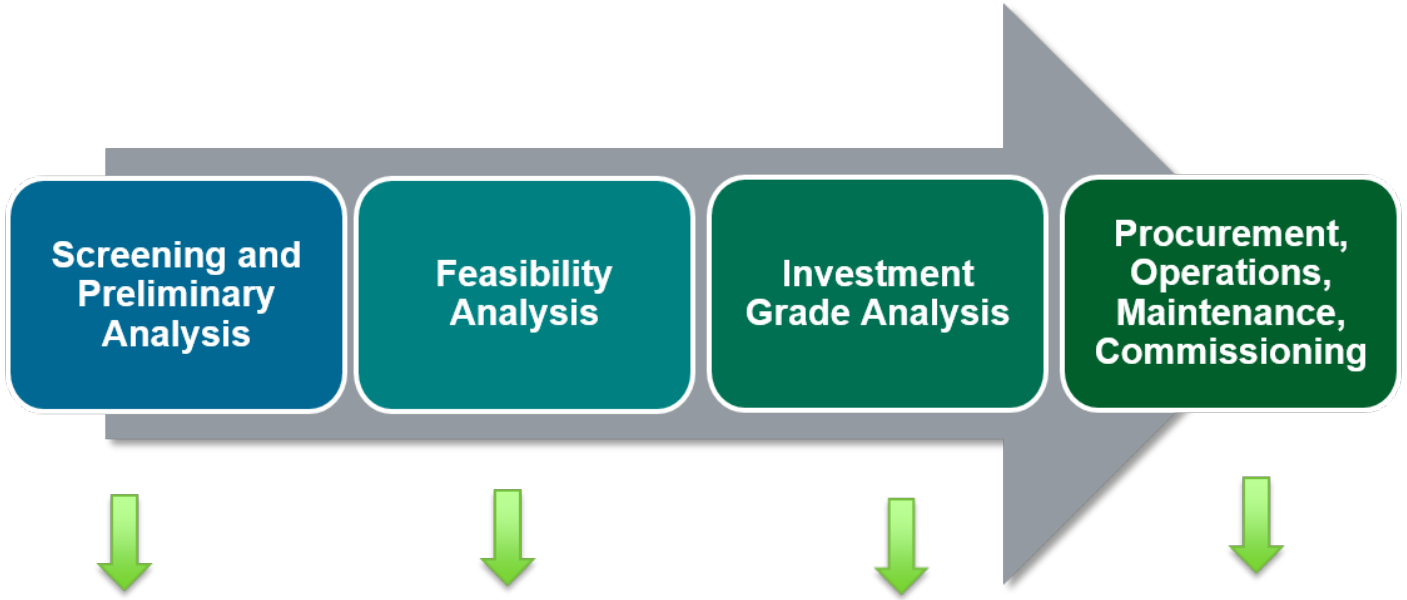
https://dg.resilienceguide.lbl.gov/

CHP: Enabling Resilient Infrastructure for Critical Facilities

https://www.energy.gov/sites/prod/files/2013/11/f4/chp_critical_facilities.pdf

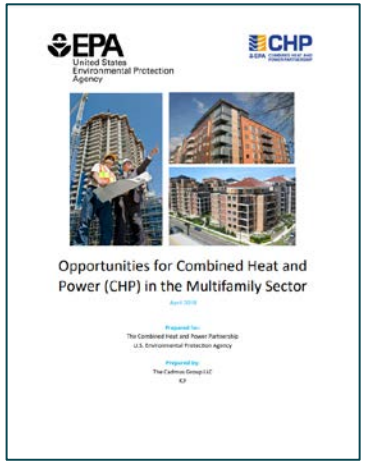
Tools and Resources

CHP TAP Role: Technical Assistance



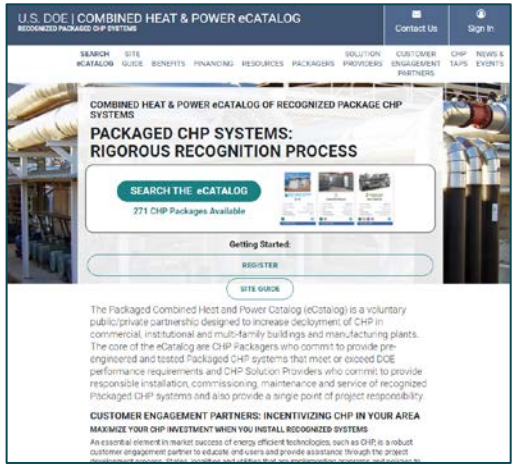
CHP Resources

Opportunities for Combined Heat and Power (CHP) in the Multifamily Sector



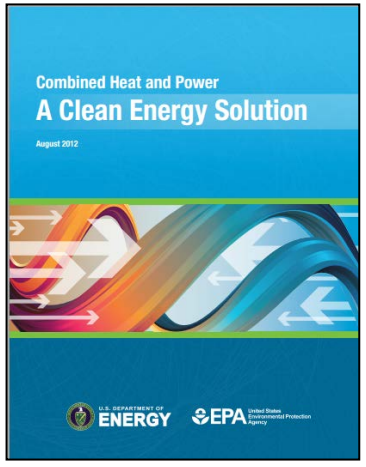
https://www.epa.gov/sites/production/files/2019-05/documents/chp_multifamily.pdf

CHP eCatalog



https://chp.ecatalog.lbl.gov/

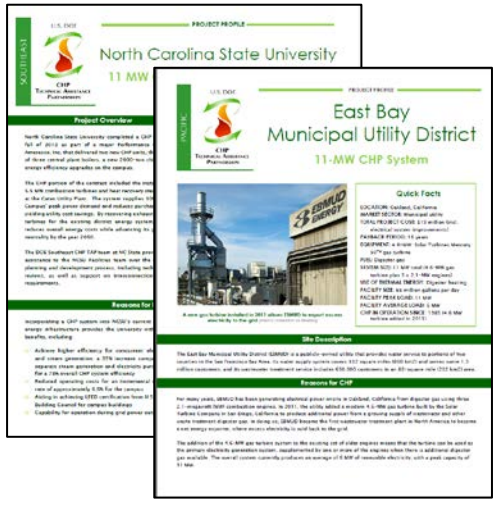
Good Primer Report



https://www.energy.gov/eere/amo/downloads/chp-clean-energy-solution-august-2012

CHP Project Resources

DOE Project Profile Database



energy.gov/chp-projects

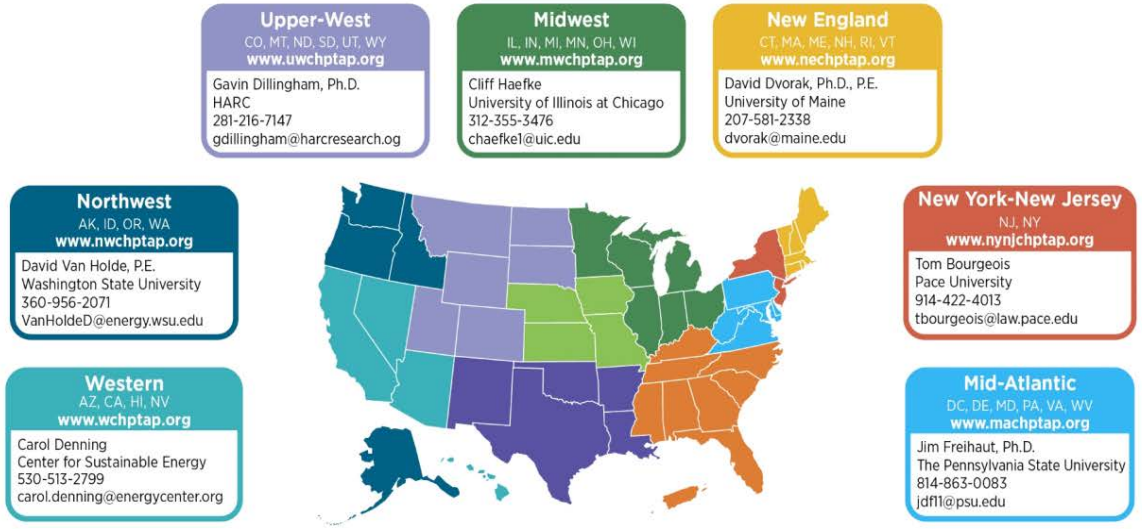
DOE CHP Technologies Fact Sheet Series

www.energy.gov/chp-technologies

EPA dCHPP (CHP Policies and Incentives Database

www.epa.gov/chpdchpp-chp-policies-and-incentives-database

DOE CHP Technical Assistance Partnerships (CHP TAPs)



DOE CHP Deployment Program Contacts
www.energy.gov/CHPTAP

Robert "Bob" Schmitt
Technology Manager
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Robert.Schmitt@ee.doe.gov

Patti Garland
DOE CHP TAP Coordinator [contractor]
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Patricia.Garland@ee.doe.gov

Summary

- CHP can provide lower operating costs, reduce emissions, increase energy resilience, enhance power quality, and reduce grid congestion and avoid distribution costs
- CHP can support emissions reductions and near-term decarbonization
- A variety of CHP technologies and sizes are available
- CHP resources are available at www.energy.gov/chp

Thank You!

Gavin Dillingham
Director, Southcentral CHP TAP
gdillingham@harcresearch.org

COMBINED HEAT AND POWER IN TEXAS

ROUNDTABLE ON INTEGRATING ENERGY RESILIENCE INTO HAZARD MITIGATION PLANNING

OCTOBER 2021

SECO
State Energy Conservation Office

Statutory Requirements

Technical Assistance and Training

Clean Energy Incubation

LoanSTAR Loan Program

Watt Watchers of Texas

Energy Codes

Programs

STATE ENERGY CONSERVATION OFFICE

SECO partners with Texas local governments, county governments, public K-12 schools, public institutions of higher education and state agencies, to reduce utility costs and maximize efficiency. SECO also adopts energy codes for single-family residential, commercial, and state-funded buildings.

SECO State Energy Conservation Office

News and Announcements

- Applications for LoanSTAR Program must be received by August 31, 2021 at 2 p.m. CT.

Funding & Incentives

SECO Funding Opportunities
LoanSTAR Revolving Loan Program
Other Funding Resources

Programs

Alternative Fuels Program
Clean Energy Incubators
Industrial Energy Efficiency
Innovative Energy Demonstration Program
Local Governments Program
Schools Program
State Agency and Higher Ed. Program
Pantex Program
Watt Watchers

Energy Codes

Training & Code Compliance
Energy Code Adoption Process
Code Contacts
Commercial & Multi-Family Construction
Single-Family Construction
State-Funded Buildings
Local Ordinances
Texas Water Conservation Standards

Energy Reporting

State Agencies and Institutions of Higher Ed.
Local Government
Utilities
Schools

Resources

Combined Heat and Power in Texas
Energy Efficiency Best Practices Guide
Energy Savings Performance Contracting
ESPC Education

About Us

Contact Us
Contract Portal
Sign up to receive updates

STATUTE
10 TGC 2311.003

Sec. 2311.002.
COMBINED HEATING AND POWER SYSTEMS.

(a) When constructing or extensively renovating a critical governmental facility or replacing major heating, ventilation, and air-conditioning equipment for a critical governmental facility,

the entity with charge and control of the facility shall evaluate whether equipping the facility with a combined heating and power system would result in expected energy savings that would exceed the expected costs of purchasing, operating, and maintaining the system over a 20-year period.

Notwithstanding Chapter 2302 (Cogeneration), the entity may equip the facility with a combined heating and power system if the expected energy savings exceed the expected costs.

(b) The State Energy Conservation Office shall establish guidelines for the evaluation under Subsection (a).

GUIDELINES

Evaluation Guidelines

The Texas Government Code (10 Tex. Govt. Code §2311.002) requires entities responsible for all criti governmental facilities to formally consider the feasibility of implementing combined heat and powe (CHP) technology prior to the construction, extensive renovation or replacement of major heating, ventilation and air conditioning equipment in critical buildings and facilities

SECO has established a set of guidelines for evaluating critical government facilities for CHP purpose

Download the CHP Evaluation Guidelines (PDF)

Technical Assistance Partnership

The Houston Advanced Research Center (HARC) is part of a team that supports the U.S. Department Energy's Southcentral Combined Heat and Power Technical Assistance Partnership (CHP TAP). This initiative promotes, assists and seeks to transform the market for combined heat and power in the nation's southcentral region. The center provides resources and expertise to help industrial, commercial, federal, institutional and other large energy users consider and evaluate CHP for their facilities. The center also assists them throughout the project development process, from initial CHP screening to installation. Center staff also work with engineers, architects, city planners, project developers, state agencies and policymakers to increase understanding and awareness of CHP including its technology, benefits, applications, regulatory requirements and other project-specific information.

For more information about this program, visit HARC's website.

CONTACTS

Eddy Trevino
Director

512-463-1876
eddy.trevino@cpa.texas.gov

Fred Yebra
SECO Engineer

512-475-0753

fred.yebra@cpa.texas.gov

www.seco.cpa.texas.gov

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Fuel Diversification to Improve Transportation Resilience

Caley Johnson
October 26, 2021

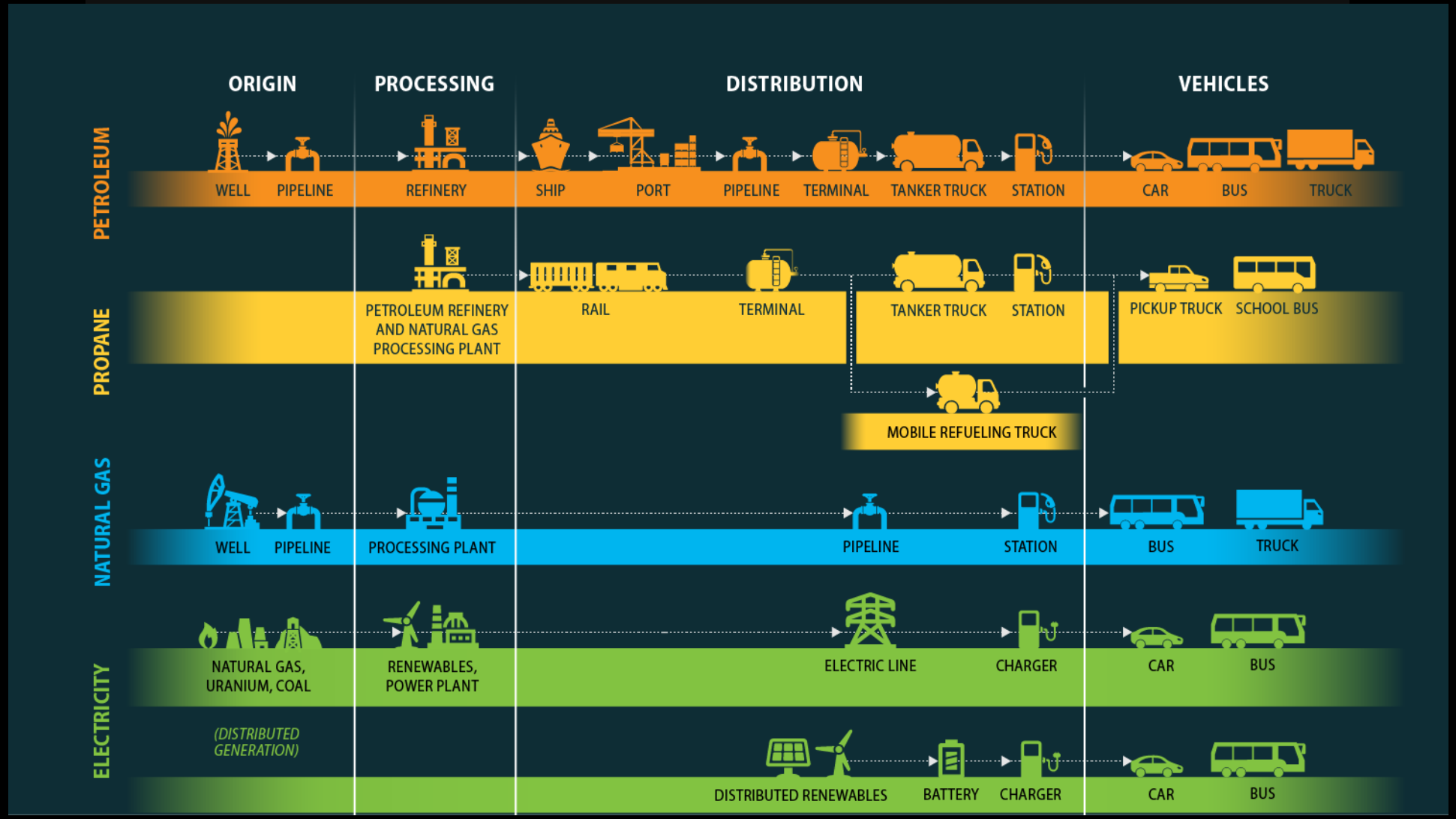
Department of Energy Projects to Improve Transport Fuel Resilience

- DOE seminal report “United States Fuel Resiliency: US Fuels Supply Infrastructure” Sept 2014
- A series of disasters proved the value of transportation fuel diversification
- The Initiative for Resiliency in Energy through Vehicles (IREV)
  - By DOE, Clean Cities, and the National Association of State Energy Officials (NASEO)
  - Case studies on EVs, biodiesel, natural gas, and propane vehicles in natural disasters
  - Toolkits developed for Virginia and Lancaster County
  - Tracking tool helps combine and visualize inventory
- Florida Alternative Transportation Fuel Resilience Plan
  - DOE-funded project with NREL, Florida Office of Energy, and University of South Florida
  - Provides a good framework for other locations and disasters

5-Pronged Approach to Resilience

1. **Redundancy**
   - Multiple fuels, sources, modes, and routes to reach vehicles
   - Multi-purpose vehicles
2. **Storage**
   - Have fuel stored nearby when source gets cut off
3. **Access**
   - Make sure access to stored fuel is maintained during disaster
   - Location of storage
   - Communication is key
4. **Resupply**
   - Ensure that local storage facilities are resupplied as soon as possible after a disaster
   - Renewable energy to resupply EVs
5. **Efficiency** (get the most work done for given amount of fuel)
   - Maximize passengers/cargo/jobs per vehicle
   - Maximize miles per gallon (or BTU)

Alternative Fuels to Improve Resilience in Florida



Fuel Interdependencies and Timing

- Electricity outages impact oil refineries, NG processing plants, pipelines, terminals, and refueling stations
- Evacuations pose a threat to all refueling systems because many personnel are not available to make repairs
  - Some fuel companies are pursuing safe havens that get exemptions from evacuation plans
- Past hurricanes show electricity most likely to be disrupted, then petroleum pipelines, then natural gas pipelines
  - There is currently more redundancy with natural gas pipelines than with petroleum

Petroleum: Key Information

- Stocks in storage at bulk terminals and distribution centers can provide 3-5 days of supply of gasoline and diesel
- Gasoline and Diesel stations require electricity to pump from underground storage tanks

Marine ports can be a chokepoint during hurricanes—Pilots need to board tankers on the open ocean and navigate narrow channels

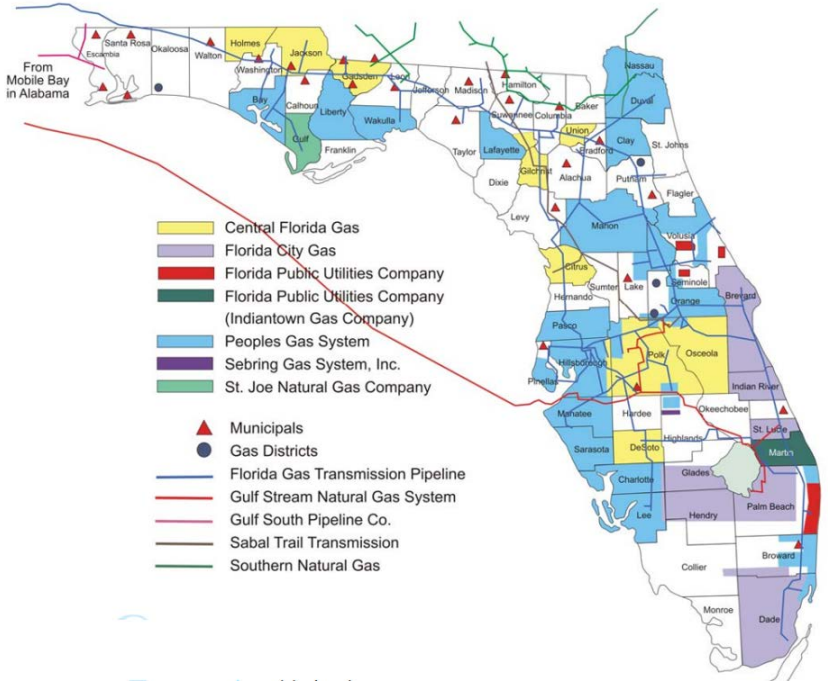
Source: safety4sea.com

Source: U.S. Energy Information Administration, This Week in Petroleum

Natural Gas: Key Information

- Natural gas supply chain is relatively free of chokepoints due to the large amount of redundancy in the system.
- Transmission Pipeline—the loss of one compressor station would reduce flow 25%. Losing 3 stations in series could halt operation.
- Transfer from transmission to distribution takes place at the city gate. Most cities have 6 or more gates.
- Distribution lines are kept pressurized during hurricanes to avoid infiltration.

Natural Gas Transmission Pipelines
Source: Florida Public Service Commission



Natural Gas: Key Information

- Some CNG fueling stations have natural gas-powered generators in case of electrical outages.
- "Fuel Mules" are mobile fueling units (compressors and NG powered generators) that can be plugged into residential-pressure lines
- CNG tanks can be brought to the fleet.
- Superstorm Sandy
  - The Port Authority of NY and NJ used CNG vehicles to provide critical services when gasoline was in short supply
  - CNG "jitney" buses continued to operate in Atlantic City (PBS MotorWeek highlight)
- Hurricane Harvey
  - Freedom buses in Houston

Ultimate CNG Fuel Mule™ and tankers
Source: Ultimate CNG

Propane: Key Information

- Propane arrives via rail to Florida; from Pennsylvania, West Virginia and Ohio.
- Propane can be stored indefinitely (it doesn't degrade) and accessed quickly
- Propane allows for mobile fueling
- Takes about the same amount of time to refuel as gasoline

HOCON portable propane dispenser "rescue unit". Source: Hocon Autogas

Electric Vehicles: Key Information

- EVs are the only vehicles that don't need oxygen
  - Numerous videos showing Teslas fording deep water but no follow-up for long-term effects
  - Rivian claims 42" fording depth in their R1T and R1S specifications
  - Green Car article reports that key EV components are typically waterproof
- Distributed generation can provide electricity to vehicles when the grid is down, if designed correctly
- SunSmart E-Shelters program is equipping schools/emergency shelters with solar panels
  - Sky is abnormally clear directly after hurricanes
- During Japan's 2011 earthquake/tsunami, oil refineries were destroyed and EVs were a tremendous asset
  - Used to transport doctors, deliver supplies, and inspect buildings for safety

Source: Masashi Kawata, City of Soja via New York Times

Electric Vehicles as Power Sources

- EVs, PHEVs, and Fuel Cell vehicles can provide backup power to appliances, buildings and potentially to microgrids
- In CA wildfires, PG&E has Class 5 Utility trucks with exportable power modules to provide power to shelters
- Tsunami in Japan Inspired the “Leaf to Home” power exporter
  - Honda and Ford also offer vehicle-to-building power exporters

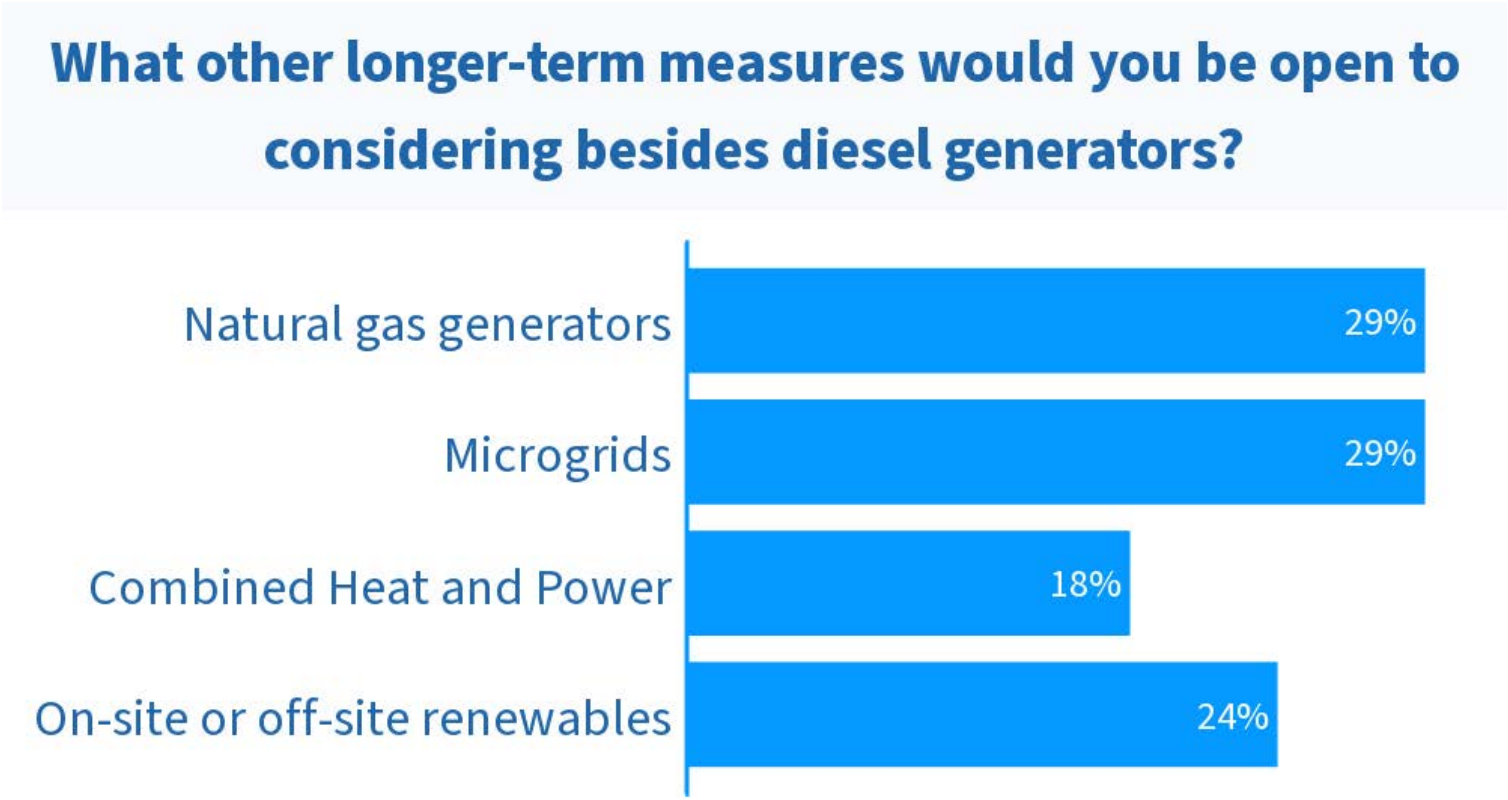
PG&E Exportable Power PHEV Truck

Source: Charged EV Magazine

Questions?

caley.johnson@nrel.gov

Poll Question



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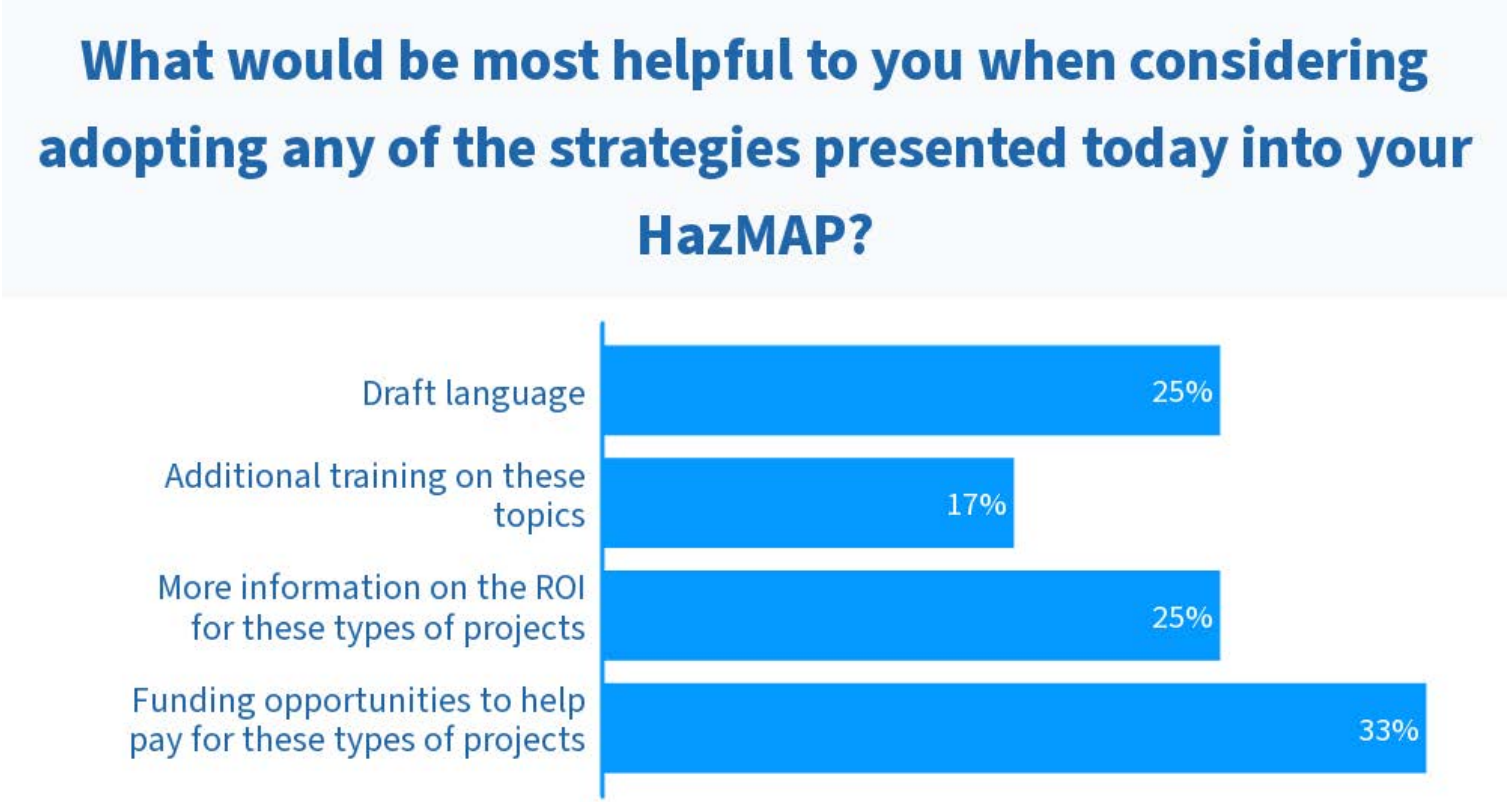
Poll Question



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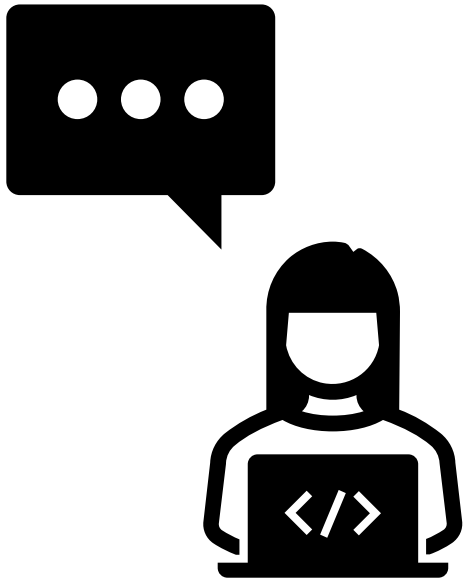
Q&A Roundtable

Have a question? Please raise your “hand” and unmute your line or place your question in the chat.



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What's Next?

- Microgrid Tour - 2022
- Develop case studies and best practices
- Develop a selection of achievable energy efficiency options and suggested language for inclusion in HazMAP plans and action tables

North Central Texas Council of Governments

Webinar Recording and Presentation Slides

- Today's presentation slides and recording will be posted on the Conserve North Texas website under News/Events → Event Archive located here: http://conservenorthtexas.org/event-archive
- Follow-up emails to come to all registrants.
- Please email Crysta Guzman, cguzman@nctcog.org, if you did not register but would like to be added to follow-up emails.

North Central Texas Council of Governments

FOR MORE INFORMATION

Tamara Cook

Senior Program Manager

Environment and Development Department

(817) 695-9221

tcook@nctcog.org

Lori Clark

Program Manager

Transportation Department

(817) 695-9232

lclark@nctcog.org

https://www.nctcog.org/envir/natural-resources/energy-efficiency

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NCTCOG
Resources

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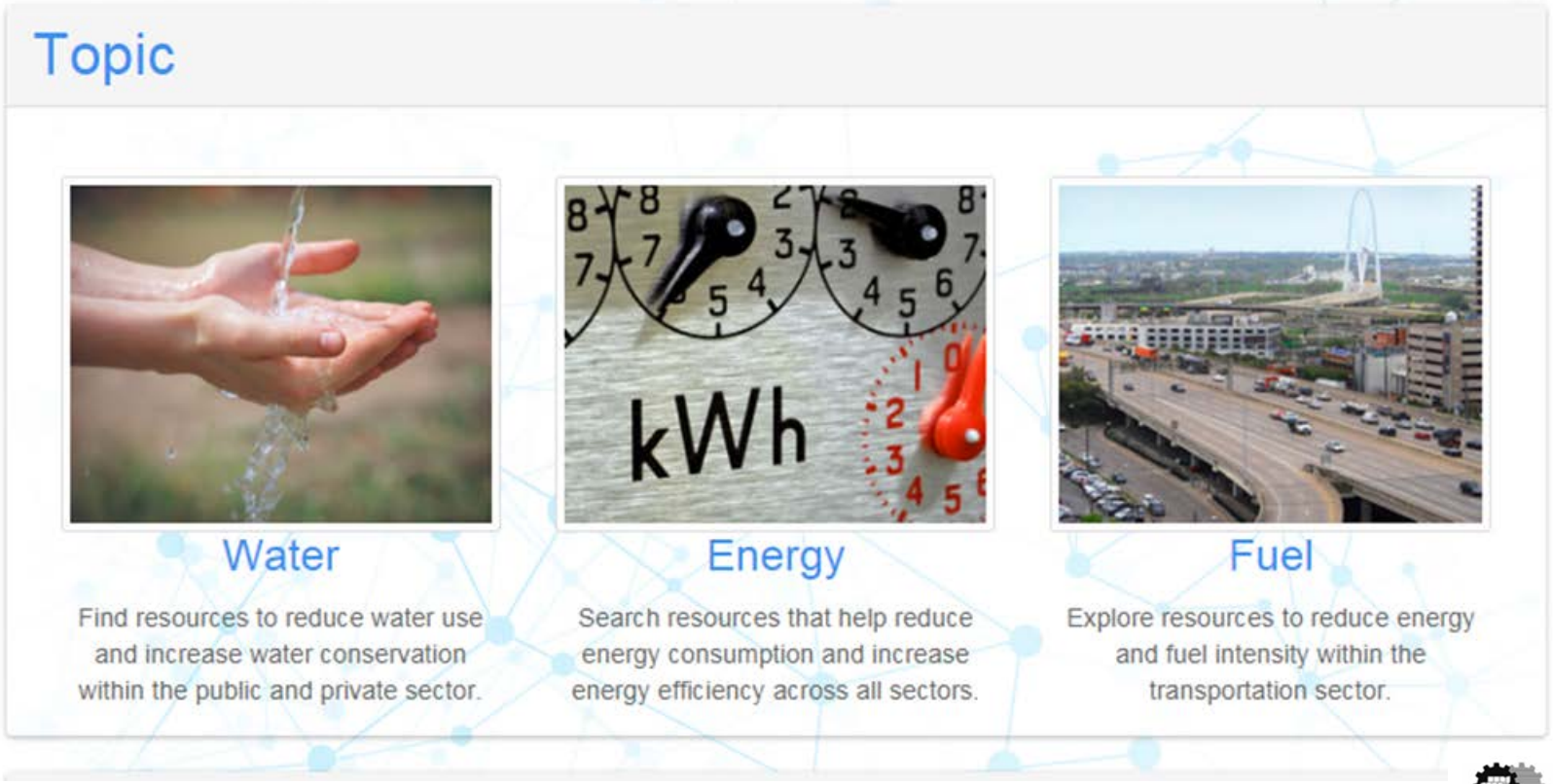
Conserve North Texas

Clearinghouse of Energy Efficiency, Water Conservation, and Transportation Resources

Resource Types:

- Programs
- Tools
- Calculators
- Case Studies

www.conservenorthtexas.org



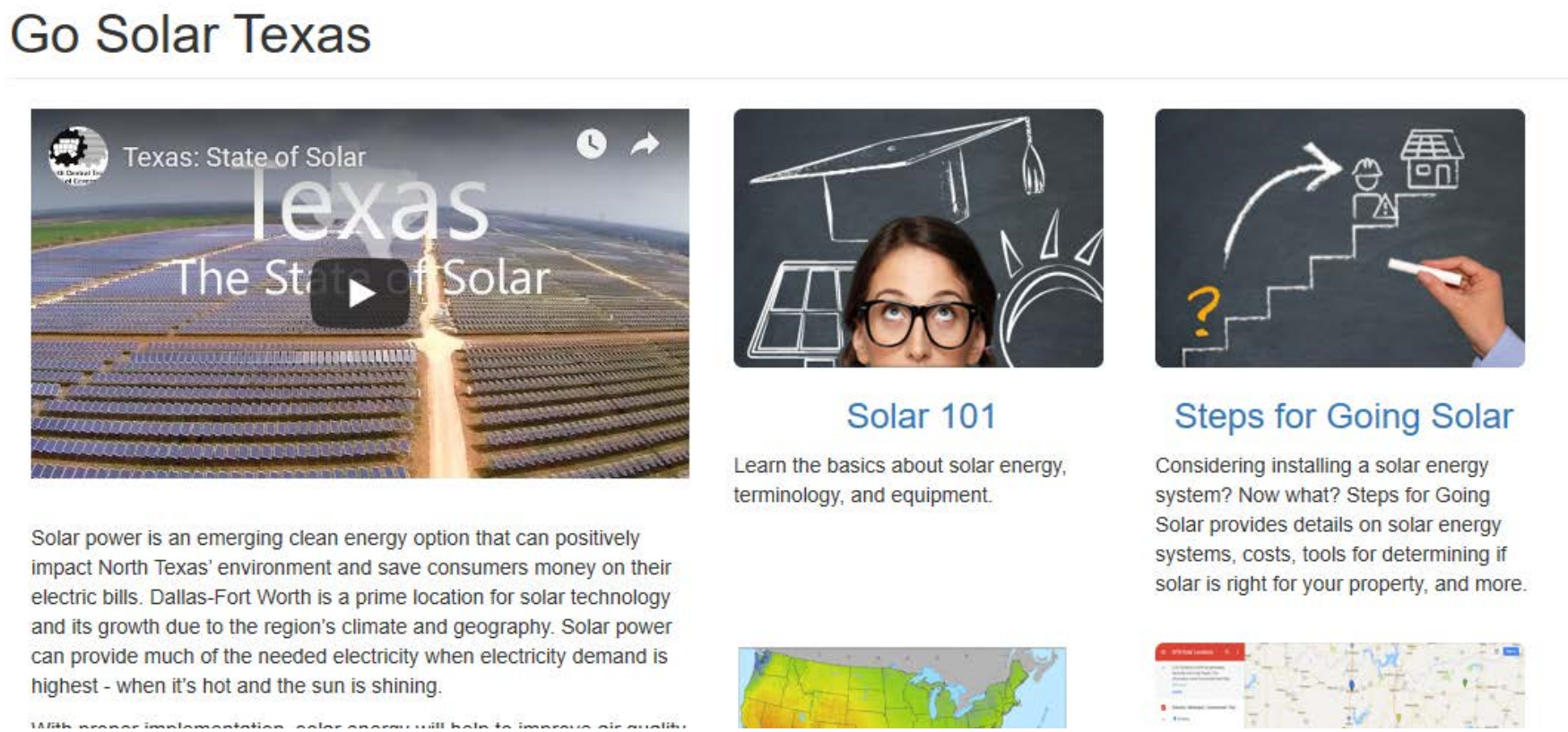
Go Solar Texas

Texas-Specific Information about Solar

Key Resource Types:

- Best Management Practices
- Cost Benefit Analysis
- Trainings
- Case Studies
- Meeting-in-a-Box

www.gosolartexas.org



SECO Resources

North Central Texas Council of Governments

About SECO

Mission Statement: To Increase the Efficient Use of Energy and Water While Protecting the Environment

Focus on Public Sector Facilities – Indirectly Benefitting Taxpayers

Support for Energy and Water Efficiency Project Implementation

- Education and Training
- Technical Assistance
- Project Financing

U.S. Department of Energy State-Level Program Conduit

- State Energy Program (SEP)

SECO Support

Training/Education

- Energy Codes (Workshops & Adoption Toolkit)

Technical Assistance

- Preliminary Energy Audits (K-12 & Local Governments)
- Virtual Energy Audits

Financing

- LoanSTAR Revolving Loan Program
- Energy Savings Performance Contract Guidelines & Education

https://comptroller.texas.gov/programs/seco

Programs

SECO State Energy Conservation Office

STATE ENERGY CONSERVATION OFFICE

SECO partners with Texas local governments, county governments, public K-12 schools, public institutions of higher education and state agencies, to reduce utility costs and maximize efficiency. SECO also adopts energy codes for single- family residential, commercial, and state-funded buildings.

Funding & Incentives

- SECO Funding Opportunities
- LoanSTAR Revolving Loan Program
- Other Funding Resources

Programs

- Alternative Fuels Program
- Clean Energy Incubators
- Industrial Energy Efficiency
- Innovative Energy Demonstration Program
- Local Governments Program
- Schools Program
- State Agency and Higher Ed. Program
- Pantex Program

Energy Codes

- Training & Code Compliance
- Energy Code Adoption Process
- Code Contacts
- Commercial & Multi-Family Construction
- Single-Family Construction
- State-Funded Buildings
- Local Ordinances
- Texas Water Conservation Standards

Energy Reporting

- State Agencies and Institutions of Higher Ed
- Local Government
- Utilities
- Schools

Resources

- Combined Heat and Power in Texas
- Energy Efficiency Best Practices Guide
- Energy Savings Performance Contracting
- SECO Reports

About Us

- Contact Us
- Sign up to receive updates

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LoanSTAR Revolving Loan

Finances Projects that Reduce Energy/Water/Utility Costs

- Simple Payback Period of 15 Years or Less
- 2% Loan Interest Rate; 1% if Choose ARRA Funds with More Reporting
- Maximum $8 Million Loan Per Application
- Maximum 3 Loans per Entity

Program Page:
https://comptroller.texas.gov/programs/seco/funding/loanstar/

Program Overview:
https://www.youtube.com/watch?v=4IFuj_5ZeGI

Other Energy Resiliency Planning Resources

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Local Government Energy Assurance Guidelines

Public Technology Institute

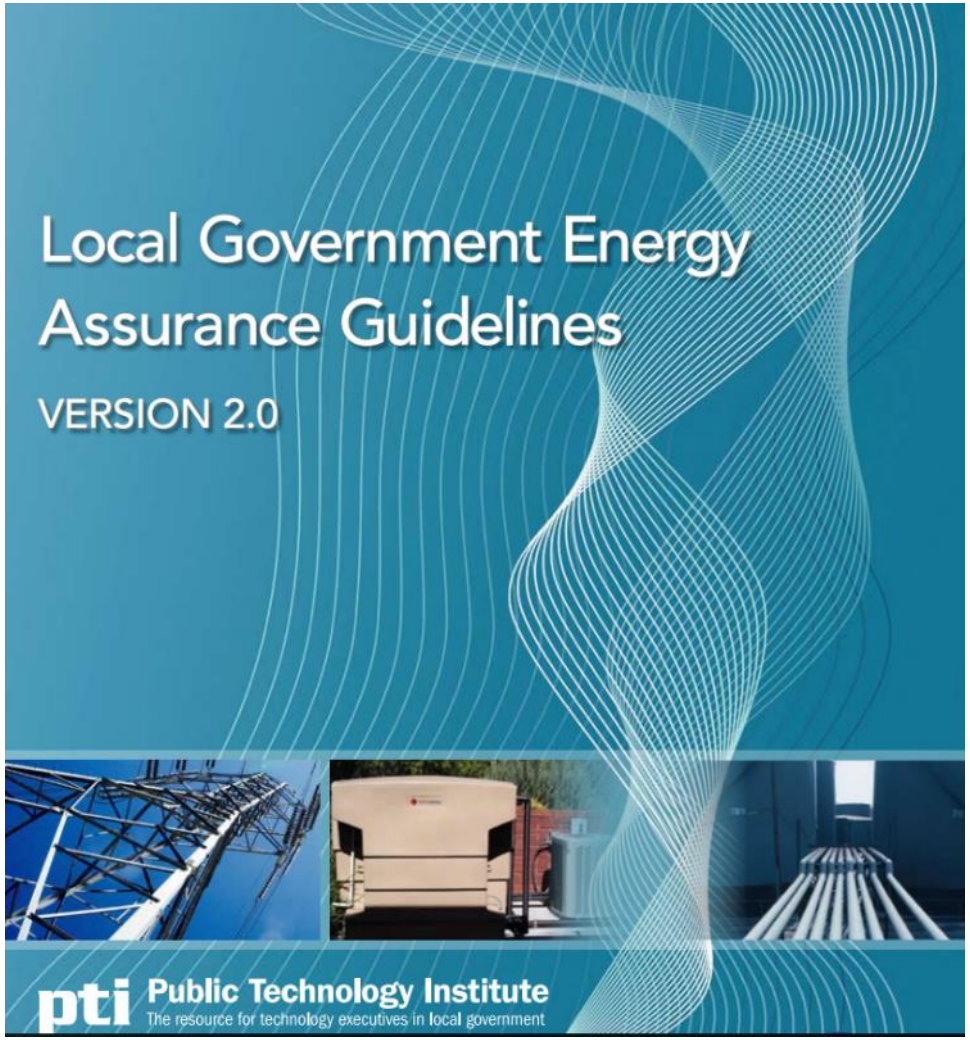
- The goal is to enable communities to make the transition to a pre-disaster planning and risk reduction approach.

- Assist local governments in planning for as well as responding to natural and man-made events and emergencies, often resulting in a decrease or total outage of energy that is needed to sustain critical functions and essential services within a community.

- Assist jurisdictions in the recovery phase, in which energy services vital to the health, welfare, and safety of the resident population are restored.

- Produced because very few local governments have a response and recovery plan that is specific to energy emergencies.

https://www.naseo.org/Data/Sites/1/documents/energyassurance/documents/pti_local_governement_energy_guidelines.pdf



Local Government Energy Assurance Planning Resources

https://sites.google.com/site/ptileap/publications

http://www.energyassurance.us/

American Council for an Energy-Efficient Economy (ACEEE):

Enhancing Community Resilience through **Energy Efficiency**

Enhancing Community Resilience through Energy Efficiency : Discusses ways in which energy efficiency can increase the resilience of energy systems and the communities they serve. It reviews the resilience-related benefits of:

- efficiency measures
- incorporation of efficiency into resilience planning
- presents four case studies showing how local governments and utilities can leverage energy efficiency to increase community resiliency

Table ES1. Resilience benefits of energy efficiency

Benefit type	Energy efficiency outcome	Resilience benefit
Emergency response and recovery	Reduced electric demand	Increased reliability during times of stress on electric system and increased ability to respond to system emergencies
	Backup power supply from combined heat and power (CHP) and microgrids	Ability to maintain energy supply during emergency or disruption
	Efficient buildings that maintain temperatures	Residents can shelter in place as long as buildings' structural integrity is maintained.
	Multiple modes of transportation and efficient vehicles	Several travel options that can be used during evacuations and disruptions
Social and economic	Local economic resources may stay in the community	Stronger local economy that is less susceptible to hazards and disruptions
	Reduced exposure to energy price volatility	Economy is better positioned to manage energy price increases, and households and businesses are better able to plan for future.
	Reduced spending on energy	Ability to spend income on other needs, increasing disposable income (especially important for low-income families)
	Improved indoor air quality and emission of fewer local pollutants	Fewer public health stressors
Climate mitigation and adaptation	Reduced greenhouse gas emissions from power sector	Mitigation of climate change
	Cost-effective efficiency investments	More leeway to maximize investment in resilient redundancy measures, including adaptation measures

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https://aceee.org/sites/default/files/publications/researchreports/u1508.pdf

National Institute of Standards and Technology (NIST)
Community Resilience Planning Guide for Buildings and Infrastructure Systems

Helps communities develop consistent resilience goals into their comprehensive, economic development, zoning, mitigation, and other local planning activities that impact buildings, public utilities, and other **infrastructure systems**

Volume I

Describes the six-step planning process

Volume II

Elaborates on how to characterize the social and economic dimensions of the community, any potential impacts and the infrastructure/building performance.

https://www.nist.gov/topics/community-resilience/planning-guide

Department of Energy (DOE) Better Buildings

Distributed Generation for Resilience Planning Guide

The U.S. Department of Energy Better Buildings Initiative developed the Distributed Generation (DG) for Resilience Planning Guide to provide information on how DG, with a focus on combined heat and power (CHP), can aid communities to meet their resiliency goals. The guide can be used by a variety of users, including decision makers, state and local policy makers and utilities to gain a better understanding on the role that DG and critical infrastructure (CI) in resiliency planning.

The Efficiency-Resilience Nexus

The Better Buildings Efficiency-Resilience Nexus describes energy-efficient technologies and practices that contribute to and increase resiliency.

Department of Energy (DOE)

Southcentral Technical Assistance Program with HARC

Promotes Combined Heat and Power (CHP) technology solutions for the industrial and manufacturing sector, critical infrastructure, institutions, commercial facilities, and utilities seeking to reap the many benefits of CHP.

CHP is increasingly recognized as a way to make facilities more resilient against power outages.

Houston Advanced Research Center (HARC) in The Woodlands, Texas has been awarded funding from the U.S. Department of Energy (DOE) to assist public and private entities considering CHP.

More information or to fill out interest survey:
https://www.harcresearch.org/work/CHP_TAP

Financial Tools & Resources

Better Buildings Financing Navigator

THIS NAVIGATOR HELPS YOU AVOID THE COMPLEXITY ASSOCIATED WITH SECURING APPROPRIATE FINANCING FOR YOUR ENERGY EFFICIENCY PROJECTS

Commercial property assessed clean energy (CPACE) Financing for Resiliency Toolkit

LEARN ABOUT AVAILABLE FINANCING THAT CAN BE USED TO FUND RESILIENCY IMPROVEMENTS TO MAKE BUILDINGS MORE RESISTANT TO NATURAL DISASTERS OR THREATS

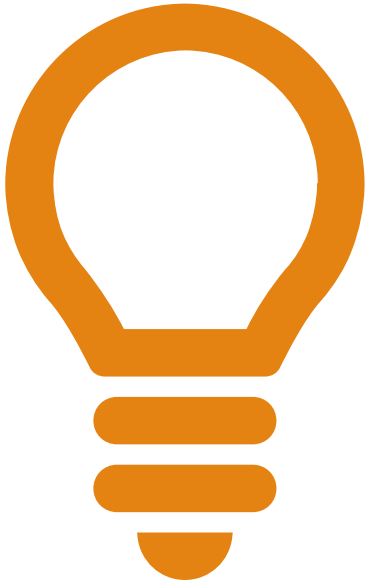
Additional Resources

Department of Energy (DOE) State and Local Solution Center

- Explore resources related to energy planning, financing energy initiatives, accessing energy data and designing energy programs.

National Renewable Energy Laboratory's REopt Lite Tool

- This free tool evaluates the viability of on-site grid-connected photovoltaic, wind, and battery storage, potential battery dispatch and size, and the critical load a system can sustain during a grid outage.



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Texas Property Assessed Clean Energy (TX-PACE) Program

TX-PACE facilitates the use of private capital to finance water conservation**, energy efficiency**, **resiliency**, and **distributed generation** projects to eligible properties

PACE is a voluntary program that can be used for the following property types.

ELIGIBLE PROPERTIES

COMMERCIAL REAL PROPERTY

Including non-profit real property such as private schools, medical facilities, churches, etc.

INDUSTRIAL REAL PROPERTY

Including privately owned agricultural real property.

Industrial Flyer

MULTIFAMILY RESIDENTIAL REAL PROPERTY

Residential real property with five or more dwelling units.

As of August 2021, PACE in North Texas Programs:

- Corinth
- Dallas
- Farmers Branch
- Princeton
- Prosper
- Erath County
- Navarro County
- Tarrant County

Eligible Improvements:

Chillers, boilers, and furnaces • HVAC, BMS, BAS, EMS controls • Lighting • Water heating systems • Energy management systems and controls • Roofing • Windows • Doors • Insulation • Elevator modernization • Pool equipment • Cogeneration or combined heat and power • Heat recovery and steam traps • Solar panels • Wind turbines • Water management systems and controls • Irrigation equipment • Rainwater collection systems • Toilets • Faucets • Greywater systems... and more!

Source: https://www.texaspaceauthority.org/wp-content/uploads/public-sector-2018-11-19.pdf

www.TexasPACEAuthority.org

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