# Building Energy Resilience

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Senior Director, Regulatory Affairs, National Rural Electric Cooperative Association

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Executive Director, Puerto Rico Central Office of Recovery, Reconstruction and Resilience

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Vice President, Grid Strategy, LUMA

Ben Bolton
Senior Energy Programs Administrator, Tennessee Department of Environment and Conservation


Tom Hughes
State Hazard Mitigation Officer, Pennsylvania Emergency Management Agency; Lead, NEMA SHMO Subcommittee

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# Energy Resilience Workshop

## Puerto Rico's Moonshot Opportunity

**03.18.24**

**Manuel Laboy, PE, MBA**
**Executive Director, COR3**
**Governor's Authorized Representative (GAR)**

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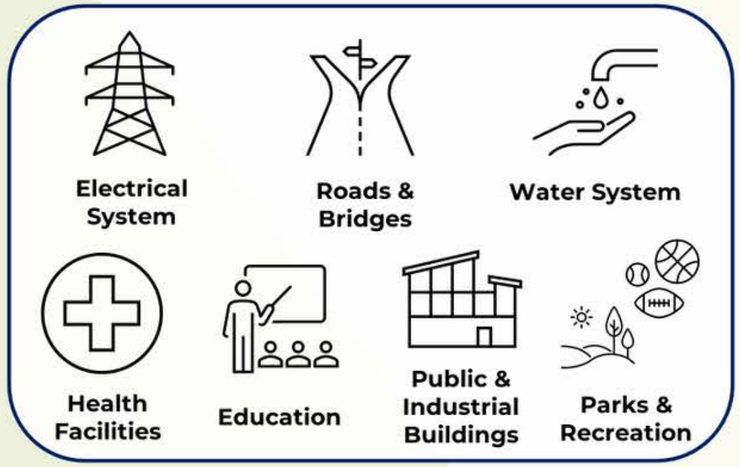
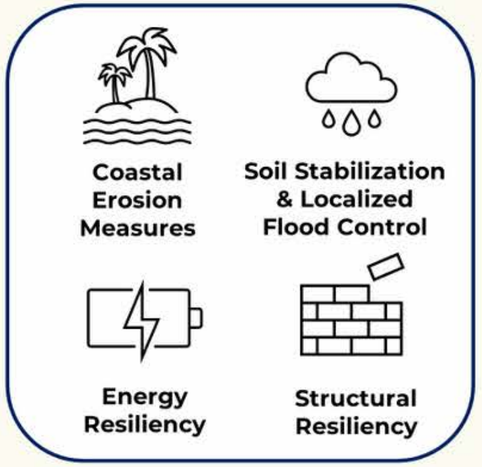
# **Modern Infrastructure, Resilience and Sustainability** are the foundations for Puerto Rico's Economic Development




## Public Assistance

**Permanent Work Sections 406 & 428**

Repair, Restore or Replace Damaged Facilities after Natural Disasters




## HMGP

**Section 404**

Mitigate Future Hazards and Build Climate Resiliency

## Public Assistance

**Permanent Work Sections 406 & 428**

Obligated (Federal + Cost Share) for María, Earthquakes and Fiona Disasters

**$28 Billion**

## HMGP

**Section 404**

Allocated Funding (Federal + Cost Share) for Irma, María, Earthquakes, COVID and Fiona Disasters

**$5 Billion**

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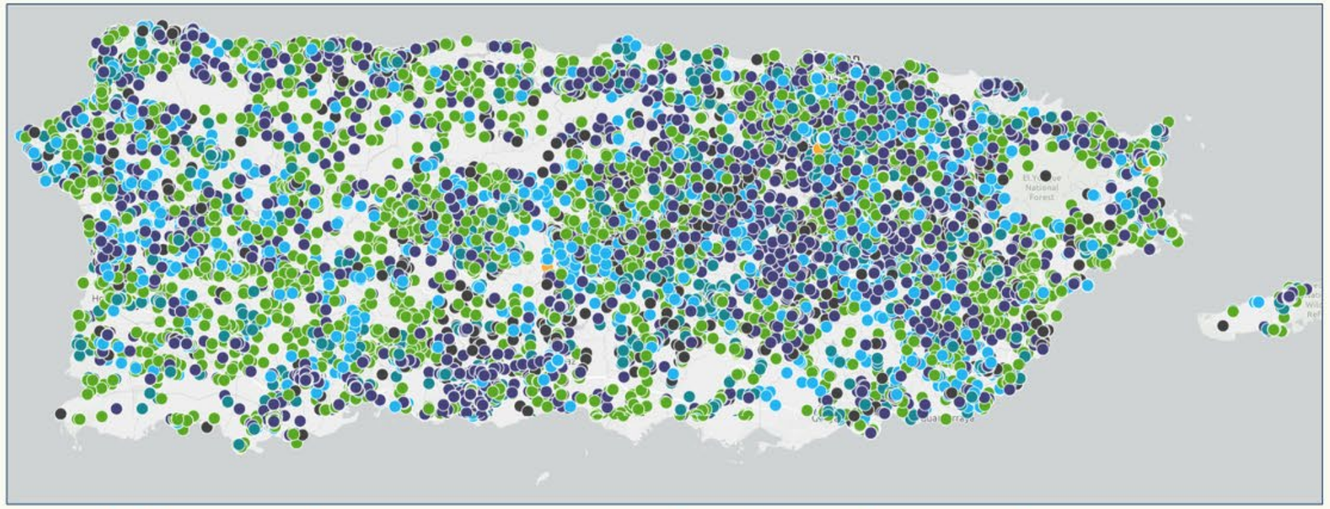
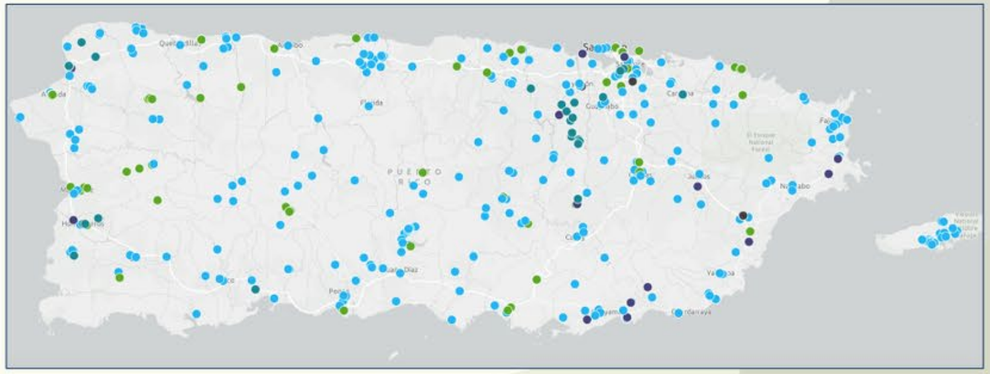
# **Puerto Rico's Road to Long-Term Recovery and Resilience is Full Steam Ahead:** María (2017), Earthquakes (2020) and Fiona (2022)



## Public Assistance (María, Earthquakes)

**Permanent Work Sections 406 & 428 (>9,500 PW's, >24,000 DI's)**

## PA (Fiona) >800 PW's, >1,400 DI's



## HMGP > 171 projects – Phase 1, Phase 2, Full

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# **$18 Billion FEMA Funding** under María DR (428/406) has been obligated and/or allocated for Puerto Rico's **Electrical Infrastructure**

## COR3

**Recipient & Pass-Thru Entity**

## PREPA

**Sub-Recipient; Responsible for Water Assets and Hydro Power**

## LUMA Energy

**Agent acting on behalf of PREPA; Responsible for Transmission & Distribution O&M**

## Genera PR

**Agent acting on behalf of PREPA; Responsible for Legacy Generation Assets O&M**

# Transmission & Distribution Projects

## Public Assistance 428/406

### Equipment & Materials

A Project Worksheet obligated to allow the procurement of Long Lead Items and critical components while construction projects are authorized by FEMA, from transformers to peaking units and battery energy storage.

### Substations & Transmission Lines

Multiple projects to repair and build new substations, transmission centers, switchyards and transmission lines island-wide.

### Advance Metering Infrastructure (AMI)

1.5 million customers; obtain accurate data; prevent power outrages; allow Virtual Power Plant and Battery Emergency Demand Response projects.

### One-Time Vegetation Clearance

A mitigation measure targeted to reduce 70% of current power outrages due to hurricane María island-wide devastation.

### Energy Management System (EMS)

Monitors and controls the distribution of power across transmission system and support infrastructure; a crucial element to integrate renewables and battery storage

### Micro-Grid for Vieques & Culebra

Installation of Solar PV + BESS to infuse reliability and resiliency to these Island-Municipalities.

# Generation & Renewable Energy Projects

## PA & HMGP 406/404

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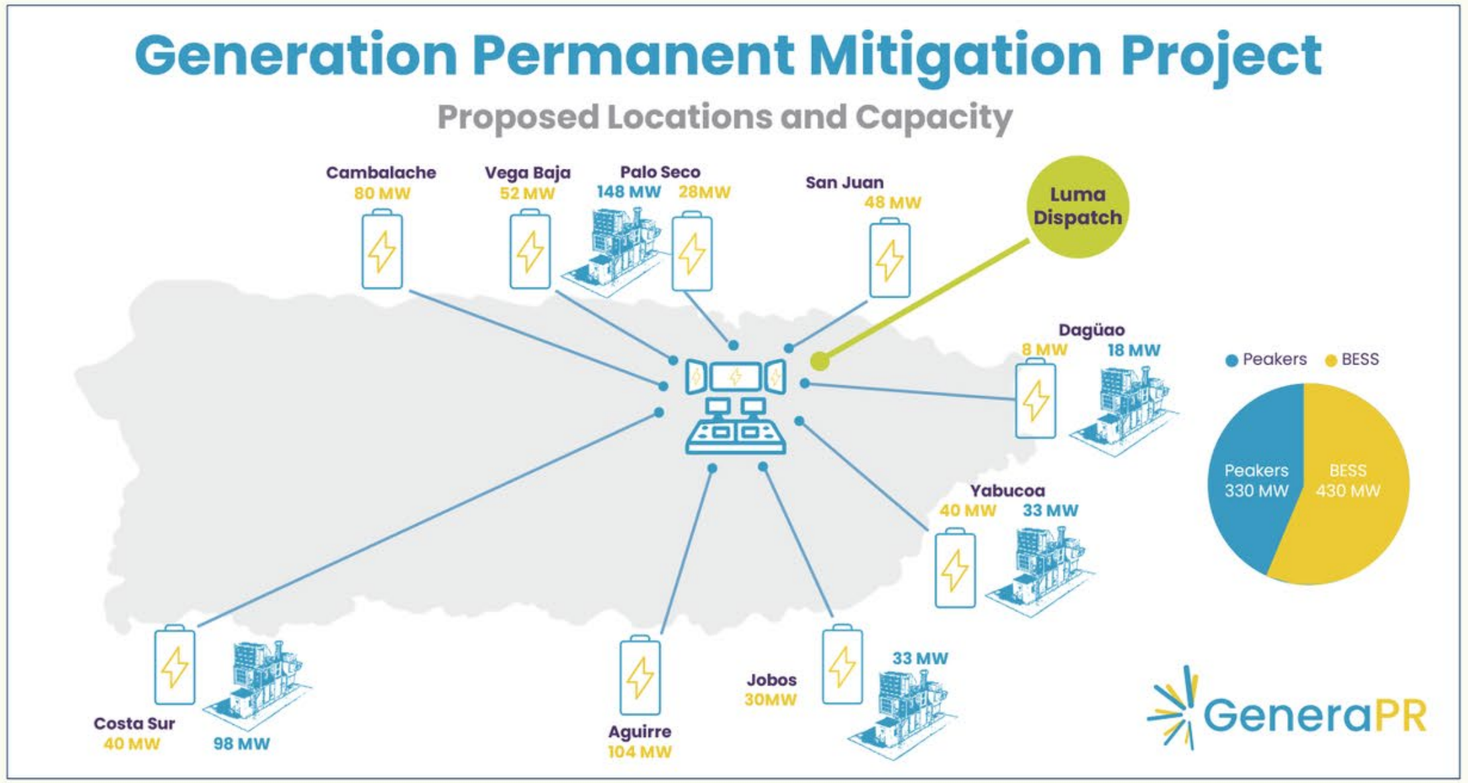
## Grid Stabilization Centers

### Blackstarts & Peakers

Four (4) Blackstarts and eleven (11) peakers to provide redundancy and synchronous condenser capabilities to mitigate risks from grid disturbances (voltage regulation, short-circuit strength). **Hydrogen-ready systems**.

### Battery Energy Storage

BESS will offer immediate response for fast spinning reserve, frequency, and voltage variations caused by disasters, mitigating the risk of blackouts and providing critical energy services during prolonged generation deficiencies.



# Generation & Renewable Energy

Projects (cont.)

## PA & HMGP 406/404

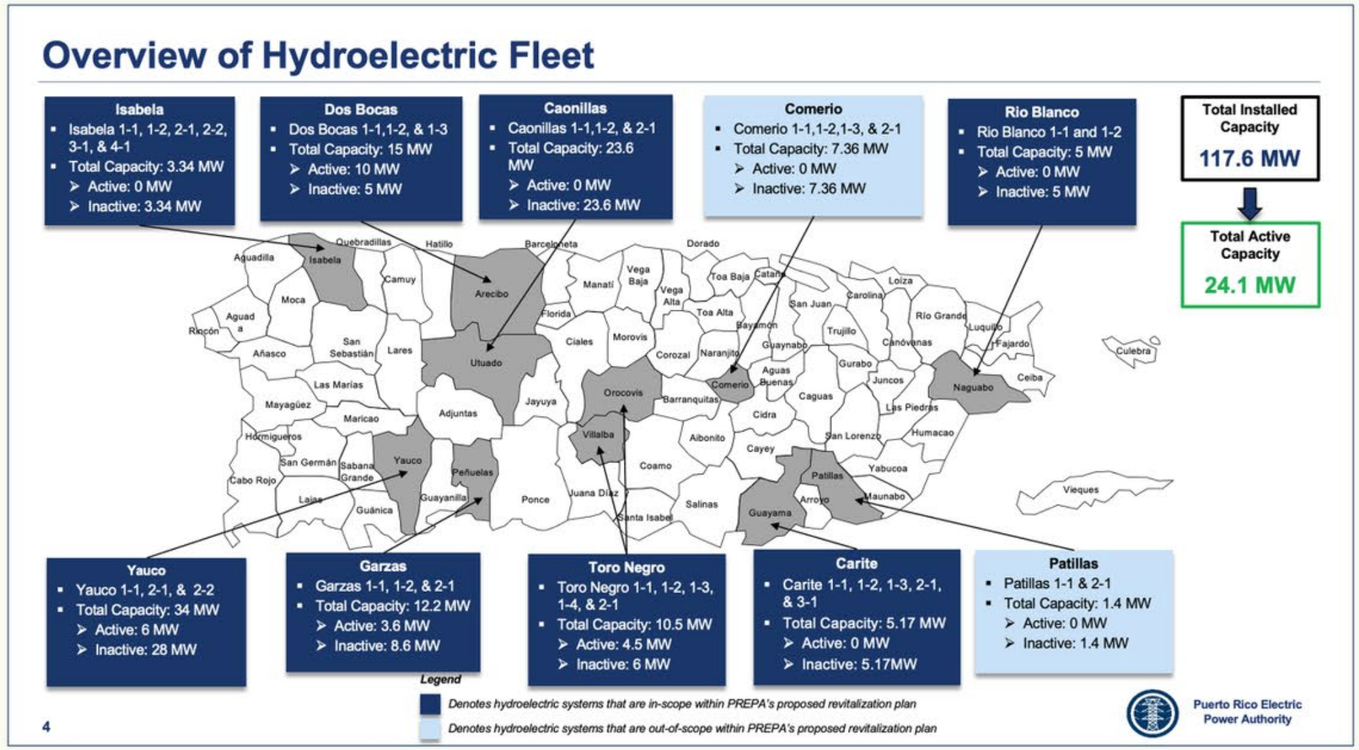
## Hydropower Fleet Retrofit (16 Facilities)

### Project #1

**Ten (10)** hydroelectric facilities to be enhanced to ensure hurricane protection, operational efficiency, and power supply reliability. This will enable PREPA to operate the plants in **island-mode (as microgrids)**.

### Project #2

**Six (6)** hydroelectric facilities to be enhanced to ensure hurricane protection, operational efficiency, and power supply reliability. This will enable PREPA to operate the plants in **island-mode (as microgrids)**.

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# Generation & Renewable Energy Projects (cont.)

## PA & HMGP 406/404

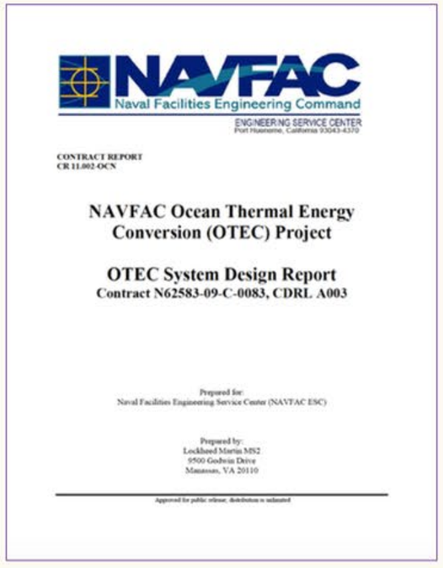
# Ocean Thermal Energy Conversion (OTEC)

## 10 MW Offshore Plant

Mitigate loss of power and provide **baseload (24 hours/7 days a week) renewable/clean** electric power to critical infrastructure and facilities off the southeast coast of Puerto Rico (Yabucoa), where hurricane María entered in 2017. Conceptual design and cost based on Lockheed Martin/NAVFAC work.

## Natural Disaster Recovery

Marine Energy (like OTEC) could **aid natural disaster recovery in certain places like Puerto Rico, USVI, HI and Guam** by providing affected communities with a resilient source of energy. Supported by **NOAA, NREL and PNNL**. Aligned with recent **FEMA action** to help communities reduce greenhouse gas emissions, building back stronger, cleaner and more resilient.


NAVFAC
Naval Facilities Engineering Command
ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

CONTRACT REPORT
CR 11.002-OCN

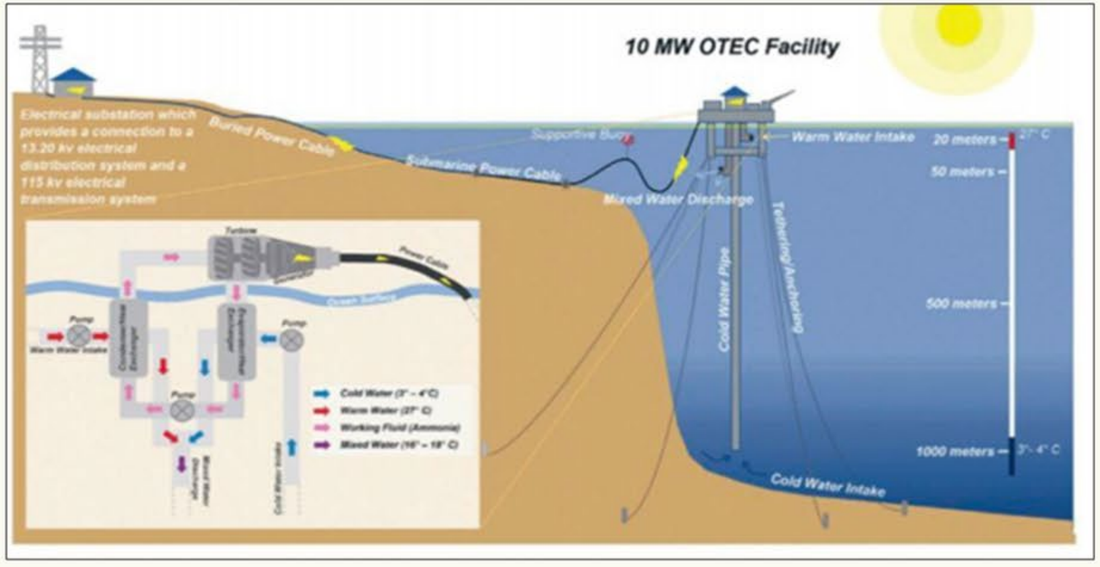
**NAVFAC Ocean Thermal Energy Conversion (OTEC) Project**

**OTEC System Design Report**
**Contract N62583-09-C-0083, CDRL A003**

Prepared for:
Naval Facilities Engineering Service Center (NAVFAC ESC)

Prepared by:
Lockheed Martin MS2
9500 Godwin Drive
Manassas, VA 20110

Approved for public release; distribution is unlimited



# **An Energy Integrated Resilience Plan** was requested by FEMA to ensure mitigation measures are articulated in a comprehensive manner

## Holistic Approach

**Projects under Sections 404 & 406**

## Multiple Assets

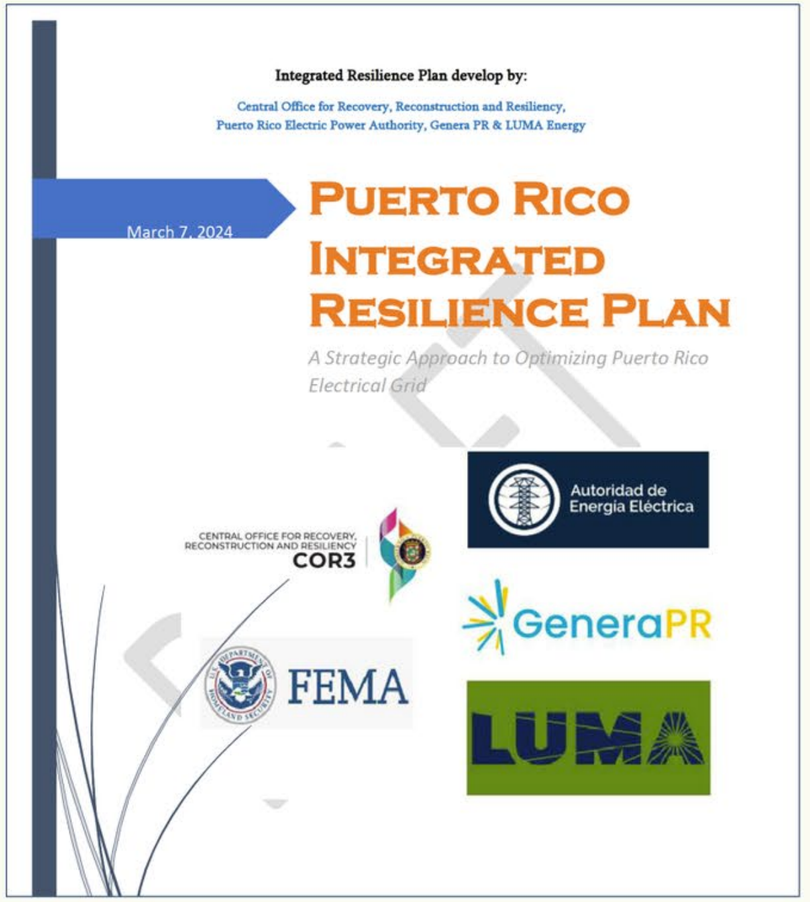
**Generation, Transmission & Distribution, and Water**

## Island-wide Benefits

**Considers direct and indirect benefits across asset categories**

## Reliability & Performance

**Improvements to reduce vulnerability to future major disasters**




## Draft Plan

**Submitted to FEMA on 3/11/24**

# On February 7, 2024, **the Department of Energy** presented the final results for the **PR100 Study**

## Federal Partnership

**Financed by FEMA, prepared by the National Renewable Energy Lab**

## Long Term Plan

**Roadmap to achieve 100% renewable energy power by 2050**

## State Policy

**In accordance with Puerto Rico Law 17 of 2019**

## Diversified Portfolio

**Utility scale and distributed energy; recognizes potential and resources for marine energy**

PR100

Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study (PR100)

# Thank you!

**Recovery.pr.gov**

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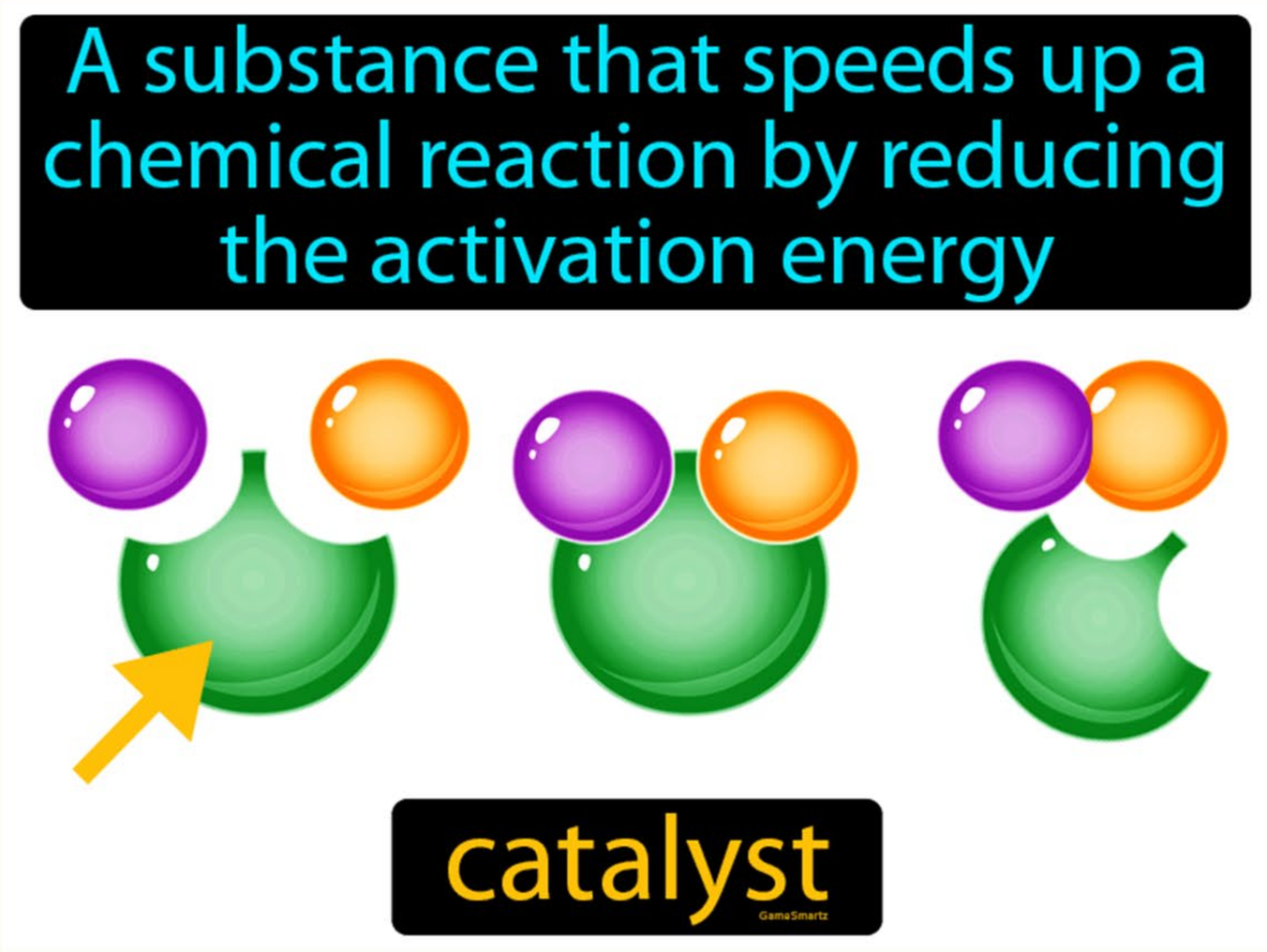
# Being A Catalyst: The Tale of an Embedded State Energy Official

**Ben Bolton, NEMAA** | Senior Energy Programs Administrator

# U.S. Department of Energy Acknowledgement and Disclaimer

**Acknowledgement:** This information, data, or work presented herein was funded in part by the Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy, under Award Number DE-EE0009487.

# Be a Catalyst




Source: Gamesmartz.com

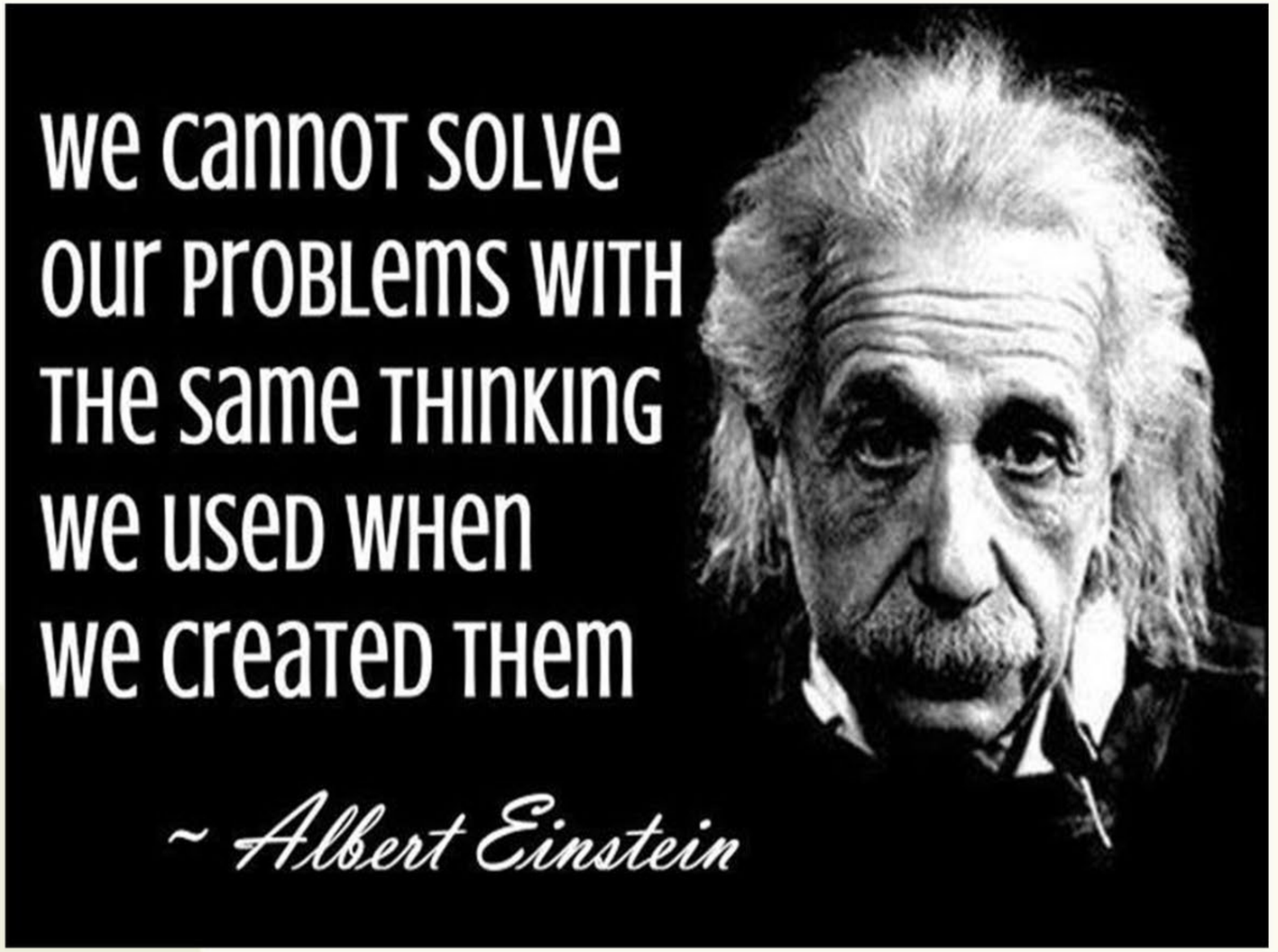
# Colonial Pipeline Leak in September, then October 31st explosion

NEWS

**Emergency Declaration Made To Avoid Petroleum Supply Disruptions**



**Several injured in explosion near site of AL gas leak**

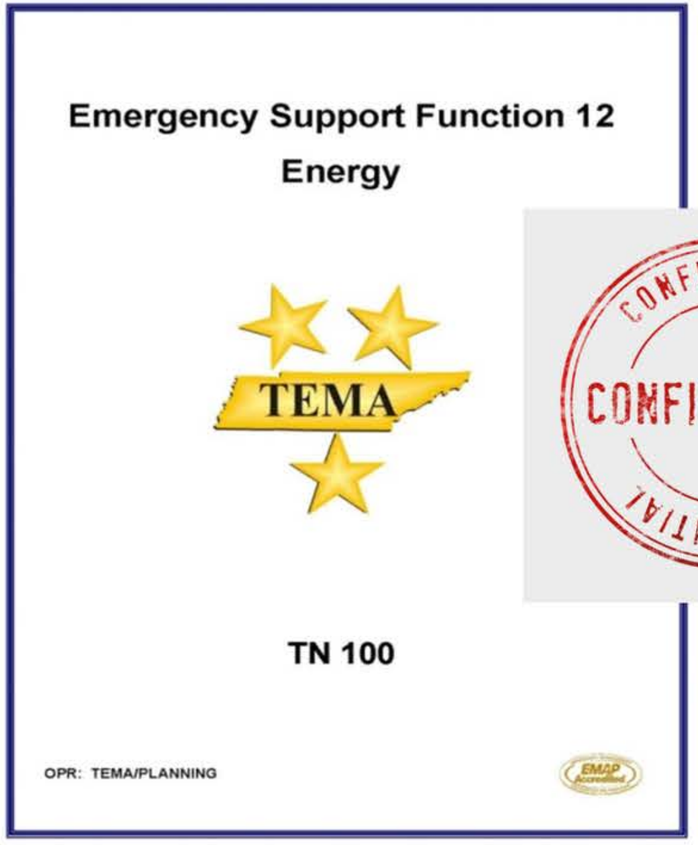

we cannot solve
our problems with
the same thinking
we used when
we created them
~ Albert Einstein

# Energy Security Legal Authority & Confidentiality Clause

## Tennessee Code Annotated:

- 4-3-510 The Office of Energy Programs has the duty and responsibility to…

  (5) promote state and local energy emergency preparedness in coordination with other appropriate state agencies, such as the military department;
- 4-3-513 Office of Energy Programs -- Set-aside program for petroleum products
- 4-3-514 Office of Energy Programs -- Additional powers – Confidentiality
  - (b)(1) The office shall maintain the confidentiality of all proprietary information it may acquire.




# Energy Security Program 101

## Energy Security Plan

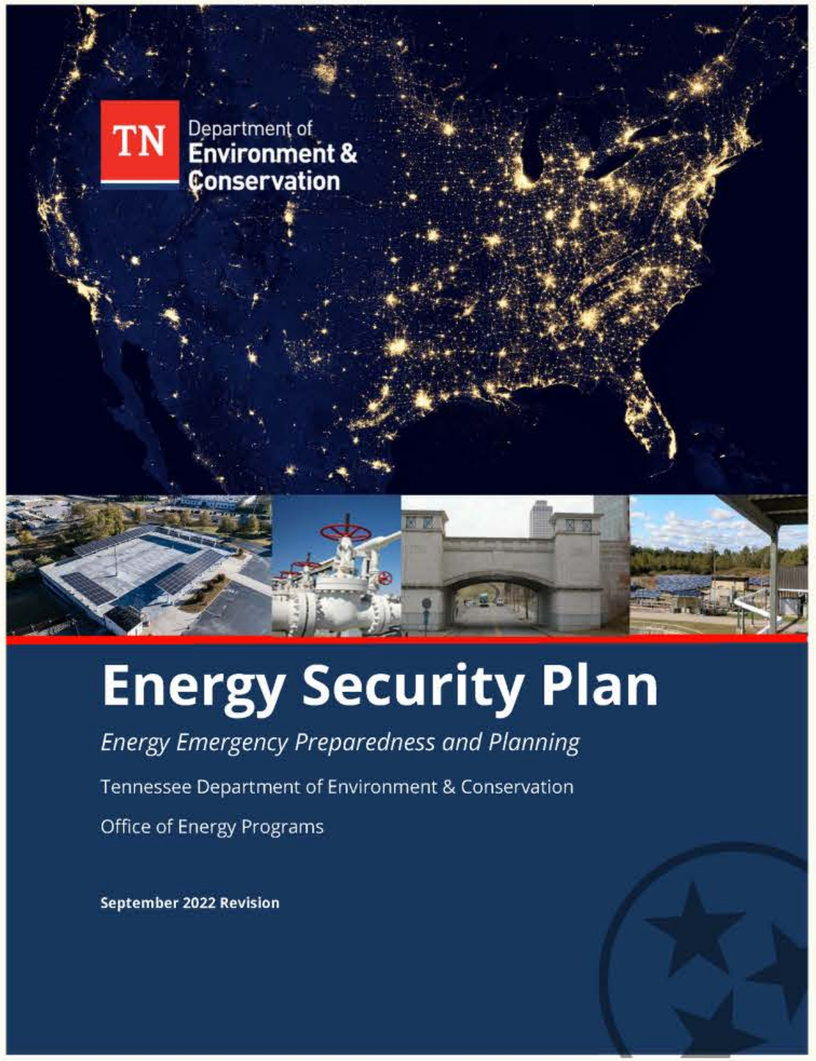
Facilitate energy emergency preparedness and planning to create a rapid response capability for recovery from disasters.

- Outlines the State's responsibilities during an energy emergency, and the coordination of federal and State resources, when required.
- 2022 Revision: Cyber, All Hazards, Mitigation, Risk Profile
- New Infrastructure Investment and Jobs Act requirements. Section 40108

## Petroleum Shortage Response Guidance

Provides plan to manage a motor fuel shortage with the least disruption to the economy.

- Modular with contingency options



## Energy Security Program 101

A great program relies on

- Relationships
- Training
- Planning
- Responding


**“The challenge is the future doesn’t look like the past.”**

- Randall Spalding-Fecher, energy advisor

# Mission Moon Pie, 2019


**Fuel Disruption Tabletop Exercise**
**70 participants**

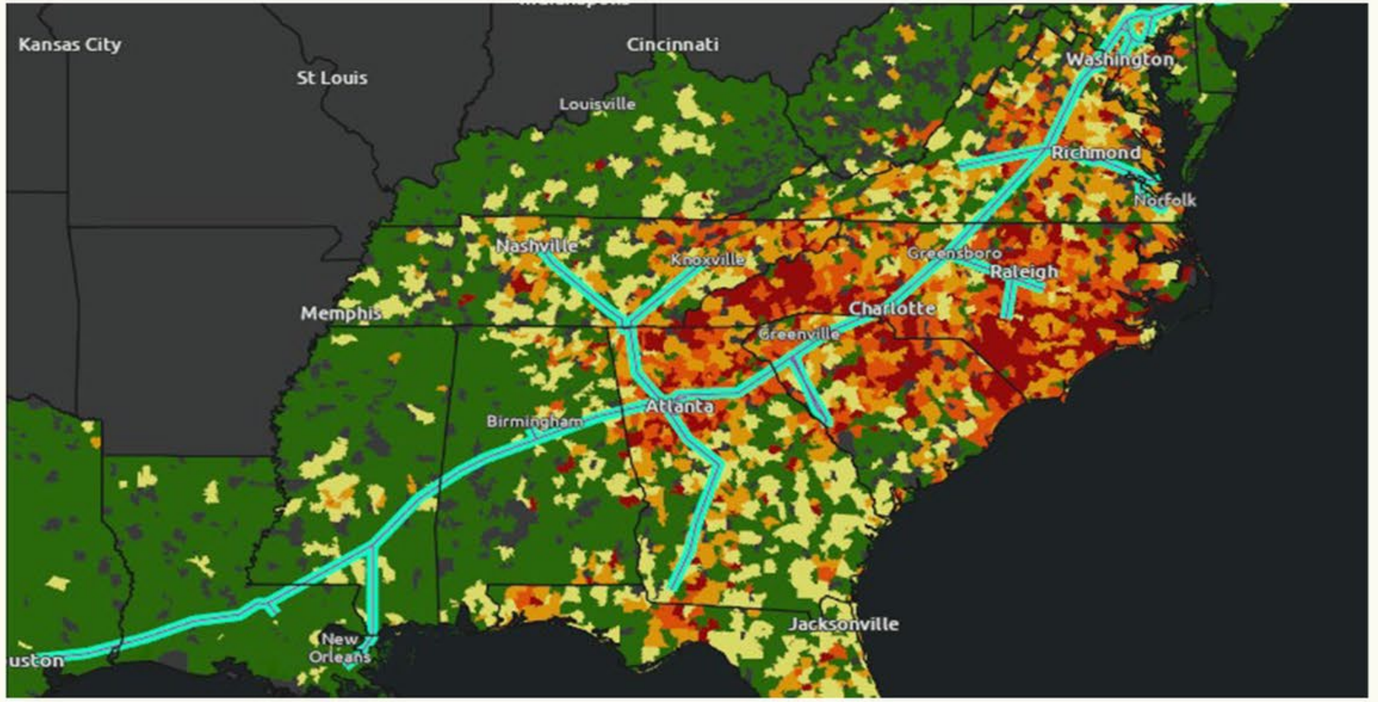
- 4 Federal agencies
  - DOE, TVA, FMCSA, CISA
- 6 State agencies
- 7 local governments
- 5 private sector fuel partners
- 3 NGOs
- 2 PIOs

**State Energy Officials from 5 states**

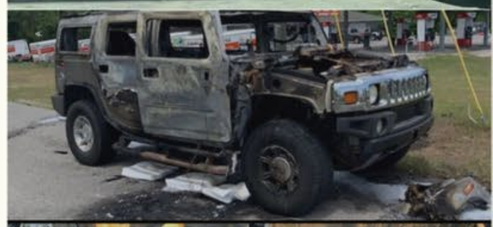
**SitMan and materials available to other states upon request.**

# “Nashville suffered less than regional cities throughout Colonial Pipeline shutdown”

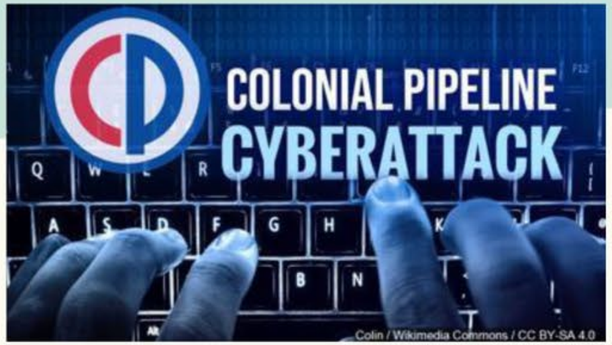
-Janey Camp, P.E. Ph.D, Vanderbilt University Center for Transportation and Operational Resiliency





# Regional Messaging




Governor Ralph Northam Retweeted

**Virginia Department of Emergency Management** @VDEM · 3h

Remember when it wasn't a good idea to panic buy toilet paper last year? Please don't do it with gas now. This can create spot shortages at stations, which is what we DON'T want to happen. Colonial Pipeline hopes to resume normal operations soon.


AAA Mid-Atl VA News and 2 others

77 659 1.1K

**T_E_M_A** @T_E_M_A · 2h

Please don't panic buy gas. This can create shortages at stations. Only buy what you need and NEVER use unapproved containers for fuel.

> **US Consumer Product Safety Commission** @USCPSC · 5h
> Do not fill plastic bags with gasoline.
> Show this thread

**Governor Roy Cooper** @NC_Governor · May 11

I have talked today with federal officials including Energy Secretary Jennifer Granholm and we have a full court press to get the Colonial Pipeline back up and fully operating quickly. Report price gouging and please don't rush to top off your tanks. – RC

295 836 2.7K

Pinned Tweet

**GA AG Chris Carr** @Georgia_AG · May 11

CONSUMER ALERT:

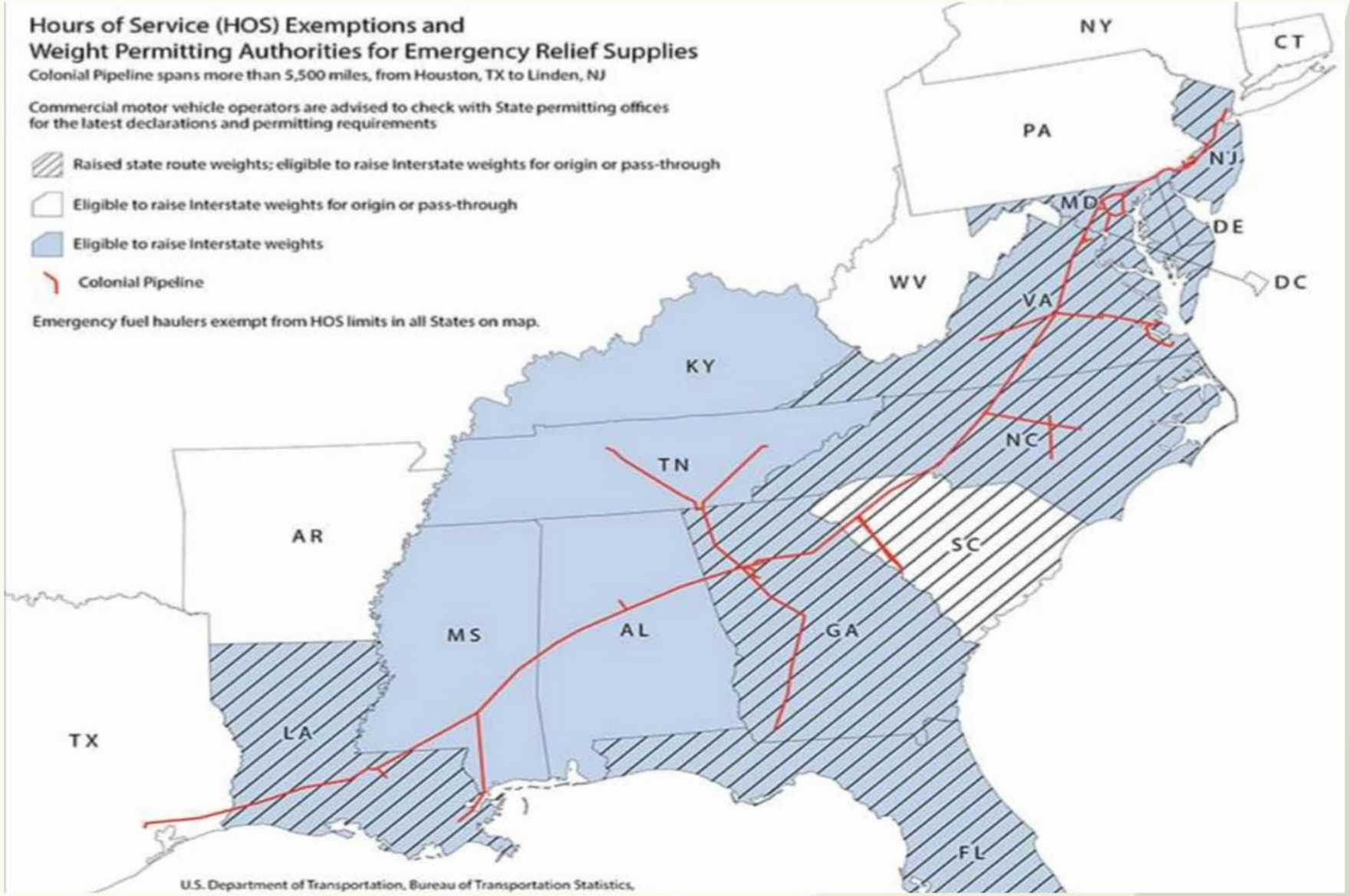
@GovKemp has declared a State of Emergency as a result of the petroleum shortage from the May 7, 2021 cyber-attack on the Colonial Pipeline.


**Governor Kay Ivey** @GovernorKayIvey · May 11

Spoke w/ @ENERGY earlier re: the #pipelinecyberattack Folks, it should be operational in a few days. Please do not fill up your car unless you need to and do not fill multiple containers. Overreacting creates more of a shortage. Please use common sense and patience! #alpolitics

50 357 726

# Regional Response

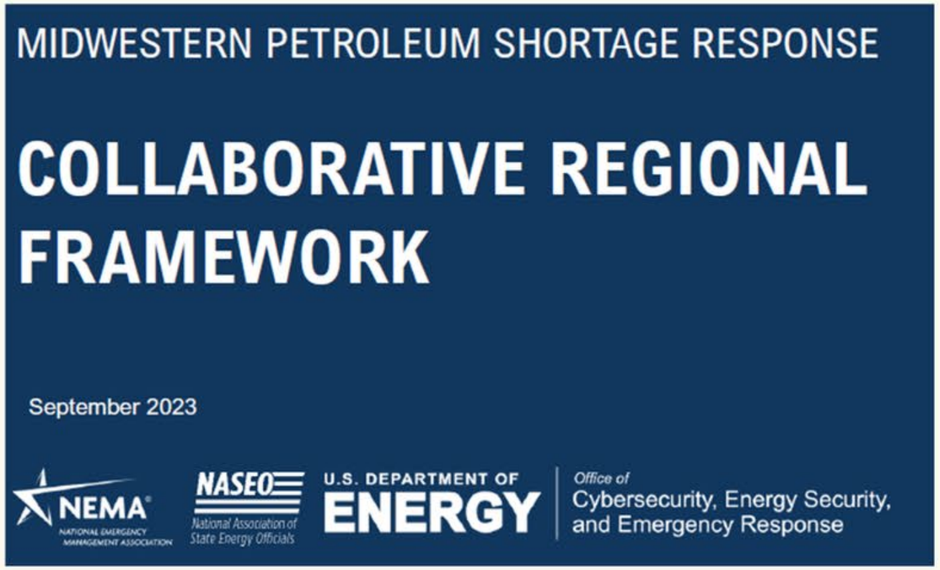
# Regional Petroleum Shortage Collaborative

**NEMA, NASEO, and DOE facilitated**

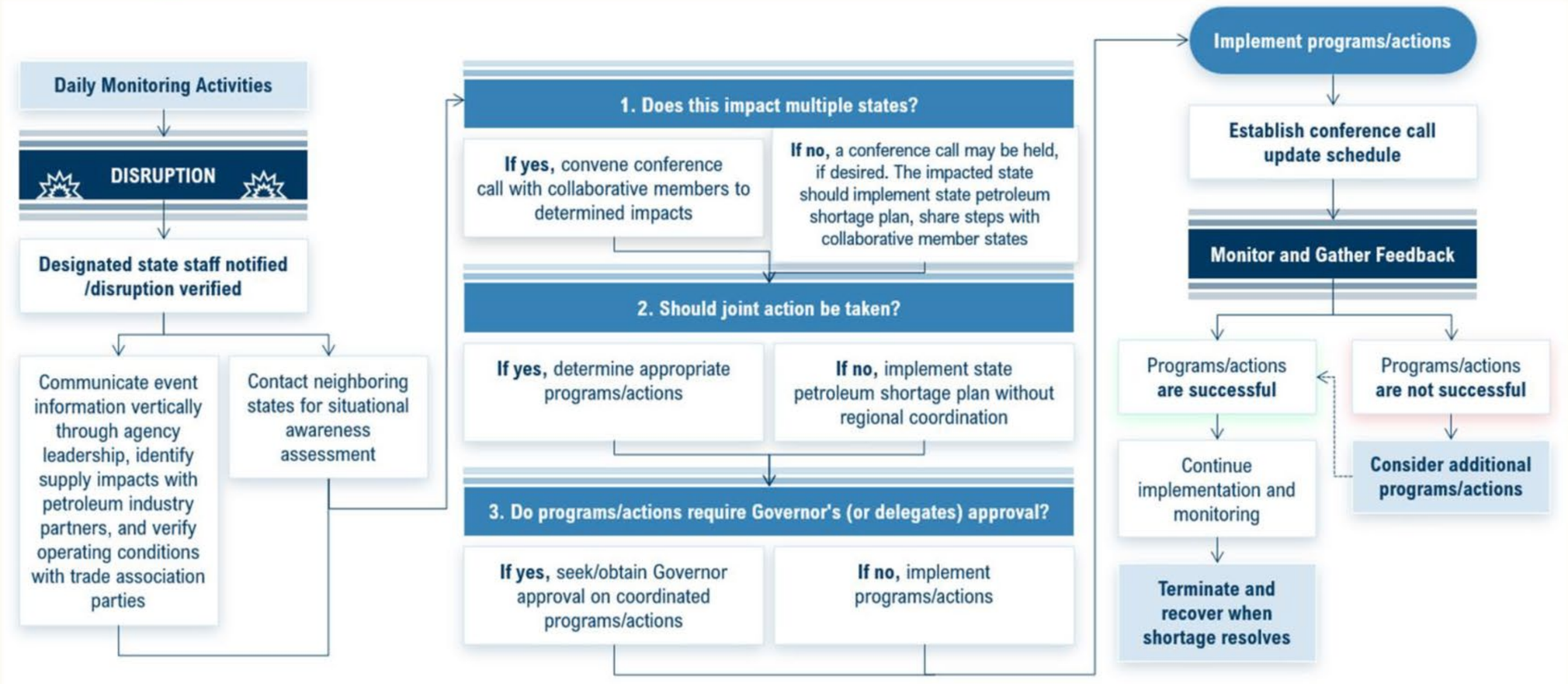
- Western region states developed a petroleum collaborative to respond to energy emergencies
- Southeast and Midwest developed same in 2022-2023.

**NASEO Petroleum Shortage Resources**

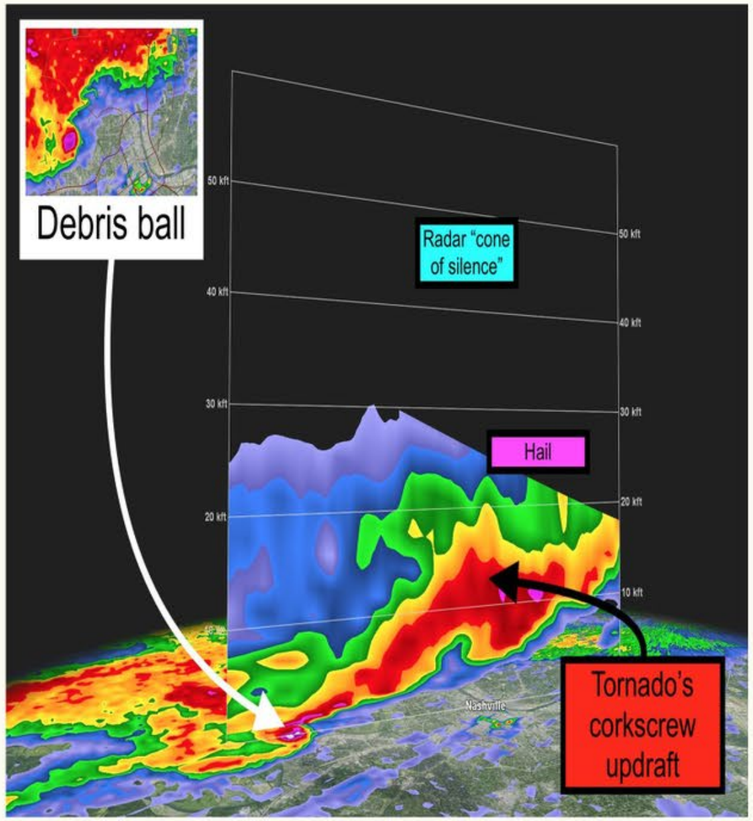
https://www.naseo.org/petroleum-shortage-response-planning



# Regional Coordination for Response

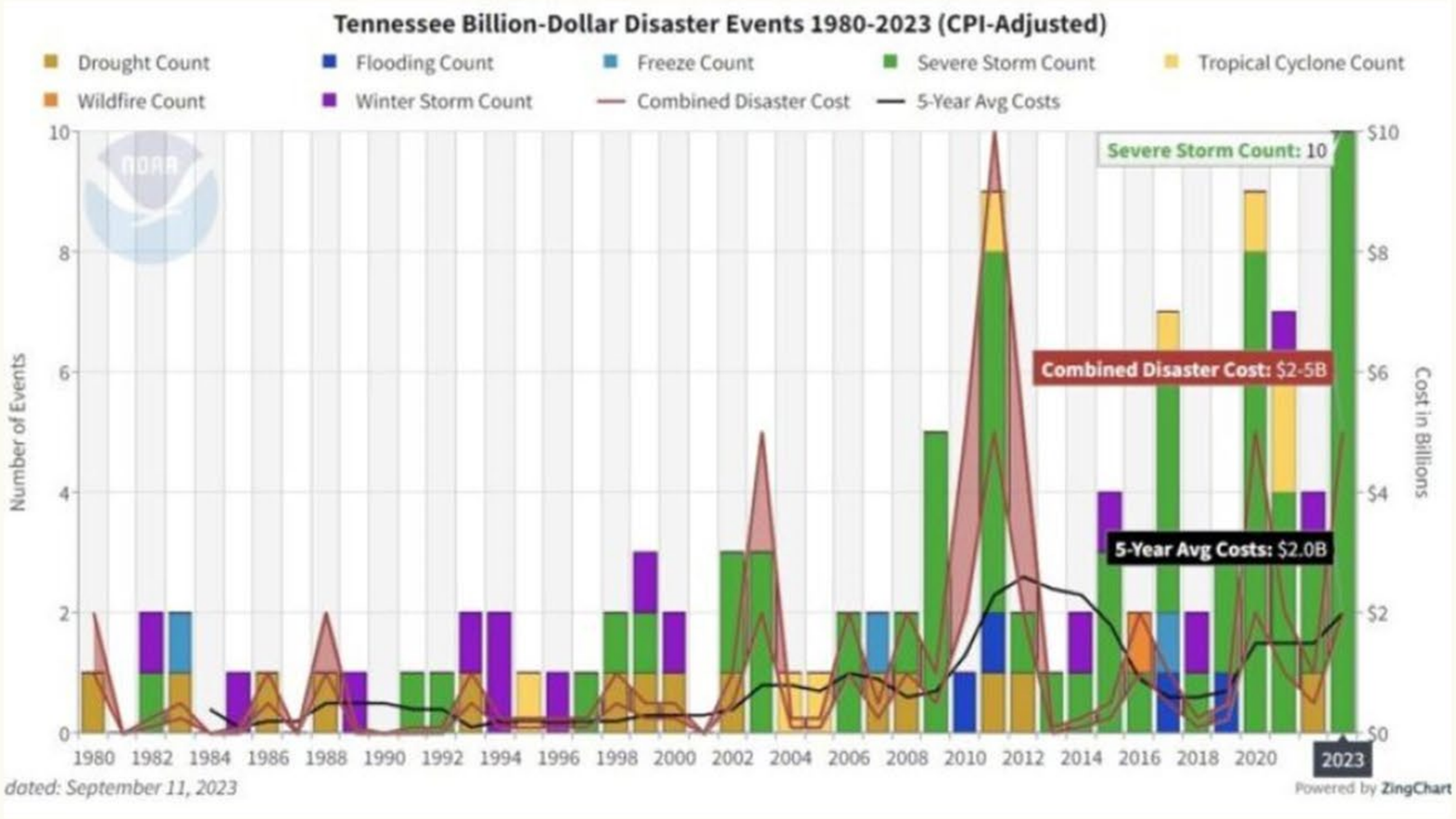


# March 3rd 2020 Tornados



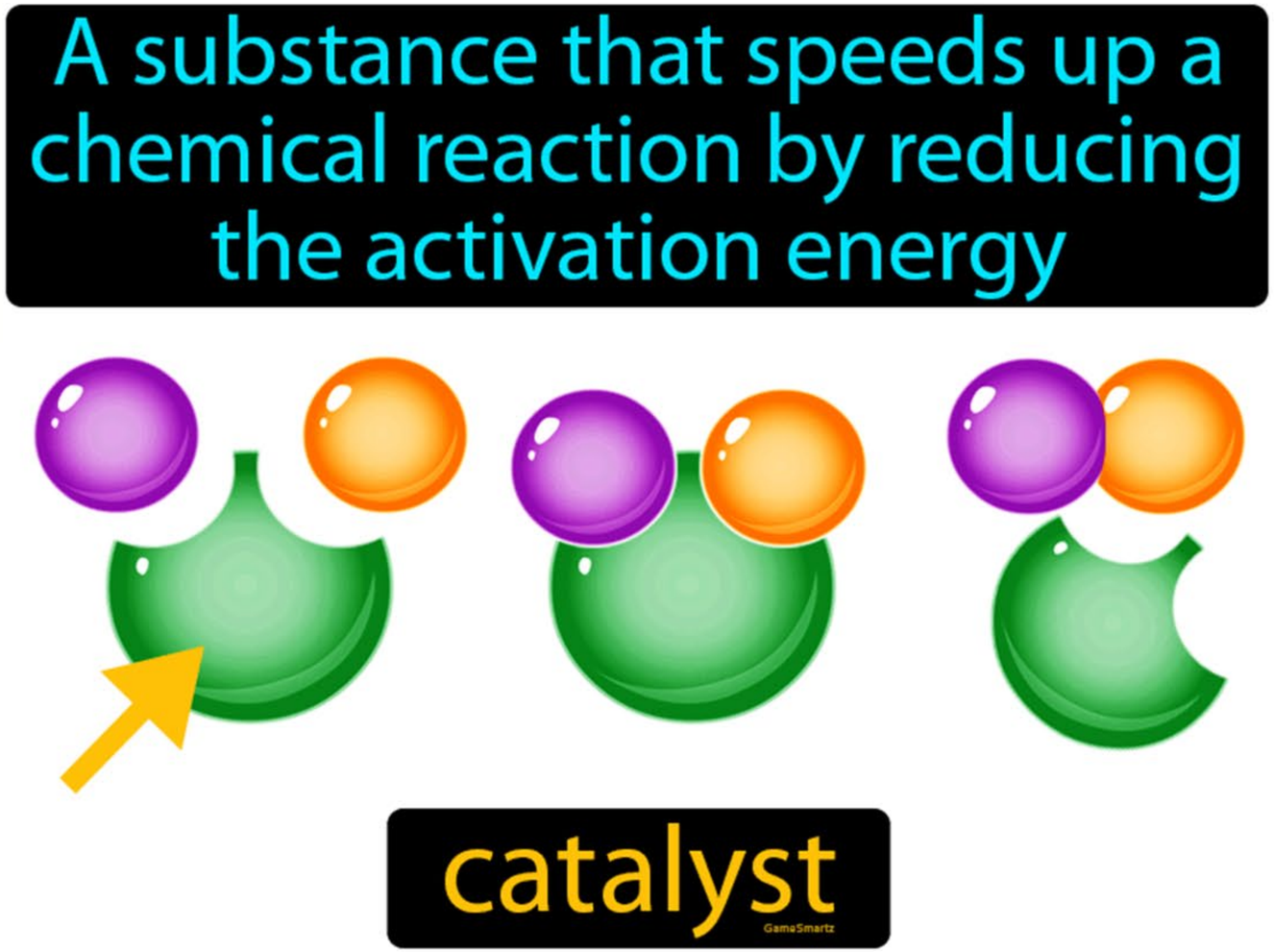


TVA transmission tower extracted from the Cumberland River. (TVA)




In 2021, the National Oceanic and Atmospheric Administration (NOAA) determined that Tennessee endured six (6) different billion-dollar disasters caused from severe storms, hurricanes, and winter weather. One of those included the catastrophic torrential rain and flooding event in Waverly, Humphreys County, that took the lives of 20 Tennesseans that day.

# Be a Catalyst




Source: Gamesmartz.com

# Ways to Work with State Energy Offices

**Examples**

- DOE Energy Sector Monthly Brief
- Winter Storm Heather TDEC Water – After Action Seminar
- Backup generator request form template
- Energy/Fuel Myths Busters
  - Rumor control: TVA “Outage”
- Funding programs – braiding funds
- Private Sector Stakeholders – power/grid brief
- Electric Vehicles (EVs) – power, EV chargers, disposal, fire
  - Training for Fire Academy
- Mitigation/Resilience
  - Technical Assistance for BRIC projects – DOE Labs
  - RNG project, permitting, resilience
  - Industrial Assistance Center evaluations
  - U.S. Army Corps of Engineers generator evaluation

# What We Can Do

**Data Tracking & Monitoring**

Energy profile
Capacity and flows
Critical infrastructure
Threats and hazards and related risk

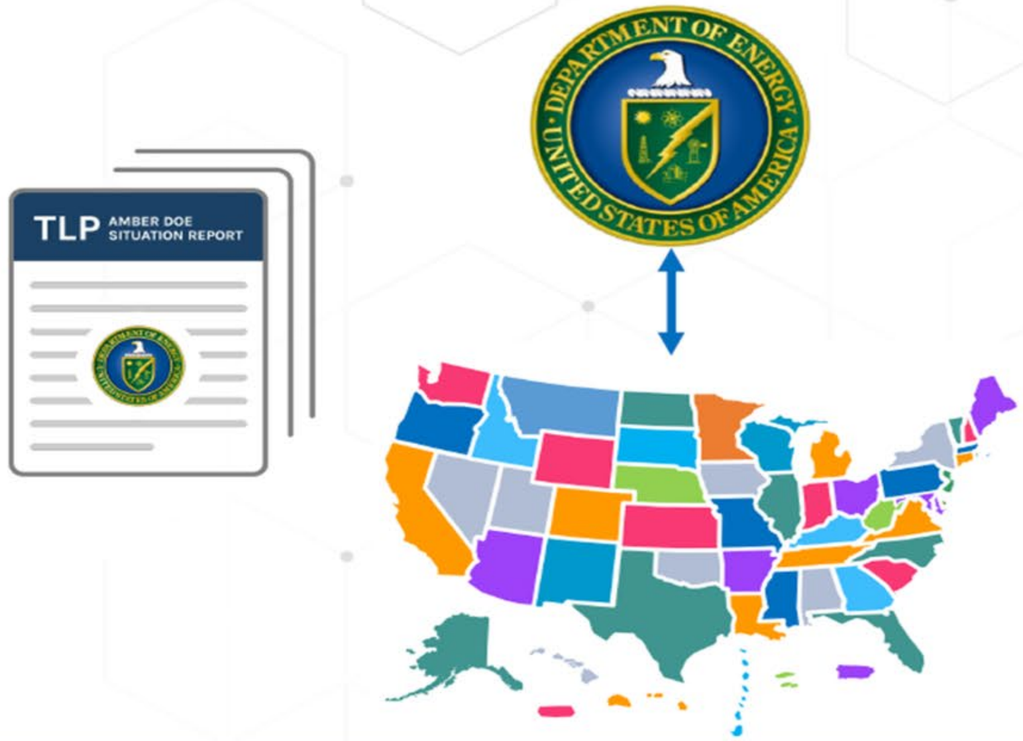
**Authorities & Responsibilities**

Emergency declarations and waivers
Connection to other state plans
Emergency electrical procedures
Petroleum shortage plans
Federal frameworks (e.g., National Infrastructure Protection Plan, National Response Framework)

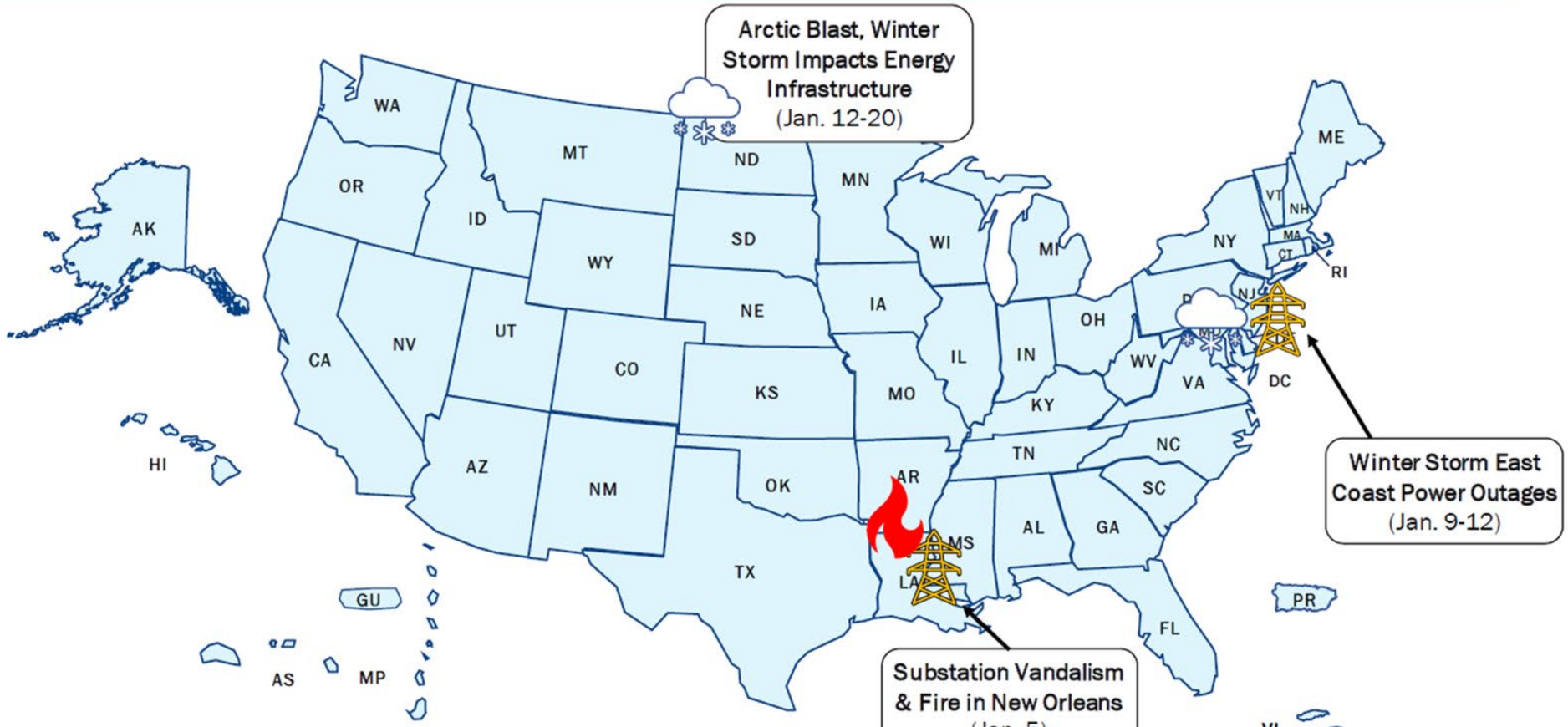
**Contacts & Coordination**

Local governments
General public
Other state agencies
Neighboring States
Petroleum suppliers
Gas and electric utilities
Distribution companies
Industry associations

**Energy Emergency Assurance Coordinator (EEAC) Program** facilitates 2-way information sharing between DOE and states leading up to and during an energy disruption or emergency



# January 2024 Energy Events Overview




Events that impacted more than 200,000 customers or represented atypical circumstances are included.

# Energy Waivers Library

Office of Cybersecurity, Energy Security, and Emergency Response

https://www.energy.gov/ceser/energy-waivers-library

CATEGORIES

| GRANTING AGENCY | Production and Supply | Transportation and Distribution | Fuel Use | Clean Up and Event Recovery |
|---|---|---|---|---|
| Department of Energy | Federal Power Act Section 202(c) | | | |
| Department of Homeland Security | | Jones Act for Maritime Commerce | | |
| Department of Transportation | | • Pipeline Emergency Special Permits<br>• Driver Hours of Service Requirements | | • Hazardous Materials Regulations for Oil and Hazardous Materials Incidents<br>• Waivers of Drone Regulations |
| Environmental Protection Agency | Generator-Related Emissions Regulations | Emissions Regulations at Distribution Terminals | • Reformulated Gasoline (RFG) Requirements<br>• Gasoline Reid Vapor Pressure (RVP) Regulations<br>• E15 RVP Regulations | |
| Federal Energy Regulatory Commission | | Emergency Prioritization of Pipeline Shipments | | |
| Internal Revenue Service | | | Red Dye Diesel Regulations | |
| Multiple Agencies | Defense Production Act | | | |

# Critical Facility Infrastructure Survey

Collaborative with TEMA and TN Safety & Homeland Security

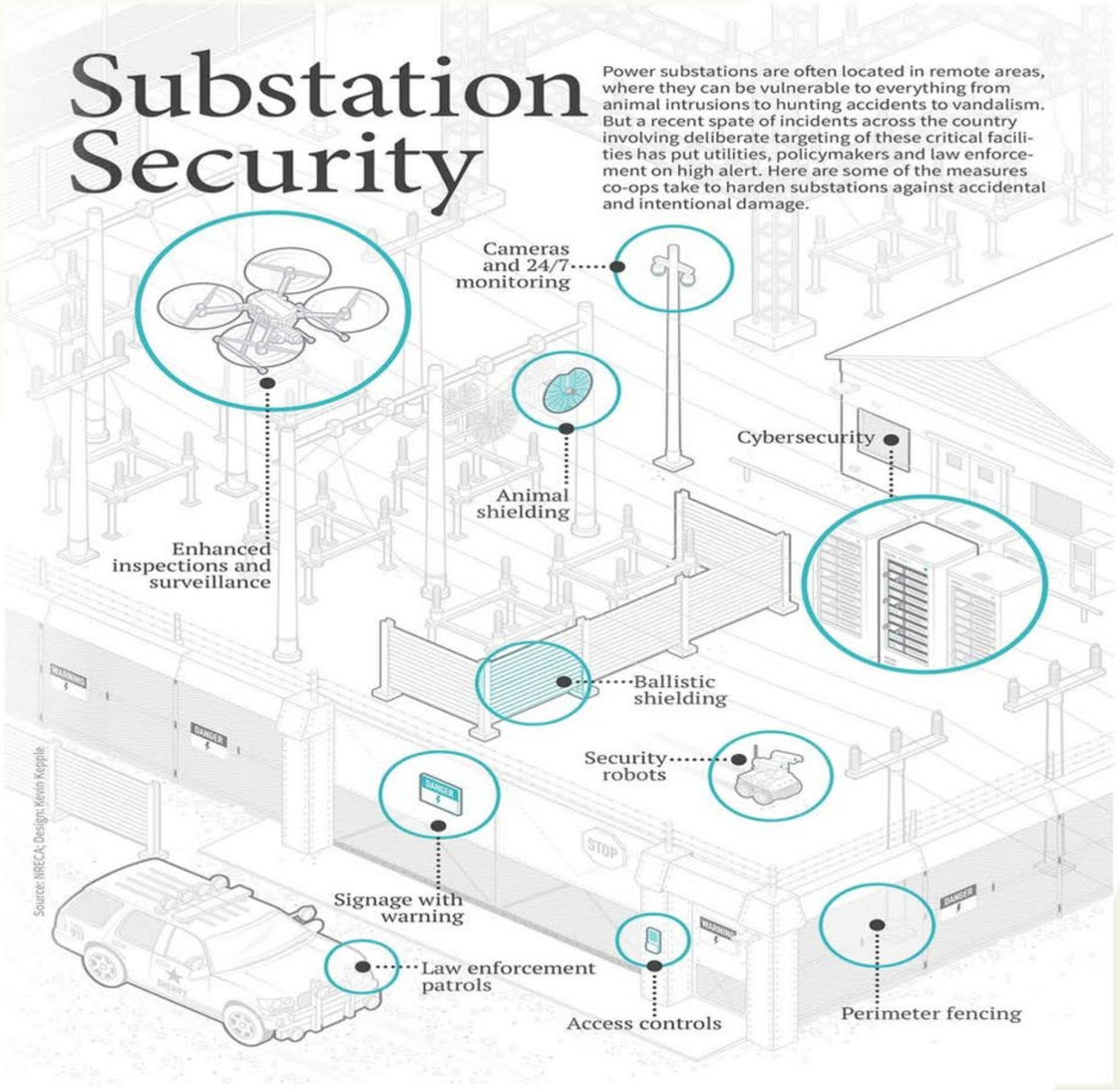
- Pilot 3 counties, 1 in each region
- Local EMA Directors and staff complete
- Integrate with Hazard Mitigation Planning process
- Reviewed every 3 years
- Involves all 95 counties
- U.S. DOE EAGLE-I data layers

Central U.S. Earthquake Consortium (CUSEC) Critical Infrastructure Template, ArcGIS
https://cusec.maps.arcgis.com/home/item.html?id=8f80ff61024c41aa989c04f2e187c2bc

# Emerging Energy Sector Issues

## Substation Security & Grid Threats

- National Rural Electric Cooperative graphic




## Cyber Ransomware Attack

- Alerted to small town hit by ransomware
- Contacted TDEC Water inspector to reach out to water and wastewater systems in that town
- Contacted TEMA District Coordinator
- Alerted State Special Agent for Cybersecurity

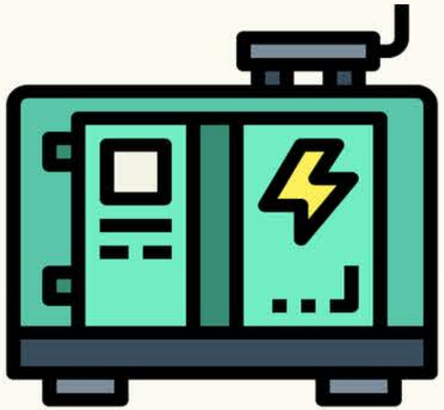
Bald Eagle Photo by Park Ranger Steve Ward, Radnor Lake State Park, Nashville, TN

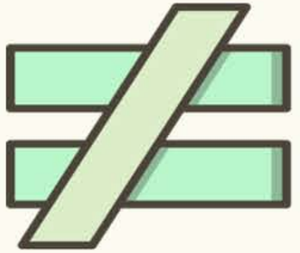
Ben Bolton
Senior Energy Programs Administrator
Emergency Services Coordinator 12 for Energy
Office of Energy Programs
Tennessee Department of Environment and Conservation
Cell 615.306.5908
Ben.Bolton@tn.gov
https://www.tn.gov/environment/program-areas/energy/state-energy-office--seo-/programs-projects/programs-and-projects/energy-security.html

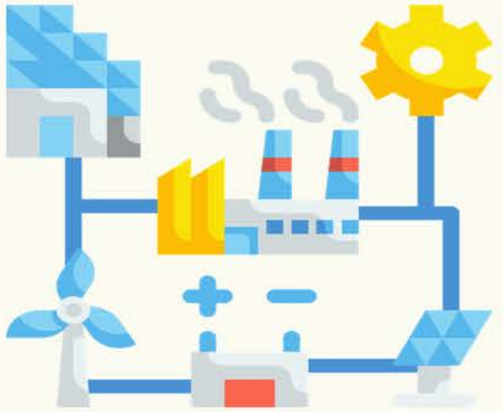
Fall Creek Falls State Park, Spencer, TN

# So - you want a Generator?

# Standby Generators vs. Microgrids







| Standby Generators | Microgrids |
|---|---|
| • Typically runs on diesel fuel (diesel emissions, heavily reliant on supply chain logistics)<br>• Supplies power to local loads during an outage<br>• A brief loss of power is typical<br>• Rated to run ≈ 500 hours/year at 70% capacity<br>• Cannot operate in parallel with or put energy onto the grid | • Can incorporate any DER (diesel, NG, RE, etc.)<br>• Senses grid conditions; can react more nimbly<br>• Reduce or eliminate experienced power loss<br>• Can typically run indefinitely at or near capacity<br>• Can be configured to interact with the grid and create revenue streams |

# PEMA and the PA DEP Energy Office Collaboration

- FEMA Region III Risk Reduction Consultation Meeting
- 2020 Building Resilient Infrastructure & Communities (BRIC) - Awarded – Using Funds for Updates to Energy Codes Material (Contracted Vendor)
- NASEO, NEMA, Business Council for Sustainable Energy (BCSE) Virtual Workshop: "Enhancing Community Energy Resilience through the FEMA BRIC" (August 24-26, 2021)
- National Association of State Energy Officials (NASEO) State Action Guide for Energy Resilience Projects Under FEMA's BRIC Program Technical Guide (November 2022)
- 2021/2022 "Improving Critical Facility Energy Resilience with On-Site Generation Storage (3 Webinars in March 2022)
- 2022 Site Surveys for up to 5 Pennsylvania Sites for Webinar Participants
- 2023 All-Hazard Consortium Application (much like VDEM did in 2022) with AHC and Westmoreland County

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# Power Projects

- Fixed-Site Generators
- Mobile Generators
- Power Hook-Ups/Power Surveys

**Combustion-Based**

- On-Site Generation (OSG) – Gas-fired Turbine
- (OSG) Reciprocating genset
- (OSG) Microturbine


**Non-Combustion**

- Solar Photo-Voltaic (PV)
- Battery Energy Storage System (BESS)

## Wait -- There's More?
## PEMA, PUC, PA DEP Energy Office and
## Many, many others Collaborating on Microgrid Study