



Local Hazard Mitigation Plan (LHMP) Energy Security Preliminary Assessment

July 22, 2026

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PNNL-SA-220183

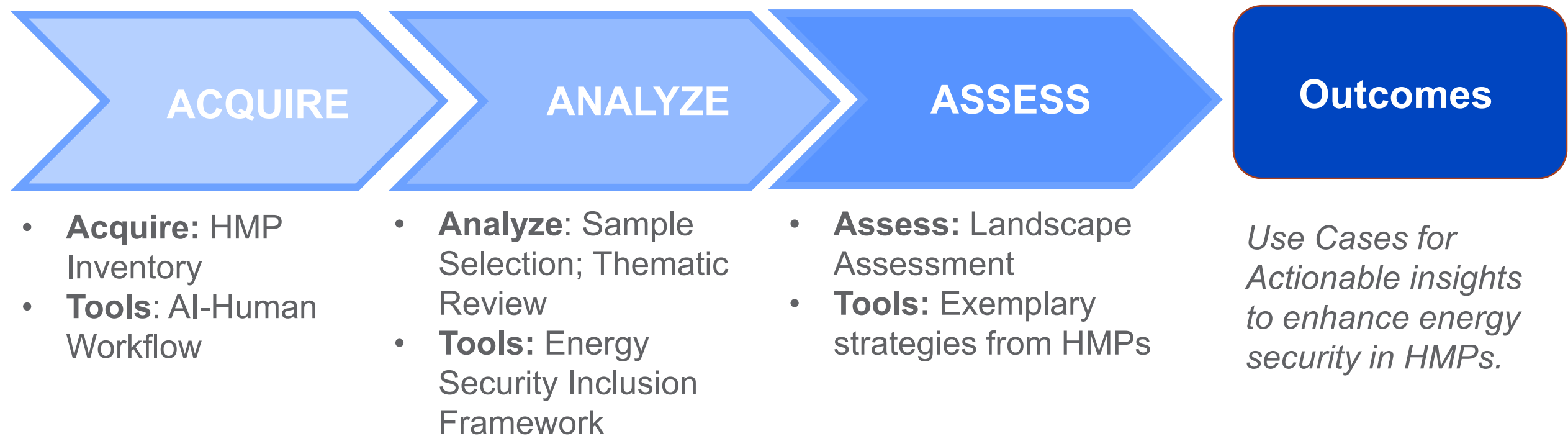


Acknowledgement

This work was made possible through the support and leadership of the **U.S. Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response (CESER)**. Through the **ASSET Program**, CESER has provided critical guidance, resources, and vision that enabled this and other analyses. We are especially grateful to Megan Levy, SLTT Program Manager at CESER.

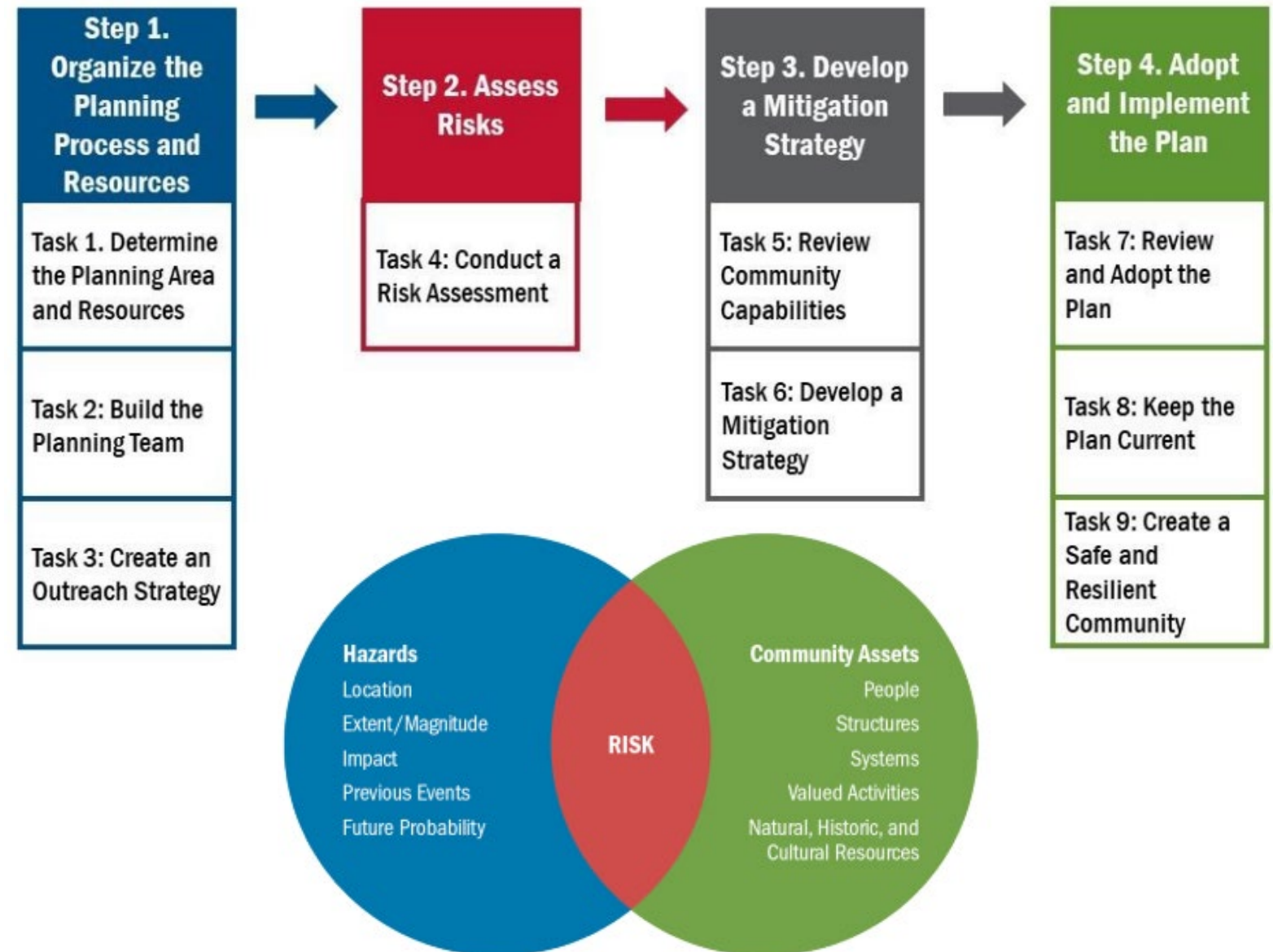
Objective and Approach

Objective: Evaluate how Local Hazard Mitigation Plans (LHMPs) address energy-related hazards and vulnerabilities and identify currently observed best practices to enhance energy resilience planning.



Hazard Mitigation Planning Purposes

- > Serve as the basis for mitigation funding and help shape local response and resilience priorities.
- > Aim to encourage communication and coordination between federal, state, local, tribal agencies.
- > Develop a shared risk framework between stakeholders.
- > Updated every 5 years.



Sources: FEMA's 2025 & 2023 Local Mitigation Planning Handbooks

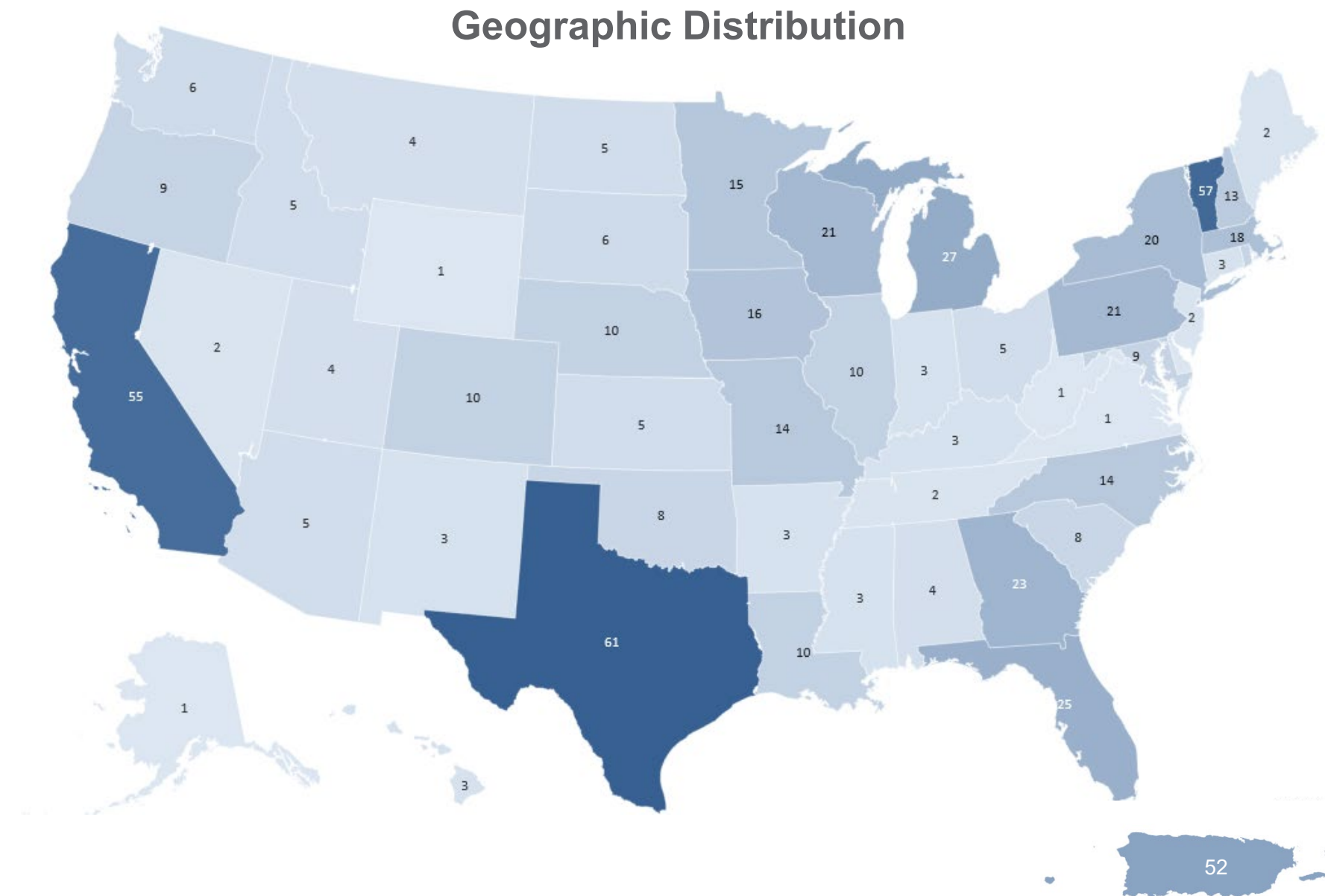
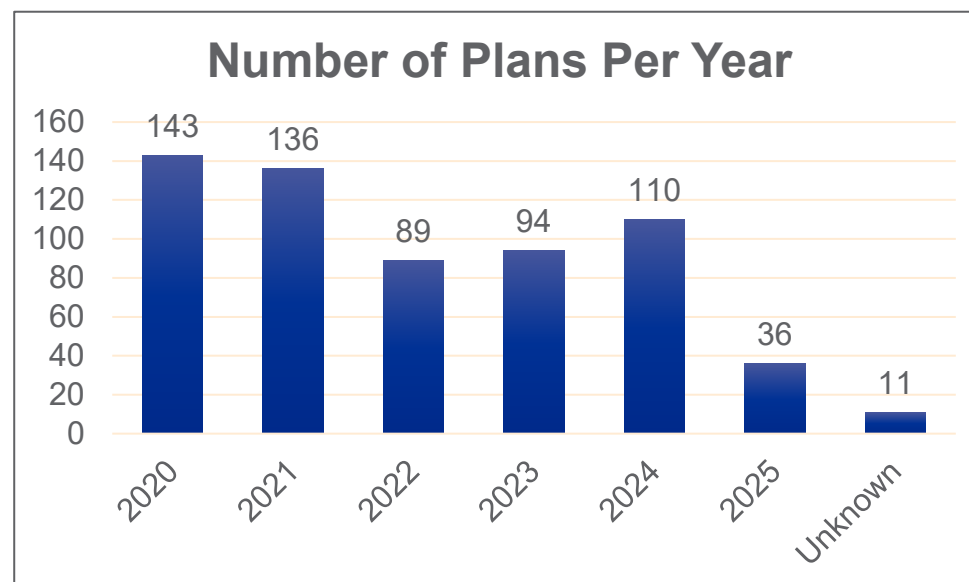
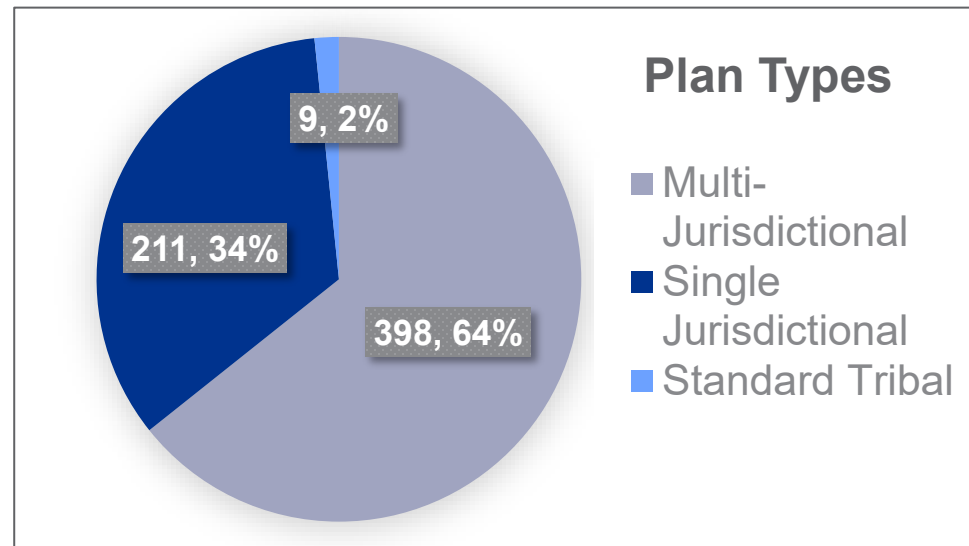
Local and Tribal HMP Inventory Development



Combined FEMA Entries: Duplicates by design

Entries in the OpenFEMA spreadsheet with the same “planID” and “planTitle” are multi-jurisdictional plans. FEMA tracks every city, town, and Tribe to show each has officially adopted a plan

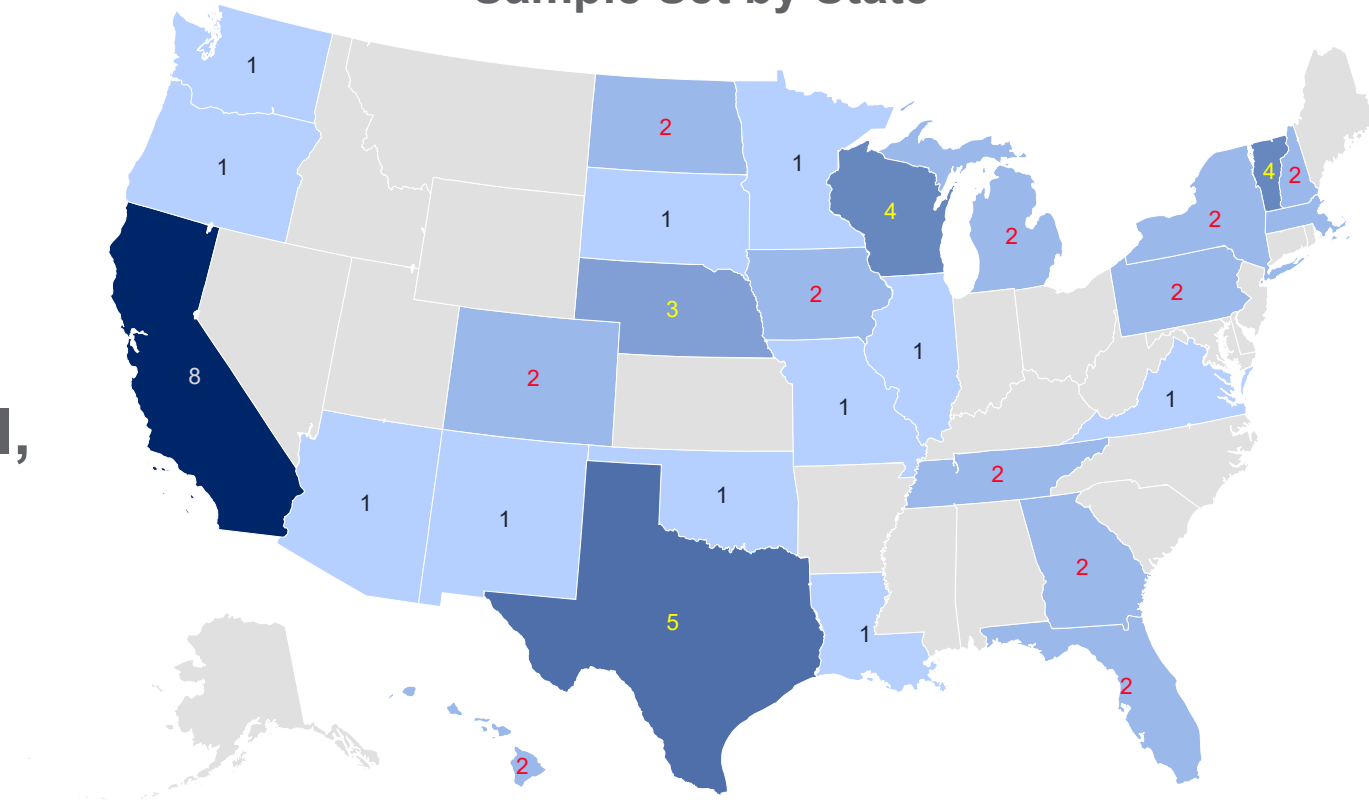
Final Local and Tribal HMP Inventory



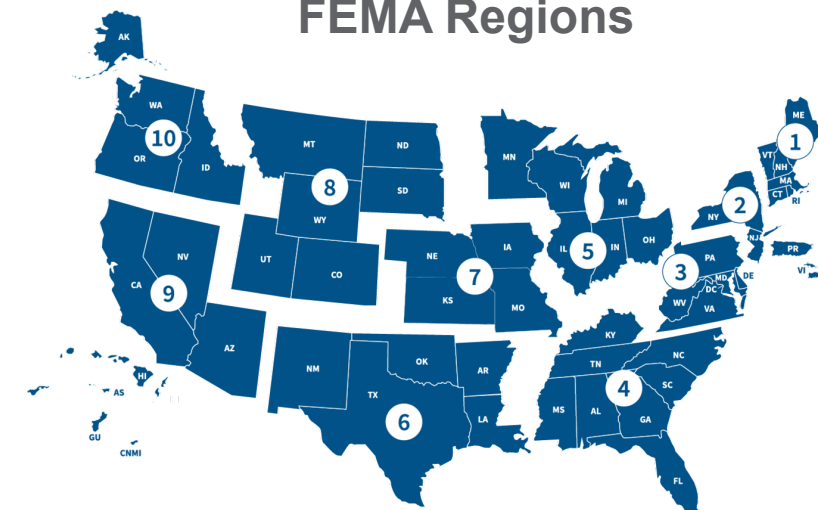
Sample Set

- > Sample of **59 active Local and Tribal HMPs** from Inventory.
- > **Representative of geographic, jurisdictional, and temporal parameters.**
 - Single jurisdiction: 17
 - Multi-jurisdictional: 33
 - Standard tribal: 9
- > Large metros, natural disaster epicenters, coastal regions, energy dependent or energy producing areas.
- > The driving factor for plan selection was the number of plans by state. As a result, some FEMA regions are more represented than others.

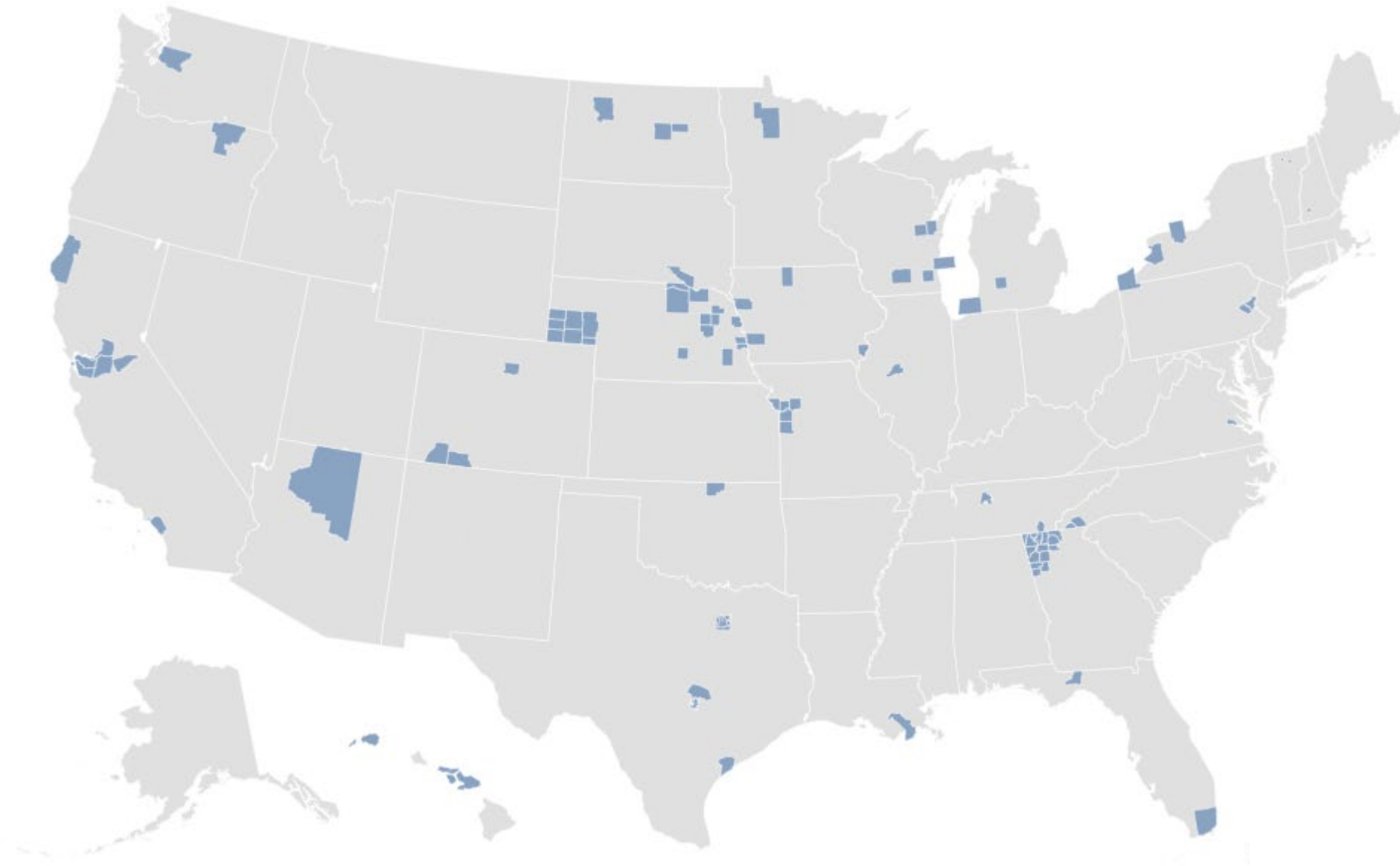
Sample Set by State



FEMA Regions



Municipalities included in Representative Sample



Note: Service area can include all or part of the highlighted counties

Analytical Framework

This research investigates:

- > Framing of energy systems in hazard profiles.
- > Depth and breadth of vulnerabilities explicitly related to energy assets.
- > Existing mitigation strategies focused on energy security.



HAZARD
IDENTIFICATION



VULNERABILITY
ASSESSMENT



CRITICAL
INFRASTRUCTURE
INVENTORY



MITIGATION
ACTIONS



COORDINATION &
PARTNERSHIPS



ENERGY
DATA SOURCES



NATURE-BASED
SOLUTIONS

Hazard Identification Findings

Energy system impacts are primarily framed as cascading consequences of natural hazards.

> HMPs profiled energy system impacts in two ways:

1

CASCADING IMPACTS PROFILES:

Energy system impacts framed as consequences from other hazards.

- Example 1: Primary hazard = Ice accumulation;
Secondary hazard = downed power lines;
Cascading impact = power outage
- Example 2: Primary hazard = Rail Transportation Incident;
Cascading impact = fuel shortages (Waukesha Co., WI)

2

STANDALONE PROFILES:

Energy system interruption as a primary hazard.

- Examples: Utility Failure (Waukesha Co., WI; Erie Co., NY),
Infrastructure Failure (Des Moines Co., IA)

In Monroe Co, NY's most recent LHMP update, "Utility Failure" was changed from a standalone hazard profile to a cascading impact of other profiles.

Hazard Identification Findings Cont.

Non-natural hazards were connected to energy impacts less often.

> Human-caused or technological hazard examples:

Hazard Profiles:

- King Co., WA
- Kossuth Co., IA
- City of Austin, TX

Mitigation Actions:

- Kaua'i Co., HI
- Dallas Co., TX
- Berrien Co., MI
- "Increase protection and monitoring of automated systems to include Internet of Things (IoT), Industrial Controls Systems (ICS), and Supervisory Control and Data Acquisition (SCADA)". (City of Austin, TX)

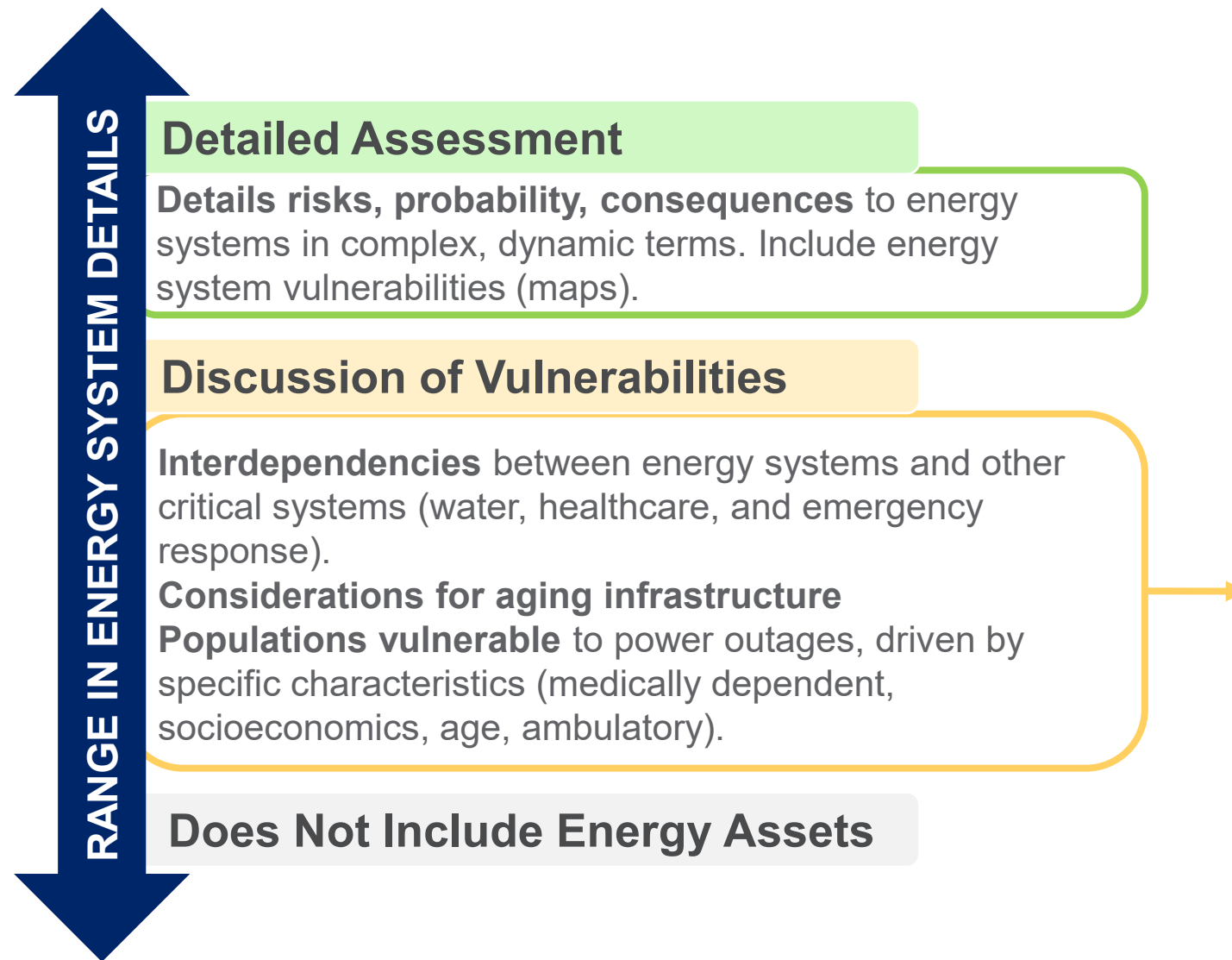
Secondary Hazards:

- Public safety power shut-off (PSPS) (San Francisco Bay Area Rapid Transit District, CA)

"In fact, FEMA does not provide mitigation funds for man-made hazards." – Craftsbury, VT

Vulnerability Assessment Findings

There is a wide range of detail about energy assets in vulnerability assessments.

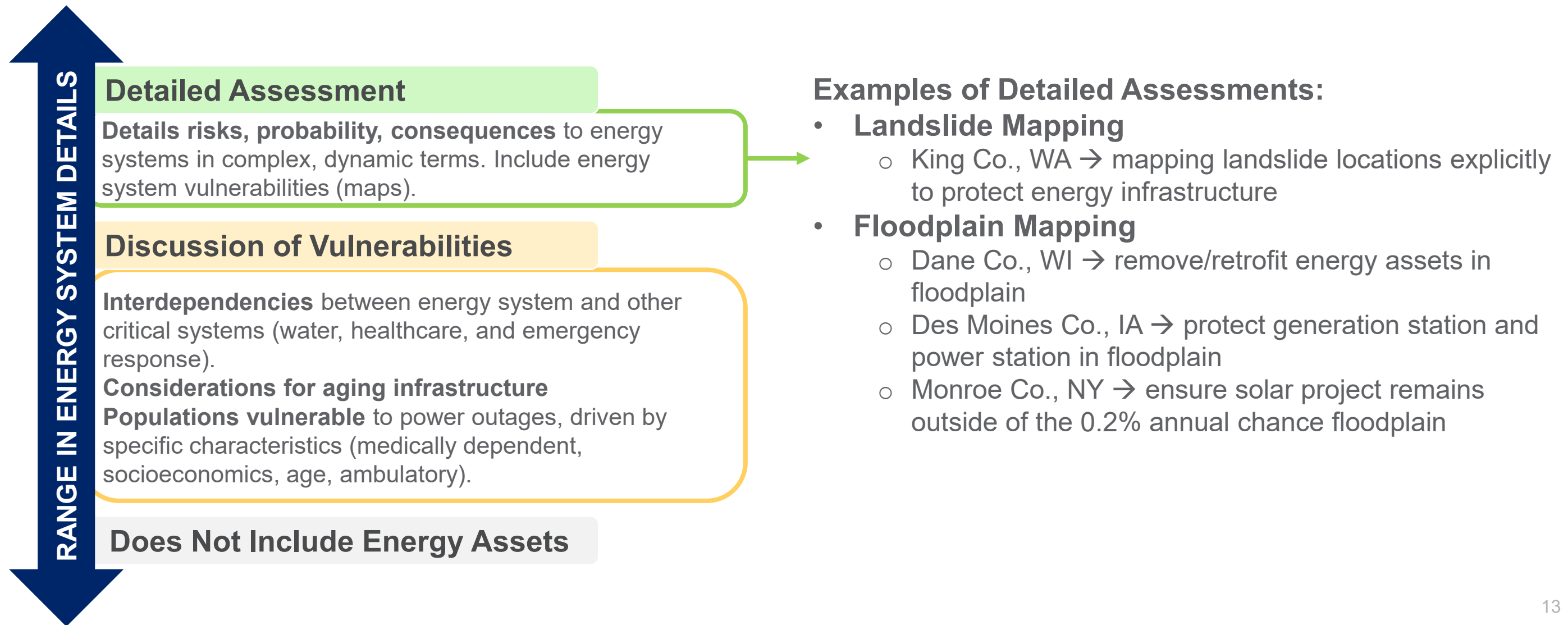


Examples of Vulnerability Discussion:

- **Interdependencies**
 - **Regional Energy:** Ozaukee Co., WI → discussion of regional natural gas interdependencies
 - **International Energy:** Des Moines Co., IA → described international energy emergencies impacting local electricity, petroleum, and natural gas supply
 - **Critical Systems:** Mason Co., IL → power loss in health facilities can destroy vaccines
- **Aging Infrastructure**
 - Barry Co., MI → “The American Society of Civil Engineers gave Michigan a D+ grade for infrastructure, and a C- grade for energy grid.”
- **Population-based**
 - King Co., WA → “Coordination with shelter providers for first aid teams and access for people to re-charge medical equipment.”

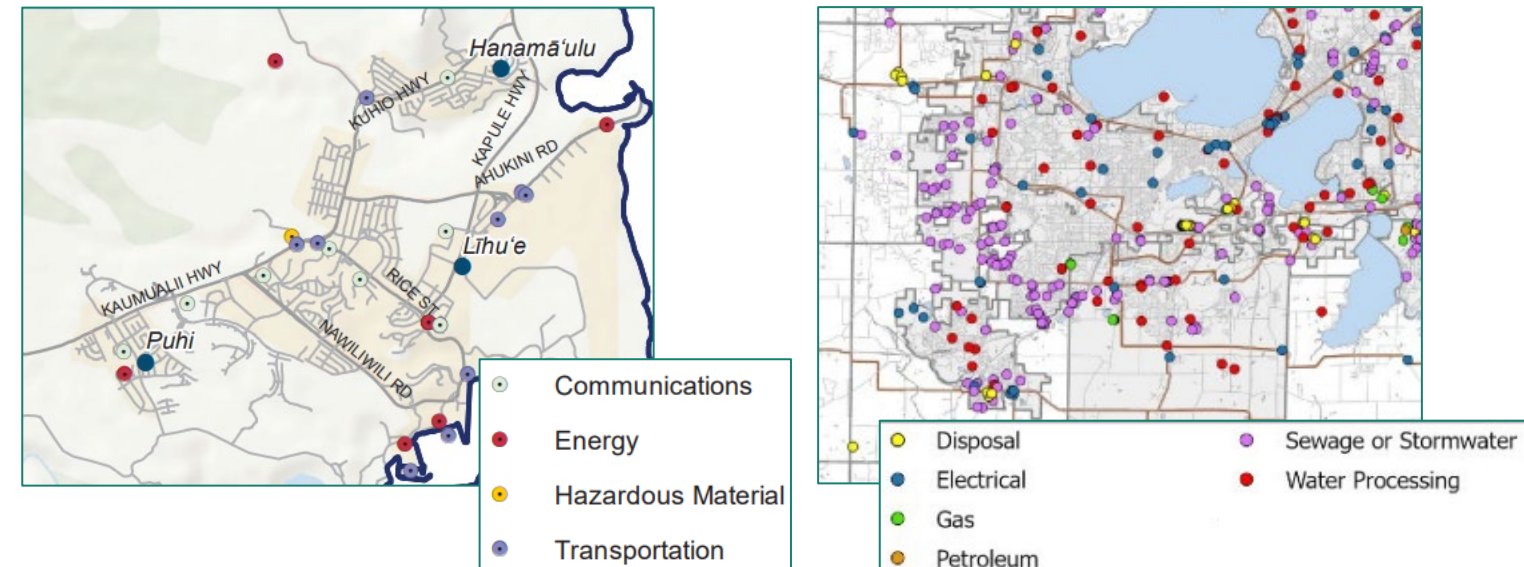
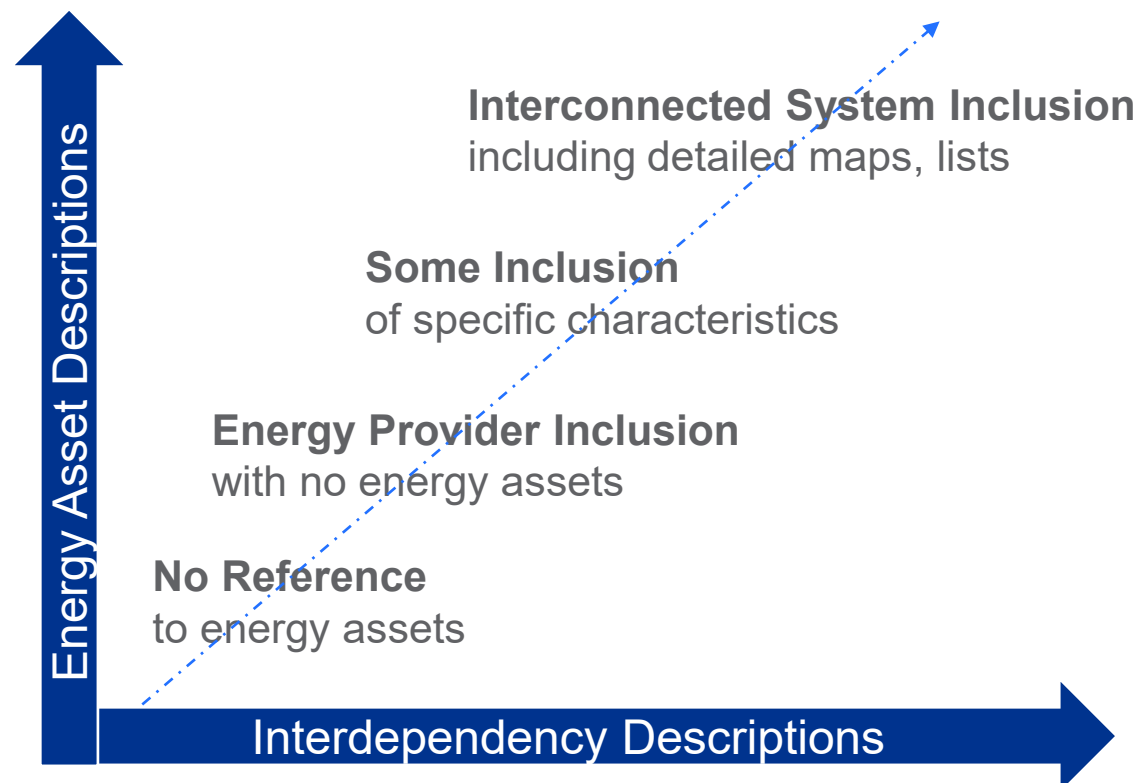
Vulnerability Assessment Findings Cont.

There is a wide range of detail about energy assets in vulnerability assessments.



Critical Infrastructure Findings

Plans differ in their characterization of energy assets as critical infrastructure.



Kaua'i Co., HI (left) and Dane Co., WI (right) included Energy Critical Facilities in maps.

❖ **High Potential Loss Facilities:** Facilities that would have an impact or high loss associated with them if their functionality is compromised such as nuclear power plants, dams, levees, military installations and facilities housing industrial or hazardous materials.

Mason Co., IL included mention of nuclear power plant in Critical Facilities list.

Critical Infrastructure Findings Cont.

Energy-specific data limitations and GIS capability constraints are identified as barriers by some plan developers.

- > Some noted these limitations influenced the accuracy of their assessments and comprehensiveness of their critical infrastructure inventories.
- > **Data limitations:**
 - Three plans identified energy infrastructure data limitations.
 - ✓ Maui, Co., HI: certain “data limitations [specific to critical facilities] do constrict the risk analysis”.
 - ✓ Kossuth Co., IA: “There is no known database for recording infrastructure failure.”
 - ✓ Clay Macon Co., NC: acknowledged critical infrastructure listing is not all-inclusive, anticipated to expand once more georeferenced data becomes available.
- > **GIS Capability limitations:**
 - Three Tribal plans noted limitations in GIS capabilities.
 - ✓ Chickahominy Indian Tribe, VA
 - ✓ Havasupai Tribe, AZ
 - ✓ Santee Sioux Tribe, NE

Mitigation Action Findings

Most common energy-related mitigation action is backup power installation.

- > Local and Tribal HMPs with more robust description of energy asset hazards and vulnerabilities also had more specific energy system mitigation actions.

Challenges:

- > Information classification constraints for critical energy infrastructure information (CEII) or Protected Critical Infrastructure Information (PCII).
- > Unclear or undefined tracking mechanism for mitigation action completion when assigned to outside agencies.
- > Funding limitations.

Robust Energy System Mitigation Actions

Santee Sioux Tribe, NE

Action: 3-phase tie line connecting areas with long power outage history

Barry Co., MI

Action: CMS Energy Resilience Plan to install automatic transfer reclosers (ATR) CMS Reliability Roadmap

Erie Co., PA

Action: Support municipalities in creating solar ordinances to encourage responsible solar development

Nashville-Davidson Co., FL; Ozaukee Co., WI; Waukesha Co., WI

Action: Update floodplain maps to protect critical infrastructure

Mitigation Action Findings Cont.

Mitigation actions to improve electrical grid capabilities found in two multi-jurisdictional plans, a single jurisdictional plan, and a tribal plan.

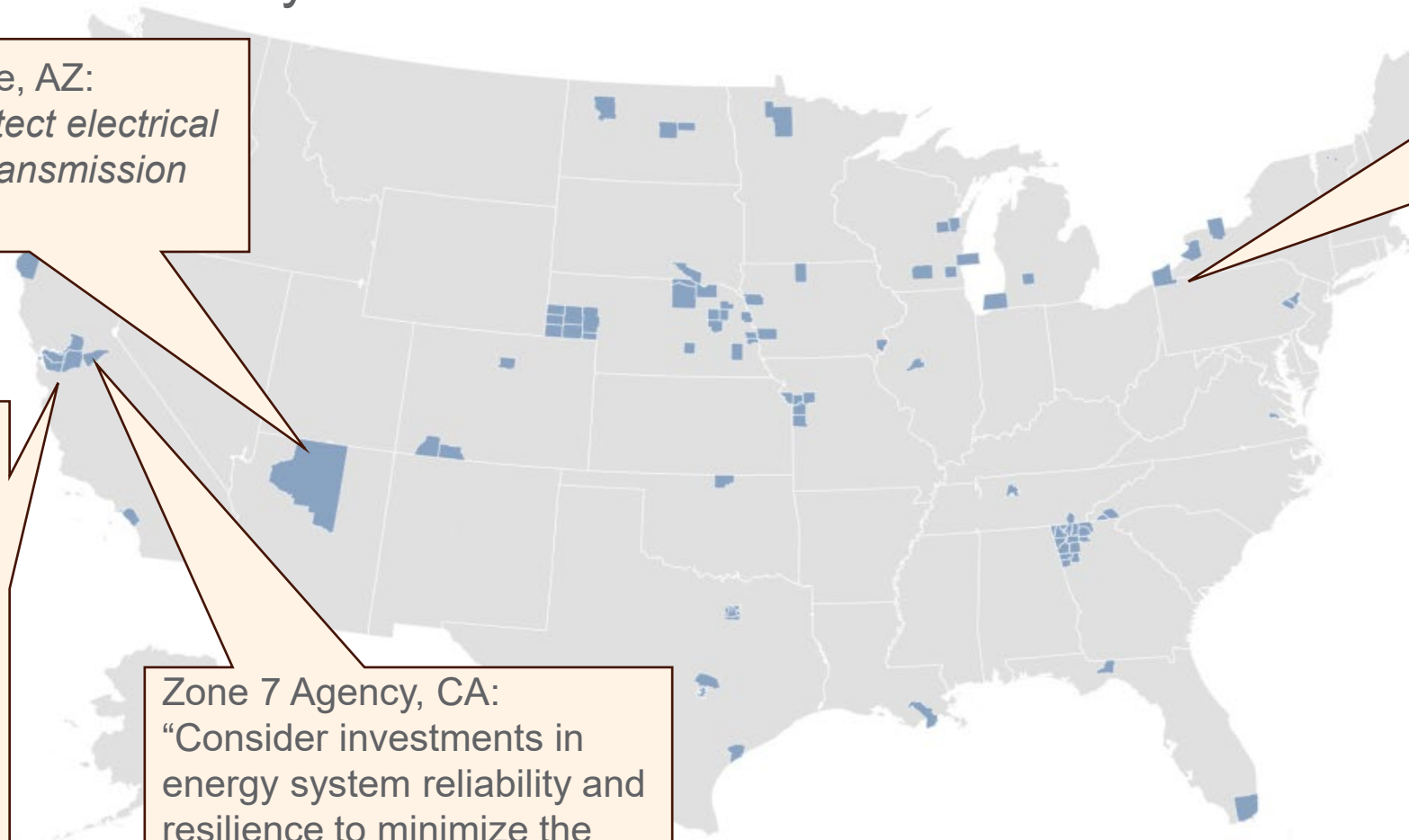
- > Separate documents may contain more detailed information.

Havasupai Tribe, AZ:
“Improve & protect electrical distribution & transmission system.”

City & County San Francisco, CA: “Develop redundant and resilient electrical power capacity and distribution at SFO.”, “Continue to improve power distribution infrastructure to support new development and increase resilience.”

Zone 7 Agency, CA:
“Consider investments in energy system reliability and resilience to minimize the potential impacts of utility system outages.”

Erie Co., PA: *“Increase electrical grid capabilities, identify populations that would be at greatest risks during extended power outage.”*



Coordination and Partnership Findings

Participation from utilities and the public in plan development varies.

- > Some Local HMPs (Beltrami, Co., MN; Kossuth, Co., IA) describe **unsuccessful attempts** to include utilities in plan development.

Examples:

- > Plans highlight the importance of partnerships with utilities.
- > Some plans include the public in mitigation priority development, not just for public review.
 - Dallas Co., TX
 - Concord, VT
 - Southern Ute Indian Tribe, CO



Maui Co., HI

Electrical Utilities Play a Role in Plan Development



Kaua'i Co., HI

Co-Op Responsible for Mitigation Actions



Tallahassee-Leon Counties, FL

Collaboration for CI Data from Utilities for Plan



Boulder Co., CO

Utilities Identified as Key Stakeholders

Energy Data Source Findings

Local and Tribal HMPs utilize energy data, state plans, and utility documents to improve GIS applications and energy system representation.

Examples:

- > **Energy assets in GIS:** Waukesha Co., WI
- > **EIA.gov data:** Ozaukee Co., WI; Kossuth, Co., IA; Metropolitan Nashville-Davidson Co., TN
- > **Utility data:** Ozaukee Co., WI; Monroe Co., NY
- > **Metrics:**
 - **Energy burden metrics for assessing vulnerable populations:** Craftsbury, VT
 - **Sperry-Piltz Ice Accumulation Index (SPIA):** support utilities better prepare for predicted ice storms (Sugar Hill, NH & Dane Co., WI).

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Revised September, 2009

ICE DAMAGE INDEX	RADIAL ICE AMOUNT (inches)	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Nature-based Solutions (NbS) Findings

Commonly described as “natural system protection” actions, very few plans with NbS explicitly linked these mitigation actions to energy system protections.

- > Nearly 50% of reviewed plans did not include NbS.
- > We identified some plans with NbS that may include energy system protections, but more information is needed to make that determination.
- > One plan includes an **NbS + energy system protections**:
 - Tallahassee-Leon Counties, FL – *Develop an Urban Forest Management Plan, emphasizing a managed canopy to make electric transmission and distribution more resilient to hurricanes.*
 - Aim is to sustainably manage societal challenges while providing biodiversity.

Exemplary Strategies for Energy Resilience

Hazard Identification & Energy System Risks

- Energy-focused hazard profiles that reflect local and regional risk conditions
- Inclusion of non-natural hazards affecting energy systems (e.g., cyber, technological, supply-chain)

Energy System Assets in Vulnerability Analysis

- Energy system–specific vulnerability characterization
- Detailed inventories of energy-critical assets
- Inclusion of relevant energy data and available planning and operational resources
- Explicit identification of interdependencies among community lifelines and critical services

Mitigation Planning & Implementation

- Mitigation actions directly tied to identified energy system risks
- Integration of nature-based solutions (NbS) with energy system protection measures

Coordination Among Agencies

- Active participation from utilities and energy providers
- Regional context to support understanding of localized energy disruptions

Tribal HMP Observations

> Energy Asset Inclusion:

- One plan mapped energy assets in high-risk wildfire threat areas. (Trinidad Rancheria [Cher-Ae Heights Tribe], CA)

> Capability Limitations:

- Plan with “few mitigation measures in place to address wildfires, which is ranked as the #1 hazard in the plan”. (Pueblo of Isleta, NM)
- Three plans indicated critical inventory dataset limitations with corresponding mitigation actions specific to improving GIS capabilities. (Santee Sioux Nation, NE; Chickahominy Indian Tribe, VA; Havasupai Tribe, AZ)

> Cybersecurity Discussions:

- Plan includes cybersecurity in the vulnerability attributes explicitly linked to water systems. (Chickahominy Indian Tribe, VA)
- Plan that did not include specifics on cybersecurity risks and mitigation actions but identified it as important to energy security. (Oneida Nation, WI)

> Funding Limitations:

- One plan identified disproportionate vulnerability impacts based on geographic and socioeconomic characteristics. (Ponca Tribe, NE)



This work was sponsored and guided by the Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response (CESER).

Thank you

*More information is available at:
<https://www.pnnl.gov/projects/assisting-state-security-energy-together-asset>*



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59 Plans Included in Preliminary Assessment

State	Plan Name
Arizona	1. HAVASUPAI TRIBE HAZARD MITIGATION PLAN
California	1. Cher-Ae Heights Indian Community of the Trinidad Rancheria Multi-Hazard Mitigation Plan 2. City and County of San Francisco Hazards and Climate Resilience Plan 3. City of Long Beach Natural Hazard Mitigation Plan 4. Local Hazard Mitigation Plan 2023 East Bay Municipal Utility District 5. Local Hazard Mitigation Plan San Francisco Bay Area Rapid Transit District 6. Orange County Transportation Authority Hazard Mitigation Plan 7. Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan 8. Zone 7 Water Agency Hazard Mitigation Plan
Colorado	1. 2022 – 2027 BOULDER HAZARD MITIGATION PLAN 2. Southern Ute Indian Tribe Hazard Mitigation Plan 2025
Florida	1. Miami-Dade County Local Mitigation Strategy 2. Tallahassee-Leon County Local Mitigation Strategy 2025 Update — Adopted
Georgia	1. Northwest Georgia Regional Plan 2024-2028
Hawaii	1. County of Kaua'i Multi-Hazard Mitigation and Resilience Plan 2. HAZARD MITIGATION PLAN UPDATE County of Maui, Hawai'i
Illinois	1. Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan Update
Iowa	1. Des Moines County, Iowa Multi-Jurisdictional Pre-Disaster Mitigation Plan 2. KOSSUTH COUNTY HAZARD MITIGATION PLAN 2024
Louisiana	1. 2020 Lafourche Parish Multi-Jurisdictional Hazard Mitigation Plan Update
Massachusetts	1. CITY OF CHELSEA HAZARD MITIGATION PLAN 2. Town of Dunstable Hazard Mitigation Plan (HMP) 2024 Update and Municipal Vulnerability Preparedness (MVP) Summary of Findings Report
Michigan	1. Berrien County, MI HMP 2. HAZARD MITIGATION PLAN BARRY COUNTY, MICHIGAN
Minnesota	1. Multi-Hazard Mitigation Plan Beltrami County, Minnesota, 2020
Missouri	1. Regional Multi-Hazard Mitigation Plan



59 Plans Included in Preliminary Assessment

State	Plan Name
Nebraska	1. North Platte NRD Multi-Jurisdictional Hazard Mitigation Plan 2. Ponca Tribe of Nebraska Hazard Mitigation Plan 3. Santee Sioux Nation Tribal Hazard Mitigation Plan 4. South Platte NRD Multi-Jurisdictional Hazard Mitigation Plan 2022
New Hampshire	1. STODDARD HAZARD MITIGATION PLAN UPDATE 2025 2. Sugar Hill, NH HMP
New Mexico	1. Pueblo of Isleta Tribal Hazard Mitigation Plan
New York	1. Hazard Mitigation Plan Erie County, New York 2. Monroe County Hazard Mitigation Plan 2023Update
North Carolina	1. Clay Macon Regional Hazard Mitigation Plan – 2021 Update
North Dakota	1. 2023 Eddy & Wells Counties, N.D. Multi-Jurisdictional Multi-Hazard Mitigation Plan 2. Mountrail County, North Dakota Multi-Hazard Mitigation Plan
Oklahoma	1. KAW NATION MULIT-HAZARD MITIGATION PLAN 2022
Oregon	1. Umatilla County MULTI-JURISDICTION NATURAL HAZARDS MITIGATION PLAN
Pennsylvania	1. Hazard Mitigation Plan Erie County, Pennsylvania 2. Lehigh Valley Hazard Mitigation Plan
Tennessee	1. Bradley County Natural Hazard Mitigation Plan 2. Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan
Texas	1. Calhoun County Multi-Jurisdictional Hazard Mitigation Plan 2. CITY OF AUSTIN HAZARD MITIGATION ACTION PLAN 3. CITY OF DALLAS HAZARD MITIGATION PLAN 4. DALLAS COUNTY HMP 5. WILLIAMSON COUNTY HAZARD MITITIGATION ACTION PLAN UPDATE
Vermont	1. 2024 Concord, Vermont Local Hazard Mitigation Plan Update 2. Craftsbury Local Hazard Mitigation Plan 3. Jeffersonville, Vermont Hazard Mitigation Plan 4. TOWN OF BELVIDERE, VERMONT LOCAL HAZARD MITIGATION PLAN
Virgina	1. Chickahominy Indian Tribe Multi-Hazard Mitigation Plan
Washington	1. King County Regional Hazard Mitigation Plan
Wisconsin	1. Dane County Natural Hazard Mitigation Plan 2. O N E I D A N A T I O N Pre-Disaster Mitigation Plan 3. OZAUKEE COUNTY HAZARD MITIGATION PLAN UPDATE: 2020-2025 4. Waukesha County All Hazards Mitigation Plan