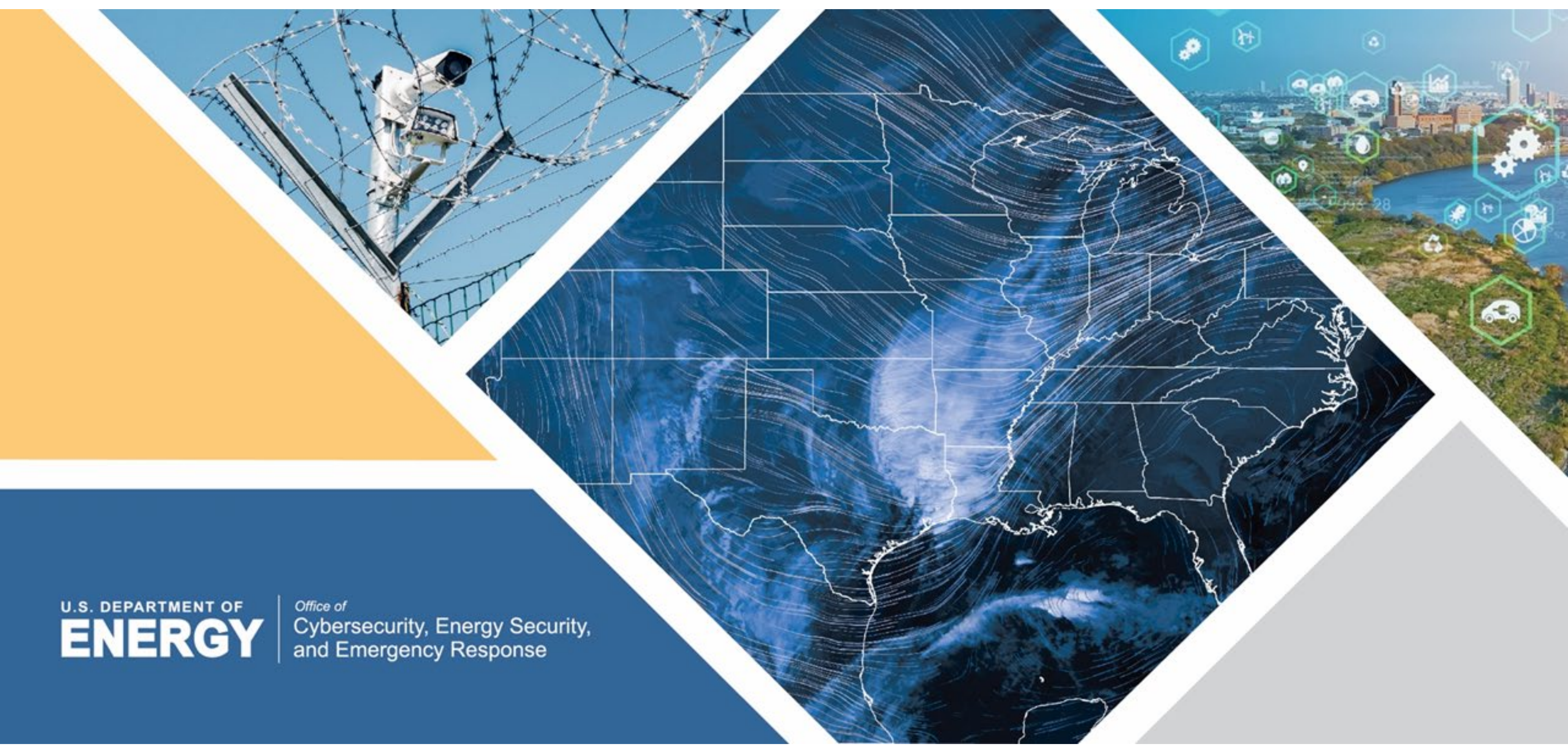
U.S. DEPARTMENT OF ENERGY

Office of Cybersecurity, Energy Security, and Emergency Response

RISK MITIGATION APPROACH GUIDEBOOK FOR STATE ENERGY SECURITY PLANS

August 2024



This document was produced by the U.S. Department of Energy's (DOE) Office of Cybersecurity, Energy Security, and Emergency Response (CESER) to aid states in the development of State Energy Security Plans (SESPs). States are encouraged to adapt or supplement the provided material as needed to better align with existing state roles, authorities, and plans to better address state-specific needs and situations. This document is not intended to be prescriptive or suggest non-statutory expansion of State Energy Office responsibilities.

Acknowledgements

The Risk Mitigation Guidebook for State Energy Security Plans was developed by DOE CESER with funding from the DOE's State Energy Program in the Office and State and Community Energy Programs. Review and comments were provided by staff from Pacific Northwest National Laboratory (PNNL) and the National Association of Energy Officials (NASEO).

Disclaimer

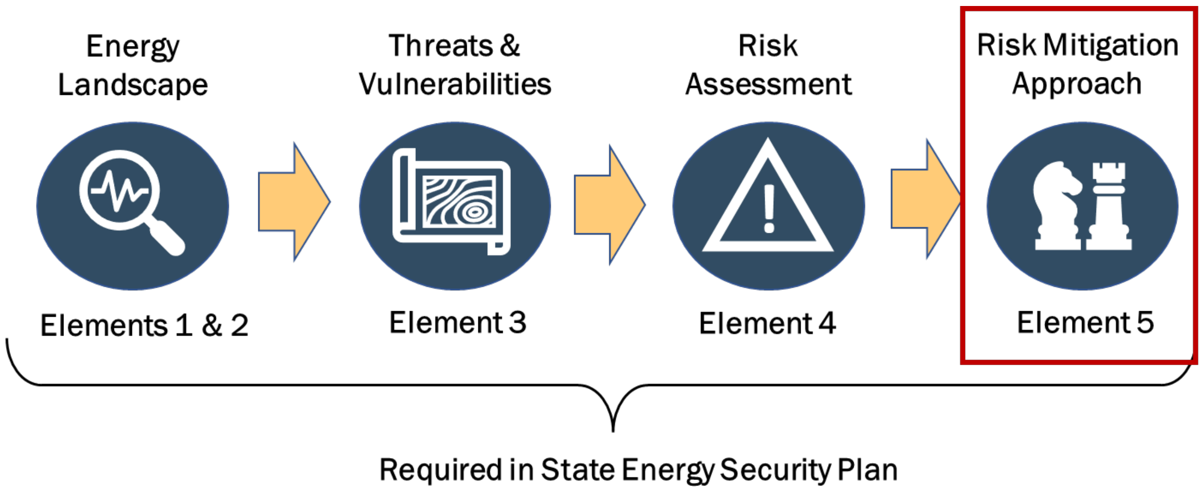
Introduction

A RISK MITIGATION APPROACH PROVIDES A FRAMEWORK FOR EVALUATING PROPOSED INVESTMENTS ACROSS THE ENERGY SECTOR TO HELP STATES PRIORITIZE AND "BUY DOWN" RISKS.

Section 40108 of the Bipartisan Infrastructure Law (BIL) requires that each State and territory have a State Energy Security Plan (SESP), the purpose of which is to ensure reliable, resilient, and secure energy infrastructure (find more information on CESER's State Energy Security Planning Resource page). Each SESP must contain 6 required elements, as defined by Section 40108, the fifth element is: "provide a risk mitigation approach to enhance reliability and end-use resilience." A Risk Mitigation Approach outlines a proactive strategy to enhance a state's energy reliability and end-use resilience through the deployment of Risk Mitigation Measures. The Risk Mitigation Approach is a critical stage in this multi-step planning process and is typically developed after the completion of the Risk Assessment (see Exhibit 1). This guidebook builds on DOE's published Risk Assessment Essentials guidance and it is recommended that these tools be used in tandem. Following the development of the Risk Mitigation Approach, state officials and partners may engage in additional planning and prioritization activities to implement Risk Mitigation Measures.

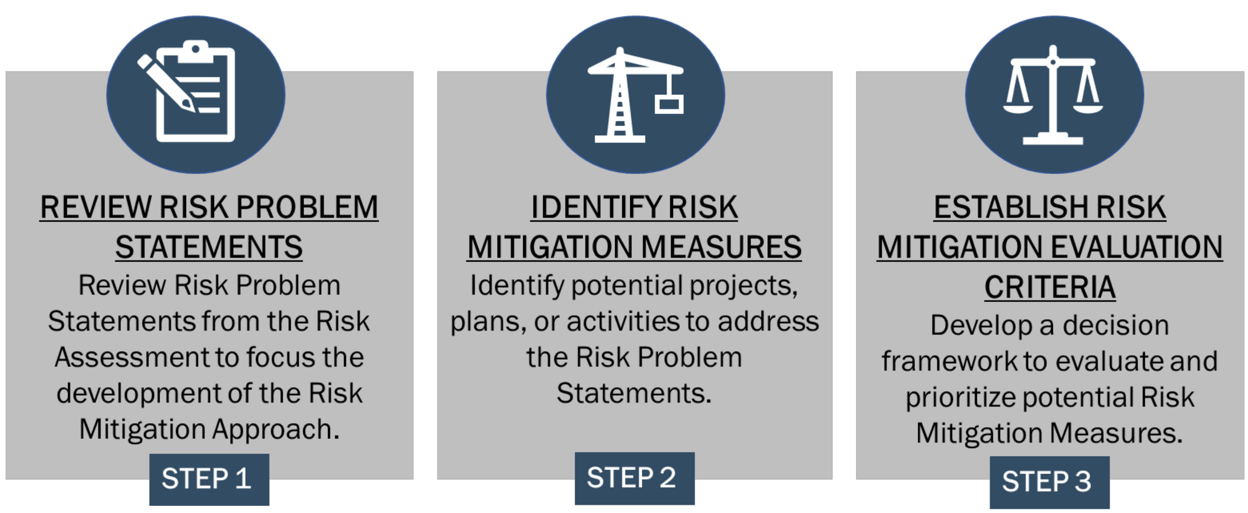
The BIL allocated 62 billion dollars to the U.S. Department of Energy (DOE) (with a large portion passing through to the states) to make historic investments in the reliability and resilience of our nation's energy infrastructure. It is with programs like the DOE Grid Deployment Office's "Grid Resilience and Reliability" formula grants for states and tribes (enabled by section 40101d of the BIL) in mind that the DOE offers this guidebook, to assist state officials with developing a Risk Mitigation Approach for their State Energy Security Plans which will also provide a framework to inform implementation of risk mitigation measures . This Risk Mitigation Approach should provide a framework for evaluating proposed investments across the energy sector, to help states "buy down" the risks that they deem to be a priority.

Exhibit 1: State Energy Security Plan Process



The primary objective of the Risk Mitigation Approach is to establish a framework for identifying, evaluating, and prioritizing measures that reduce risk. While there are numerous ways to develop a Risk Mitigation Approach to meet the intended goals, in general, a successful approach is displayed below in Exhibit 2. A Risk Mitigation Approach will incorporate results of the risk assessment, as well as feedback from stakeholder engagement, and interagency coordination to determine Risk Mitigation Measures. Guidance on each of these activities is provided in the subsequent section of this guidebook. *Appendix B. Risk Mitigation Approach Template* provides a template for state use. Mitigation Approaches should be reevaluated over time and may need to adjust due to changing threats, technologies, regulations, and policy.

Exhibit 2: Steps in Development of the Risk Mitigation Approach



Taking the approach further, states may also include the completed evaluation and prioritization of the potential Measures as detailed in the Risk Mitigation Approach to inform their implementation. A Risk Mitigation Implementation Plan may describe when and how the selected Mitigation Measures will be implemented, including the responsible organizations and resources.

Key Risk Mitigation Terms

Proactive Mitigation: Reducing or eliminating identified risks, before an emergency happens, investing in ways to avoid or alleviate these risks (also known as Pre-Hazard Mitigation).

Reactive Mitigation: During an emergency, understanding acute response needs to mitigate further impacts from the situation.

Risk Mitigation Approach: A proactive strategy to enhance the State's energy reliability and end-use resilience through which Risk Mitigation Measures are identified, evaluated, and may be prioritized for implementation.

Risk Mitigation Measure: Project, plan, or activity designed to enhance the state's energy infrastructure reliability and end-use resilience through the reduction of risk to directly reduce the potential of future damage.

Risk Problem Statements: Statements that summarize the greatest risks to the state's critical energy infrastructure.

Risk: The potential for the loss or degradation of energy supply or services, and the associated indirect impacts of those losses on society, resulting from the exposure of energy infrastructure to a threat.

Risk Scenario: A hypothetical situation comprised of a threat and an energy infrastructure asset, or assets impacted by that threat.

Threat: Anything that can damage, destroy, or disrupt energy systems, including natural, technological, human/physical, and cybersecurity incidents. For purposes of this guidebook, interchangeable with the term "hazard."

Vulnerability: The degree of susceptibility of an energy system or asset to loss or degradation from a threat due to weaknesses within the asset or due to the asset's dependency on other critical systems affected by the threat.

Consequence: The effect of the loss or degradation of an energy infrastructure system or asset on energy supply or service, and the associated indirect impacts of those losses on society.

Step 1. Review Risk Assessment Output

The first step in developing the Risk Mitigation Approach is to review the results of the Risk Assessment. The output of the Risk Assessment is a list of risks which are ranked or prioritized according to the risk assessment criteria chosen by the state. DOE's Risk Assessment Essentials guidance walks energy officials through the process of creating Risk Problem Statements that clearly describe and detail the threat, vulnerability, and consequence of each Risk Scenario considered in the Risk Assessment. These Risk Problem Statements may have been assigned risk values or scores based on the Risk Assessment methodology and the focus of the Risk Mitigation Approach should be to address the highest ranked Risk Problem Statements. By designing the Risk Mitigation Approach to target these priority risks, state officials can limit the scope of the Risk Mitigation Approach and maximize the risk reduction potential of Risk Mitigation Measures. Exhibit 3 presents an example of a Risk Problem Statement produced by an energy infrastructure Risk Assessment.

Exhibit 3: Example of Risk Problem Statement

Risk Scenario A: 2-ft Flooding / Big State City Substations	
THREAT	The Big State River in the southern district of Big State City has flooded three times over the past 20 years, including twice in the past 5 years with river levels reaching as high as 1.5 feet above flood stage during the 2021 flood event. Flooding has occurred more frequently in recent years due to new developments impacting stormwater drainage in Big State City. Meteorologists are warning that Big State City will be experiencing more frequent high-precipitation rainfall events, which will cause the river to exceed the existing floodplain by at least 3 feet. **According to current climate projections, heavy rainfall events are expected to occur more frequently in the future, increasing the threat to assets located in the floodplain.**
VULNERABILITY	Current flood prevention measures at Big State Utility's electric power substations in the southern district of Big State City are sufficient to prevent flooding when river levels are up to 2-feet above flood stage. Beyond 2-feet, existing flood prevention measures would be insufficient to protect the facility, which would be severely damaged if fully inundated. Inundated substation infrastructure is expected to take several weeks to fully repair.
CONSEQUENCE	Big State Utility estimates that approximately 5 of its high-voltage substations (69-kV+) are potentially exposed to the flood threat and that these substations serve a total of approximately 100,000 customers in the southern district. Simultaneous loss of all 5 substations would leave about 25% of Big State City without power, including the downtown commercial district and Big State City Hospital, which is the largest of three hospitals in Big State City. Big State City Hospital has an emergency backup generator capable of serving critical facility loads but this generator can only operate for approximately 48 hours before refueling.
RISK	**If flooding along the Big State River exceeds two feet, existing flood protections could be exceeded at approximately five Big State Utility high-voltage substations that serve the southern district of Big State City, potentially disrupting power supply to the downtown commercial district, including Big State City Hospital.**

COLLECTING STAKEHOLDER FEEDBACK

After reviewing the Risk Assessment output, state officials should engage with energy sector stakeholders including State and local governments, asset owners and operators, communities, and other organizations that affect, influence, are served by, or regulate the state's energy infrastructure. During these engagements, state officials may:

1. Review the key Risk Problem Statements to confirm and verify the results of the Risk Assessment;

2. Obtain additional insights or understanding of threats, vulnerabilities, and consequences to further refine Risk Problem Statements;
3. Gather information on potential Risk Mitigation Measures to address the key Risk Problem Statements; and
4. Engage with State agencies, regulators, and private sector partners to identify potential barriers, capabilities, and interests in investing in Risk Mitigation options. These discussions may identify areas where government action may be appropriate.

Stakeholder interviews may be conducted through group meetings, one-on-one interviews, and/or by surveys or e-mail correspondence. Stakeholder feedback will help identify, reinforce, or alter assumptions regarding risks, mitigation priorities and challenges, and capabilities to support development of the Risk Mitigation Approach. A list of common energy sector stakeholders and sample interview questions are provided in *Appendix A. Energy Sector Stakeholder Engagement Questions*. Some of the stakeholder engagements described here may have already occurred during the development of the Risk Assessment, but it is recommended to engage stakeholders continuously and meaningfully when developing the Risk Mitigation Approach. Mitigation is an ongoing process and continuous stakeholder engagement is necessary due to evolving threats/hazards and priorities.

Best Practice

The *Risk Assessment Essentials for State Energy Security Plans* includes best practices for stakeholder engagement, which includes guidance on selecting and engaging stakeholders.

ALIGNMENT WITH OTHER RELEVANT PLANS

Reviewing other relevant state and local plans may identify planned or existing goals, priorities, programs, or projects that address risks identified in the Risk Mitigation Approach. A non-exhaustive list of examples of relevant state and local plans that may be reviewed are presented in Exhibit 4. Note that the focus and objectives of these plans may or may not align with the energy security and reliability goals of the SESP, however they may still contain approaches, programs, or projects that are useful for addressing energy security risks.

Exhibit 4: Examples of Other State, Local Plans, and Plans Submitted to the State Relevant to Risk Mitigation

Plan	Description
Hazard Mitigation Plans (Required by Section 322 of Stafford Act)	Approved plans are a prerequisite to receiving Federal aid, these plans are typically prepared by state, local, and tribal emergency management agencies, and guide investments to reduce natural and/or all-hazards risks across all sectors. See FEMA State Hazard Mitigation Guidance for more information.
Petroleum Shortage Contingency Plans	These plans generally outline how a state would respond during emergencies that impact access to fuel. They may outline measures and programs to mitigate fuel supply disruptions and ensure essential services such as law enforcement, fire, and medical services, utilities, telecommunications, public works,

Plan	Description
	public transit, and sanitation services receive the necessary supply. See Regional Petroleum Collaboratives
Climate Action Plans	These plans guide State investments to address climate changes, including resilience strategies, clean energy targets, and economic and social goals. See C2ES U.S. State Climate Action Plans for more information.
Energy Efficiency Plans	These plans guide State investments to minimize or reduce energy use during the operation of a system or machine and/or production of a good or service. See DOE Energy Efficiency Policies and Programs for more information.
Threat and Hazard Identification and Risk Assessment (THIRA)	THIRA Assessments guide communities through the process of identifying risk, capability gaps and barriers to risk mitigation. Communities complete these plans every three years through the national preparedness system. See FEMA National Risk and Capability Assessment for more information.
Utility Plans Filed with Public Utility Commissions (PUCs)	Integrated Resource Plans (IRPs) and capital investment plans filed with the PUC offer insight into planned, future investments by electric and natural gas utilities to reduce risk and enhance reliability, resilience, and infrastructure security. Not every State requires utilities to participate in integrated resource planning, check with your PUC for more information. Distribution System Planning (DSP) focuses on ensuring the ability to continue to deliver energy to customers affordably, reliably, and with environmental sustainability. These plans account for customer growth, variations in supply and grid modernization.
State Resilience Plan	A State resilience plan outlines the goals, strategies, and actions of a state government to enhance its capacity to cope with and recover from natural disasters, climate change, and other threats/hazards. These plans often foster collaboration and coordination among different stakeholders.

When reviewing other relevant plans, state officials may identify relevant:

- **Goals and objectives** that reflect the state priorities regarding hazard mitigation and energy sector reliability, resilience, and infrastructure security; and
- **Risk Mitigation Measures** such as projects, programs, or policies that the state has already committed to doing that reduce risk to the energy sector.

Identifying Risk Mitigation Measures found in other plans that align with the Risk Mitigation Approach may allow the state to leverage existing progress and commitments. For example, the SESP Risk Assessment may identify a critical petroleum product terminal located within a port area that is exposed to hurricane storm surge threats. The State's Hazard Mitigation Plan may already include measures designed to reduce storm surge vulnerability at the port to protect other critical infrastructure. Those measures can be incorporated into the Risk Mitigation Approach and considered alongside other options.

The Risk Mitigation Approach should also consider a few representative county or municipal hazard mitigation plans, potentially from areas with higher risks, as identified by the risk assessment. These plans may help identify how the state can support local mitigation efforts already under consideration through the provision of state resources, such as funding programs or technical assistance. States may choose to focus on areas known to have higher risks. When reviewing local hazard mitigation plans, state officials may compile a list of the types or categories of Risk Mitigation Measures relevant to the energy sector to determine where there's a preponderance of the same (or similar) measures. Often these measures represent areas of greatest need and potential for State investment.

Exhibit 5 presents a sample of mitigation measures excerpted from SESPs, along with the lead organization, as well as the threats and hazards each measure addresses.

Exhibit 5: Example Mitigation Measures from State Energy Security Plans

Example Mitigation Measure	Lead Organization	Risk Scenario
Encourage or require power line improvements and replacements. E.g. line burial, installing galloping arrestors and spoilers, strengthening poles, and using heavier wires.	PUC, SEO, Industry	Risk of Winter Storm, Extreme Heat, Wildfire, Thunderstorm and Lightning, Tornado, Wind causing a long-term power outage which will adversely impact public health and safety.
Pursue available funding to update and protect infrastructure such as replacing wires, smart grid improvements, hardening distribution lines, vegetation removal, and more.	SEO, PUC, EMA	Risk of Flood, Strong Wind, Winter Storms, Thunderstorm and Lightning, Tornado, or Hurricane causing a power outage which will have cascading effects in the water, and transportation sectors and ultimately public safety and economic stability.
Create an energy security equity task force to develop recommendations to state agencies about how to apply Justice 40 commitments to resilience investments.	SEO	All Hazards that could compromise the energy system, which in turn will impact multiple dependent sectors that will impact vulnerable communities.
Create a program that will install automatic or manual tap-switches at key fueling sites (to facilitate generator power) in cooperation with state, county, or Tribal fuel plans.	EMA, SEO, Local and Tribal Governments	Risk of long-term power outage from Winter Storms, Derechos, Thunderstorm and Lightning, Tornado, or Hurricane.
Light Detection and Ranging (LiDAR) Analysis for Vegetation Management. Active remote sensing system that can be used to measure vegetation heights across wide areas.	Utility	Risk of power outage caused by Wildfire, Flood, Strong Winds, Winter Storms, Extreme Heat, Thunderstorm or Tornado.

Example Mitigation Measure	Lead Organization	Risk Scenario
Install storm water pumps to remove floodwater and help prevent natural gas equipment from getting submerged.	Utility	Risk – Natural Gas Compressor stations can't operate without power and community loses access to power, impacting life, health, and safety of citizens.
Improve awareness of cyber and physical attacks on energy infrastructure and ways to reduce their impacts through awareness/education campaigns	Utility, SEO, PUC, EMA, Local and Tribal Governments	The ever-present risk of a cyber or physical attack on energy infrastructure could result in a power outage or fuel disruption with cascading impacts.

Step 2: Identify Risk Mitigation Measures

Energy sector Risk Mitigation Measures are designed to prevent or reduce impact of an event on energy infrastructure by:

- Reducing the probability of a specific threat (e.g., with more rigorous siting requirements on new builds factoring in risks associated with climate change);
- Reducing the vulnerability of infrastructure to damage or degradation from specific threat through measures that harden/protect the infrastructure (e.g., raising a substation located in a floodplain or coating wind turbine blades to make them resistant to cold weather); or
- Reducing the consequence of losing critical infrastructure (e.g., increasing redundancies such as measures that increase dispatchable energy sources that can be used in the event a power plant is impacted).

Exhibit 6 describes and provides examples of the six categories of potential State Actions that can be used to drive change: (1) Policy / Governance; (2) Regulation; (3) Planning and Studies; (4) Incentive Programs; (5) Coordination and Convening; and (6) Grants and Direct Funding. Recognizing that most energy infrastructure in the United States is privately owned, the state will need to partner with infrastructure owners to encourage the implementation of proposed measures or coordinate with regulators and/or legislators to require it. States may also run programs that have an energy security benefit (i.e. an energy efficiency program may alleviate congestion on transmission lines) and the state should evaluate existing programs for mitigating against risks.

Exhibit 6: Risk Mitigation Categories

Category	Description	Examples
Policy / Governance	These actions include government authorities, policies, or codes that affect, influence, and regulate the energy sector.	• Prioritization of economic development, mitigating the impacts of climate change on energy system, and disproportionate effects on disadvantaged populations • Agency structures, staffing, funding, and missions
Regulation	These actions include government policies that can be enacted to support existing and future infrastructure.	• Building codes and fire safety • Adopt Cybersecurity baselines for distribution utilities and distributed energy resources • Require utility wildfire mitigation and response plans • Performance – based regulation • Rate design • Clean energy standards • Energy storage deployment requirement

Category	Description	Examples
Planning and Studies	These actions involve planning projects or programs aimed at improving future or existing infrastructure and/or processes to handle hazards.	• State energy security planning • Critical infrastructure studies • Supply chain analysis • Vulnerability assessments
Incentive Programs	Implementation of State incentive programs to reduce the risk of energy infrastructure to potential hazards.	• System hardening • Re-conductoring • Building code updates • Energy efficiency • Solar and storage • Microgrids • Backup power for critical loads
Coordination and Convening	These types of actions help energy sector stakeholders collaborate and coordinate on mitigation solutions and raise public awareness about potential hazards.	• Threat intelligence sharing • Multi-jurisdictional or industry collaboration • Exercises • Local to regional partnerships • Technical working groups • Stakeholder engagement
Grants and Direct Funding	These actions involve State, Local, or Federal funds to support utilities efforts to ensure energy security.	• Include physical and cybersecurity considerations with all funding opportunities • Power Supply • Clean energy development • System hardening • Utility or grid scale retrofits and upgrades

DOCUMENTING RISK MITIGATION MEASURES

Risk Mitigation Measures may be documented in a table or may be outlined in a narrative format. An example of a table matching Risk Scenarios with Risk Mitigation Measures is presented in Exhibit 7. When documenting measures, consider the following:

- Include a comprehensive range of measures. The list may be narrowed later through an evaluation and prioritization exercise.
- Some measures may be undertaken after a disaster when funding, political, and public support are aligned. If measures are not documented, securing funding may be more difficult once it becomes available.

- For certain Risk Scenarios, there may not be enough information to recommend a specific measure or more information may be needed to select the best solution. In these cases, consider further study through analysis or targeted stakeholder outreach to collect the information needed to identify and evaluate potential Risk Mitigation Measures.
- Explain specifically how the documented measure will reduce Risk.
- Identify where the proposed measure originated (e.g., the specific stakeholder that suggested the measure or the document where the measure was initially found).

Exhibit 7: Sample Risk Mitigation Measure Documentation Table

Risk Problem Statement	Risk Mitigation Measure	State Action	Risk Reduction	Estimated Cost to State	Funding Source	Asset Owner	Estimated Timeline	Participating Orgs	Source
Risk Scenario A: 2-ft Flooding / Big State City Substations	Encourage utilities to install submersible equipment and/or elevate equipment to prevent water from accessing electrical components. This may then need to be a part of rate case filing.	Coordination and Convening (possibly via regulation)	Increased utility level coordination around flood protection measures will reduce the risk of damage to critical electrical components.	Negligible (though if it becomes a rate case filing there will be a cost to ratepayers)	State	Utilities	2-3 years	SEO and PUC	County Hazard Mitigation Plan
	Explore adding grants for hardening opportunities for flood events such as stormwater pumps or submersible equipment.	Grants and Direct Funding	Harden existing infrastructure within flood zones	To be determined	State	Utilities	6 months	SEO	Stakeholder Interview

Best Practice
Energy infrastructure systems, energy sector risks, capabilities, and technological solutions are constantly evolving. To ensure that risk mitigation priorities adapt to the changing landscape, state officials should update the Risk Mitigation Approach on a cadence like other risk-related state plans, such as the Hazard Mitigation Plans, which are updated annually with more detailed updates every five years. Updating plans on a regular basis also allows new Mitigation Measures to be included as funding becomes available from federal, state, local, or private sector sources.

Step 3: Determine Risk Mitigation Evaluation Criteria

The Risk Mitigation Approach should define a strategy and framework to evaluate and prioritize the identified measures. Each criterion may not apply or be useful for evaluating each measure, depending on the funding source and requirements, the framework may include multiple evaluation criteria. Each state should pick and tailor Risk Mitigation evaluation criteria to reflect the risk assessment output and align with state priorities. These priorities may change over time as the risk environment and capabilities, including available resources, shift. The evaluation and prioritization process helps the states weigh the pros and cons of different actions. Example criteria and questions are listed below in Exhibit 8, determine which questions are relevant for the time period and approach that the state has chosen.

Exhibit 8: Sample Criteria for Risk Mitigation Measure Evaluation and Prioritization

Sample Criteria	Sample Questions
Risk Reduction Benefits	• What is the absolute or relative reduction in overall risk given the rating systems or scales used in the Risk Assessment? (i.e. does the measure reduce an individual component of risk, such as the hazard, vulnerability, or consequence/impact?) • Does the measure address high risk hazards or priority infrastructure? • Does the measure address more than one hazard at a time?
Other Benefits	• What other benefits does the proposed measure have outside of energy sector risk reduction? Do these benefits align with other state or local plans?
Cost Effectiveness	• What is the lifetime cost of the measure? • What are the avoided costs of the measure? • What are the annual operational or maintenance costs of the measure?
Administrative / Technical	• Are there sufficient staff to implement the measure? • Is training required for the staff to implement the measure?
Funding	• What potential funding sources are available (grant programs, etc.)? • Does the organization that would implement the measure have the funds for the measure or the required match? Or the capacity to manage the grant (both financial and reporting) responsibilities? • What technical submission requirements do the funding sources have such as cost-benefit analysis?
Political / Regulatory	• Is there political support for the measure? • Does the organization implementing the measure have the legal authority to implement the measure? Are changes to laws required to implement the measure? • Does the proposed measure require regulatory approval from the Public Utilities Commission or other entities with different priorities and goals?
Industry Support	• Do the owners/operators of energy infrastructure agree with the measure? • Would implementation of the proposed measure have any adverse effects on the normal functioning of energy markets?

Sample Criteria	Sample Questions
Alignment with Other Plans	• Does the measure advance other state objectives such as hazard mitigation plans or climate action plans? • Does the measure align with the goals of the SESP?
Equity	• Does the measure enhance energy reliability and resilience for underserved and socially vulnerable populations? • Will the measure adversely affect underserved and socially vulnerable populations? • Have underserved/socially vulnerable communities been consulted or represented in public comment periods (if held) about the measure?
Environmental	• Does this measure adversely impact the environment? • Does this measure align with states environmental policies?
Time	• When will this mitigation activity take effect? • How long will this mitigation activity remedy against a hazard?

PRIORITIZING RISK MITIGATION MEASURES

State officials may choose what framework to evaluate and prioritize mitigation measures, but they should have determined a method to compare mitigation measures. The state may choose to align their SESP Risk Mitigation evaluation framework with the same methodology used in their State Hazard Mitigation Plan or in other plans. States may also choose to narrow in on a subset of these metrics in their prioritization criteria or expand the prioritization criteria based on typical funding source requirements. Regardless of the quantitative and/or qualitative metrics the state uses, each Mitigation Measure should be able to be compared with one another based on how well they satisfy the evaluation criteria.

Common evaluation frameworks include the following:

- Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria are a widespread methodology that factors in many of the components outlined in. STAPLEE evaluates the societal implications of a project, including its impact on communities and individuals, and the technical feasibility from an engineering or scientific perspective. The criteria also assess the administrative capacity of the organization to implement the project, the political implications, and the legal aspects, including compliance with relevant laws and regulations. STAPLEE considers the financial implications and the environmental impact of the project, ensuring a comprehensive and balanced decision-making process.
- **Strengths, Weaknesses, Opportunities, and Threats (SWOT)** analysis is another evaluation framework. It provides a comprehensive view of the factors inherent to a mitigation measure. Strengths and weaknesses are internal factors that can be controlled by the organization. Strengths are the resources and capabilities that a potential mitigation measure provides, while weaknesses are the areas that need improvement. Opportunities and threats are external factors that are out of the organization's control. Opportunities are the external conditions that could potentially allow for further benefits from the mitigation measure, while threats are the external conditions that could do harm to involved stakeholders.
- **Political, Economic, Social, Technical, Legal, and Environmental (PESTLE)** is another evaluation framework used to understand the impact of external factors on an organization and is used in strategic planning. Political factors include government regulations and legal issues that define both formal and informal rules under which the organization must operate. Economic factors affect the purchasing power of potential customers and the organization's cost of capital. Social factors include the demographic and cultural aspects of the external environment. Technical factors can lower barriers to entry, reduce minimum efficient production levels, and influence outsourcing decisions. Legal factors include discrimination law, consumer law, antitrust law, employment law, and health and safety law. Environmental factors include ecological and environmental aspects such as weather, climate, and climate change.

- **Benefit-Cost Analysis (BCA)** is a common methodology for determining the future risk reduction benefits of a given mitigation measure compared to its costs. It is particularly useful in instances where several mitigation alternatives could address a given vulnerability. In this analysis, the up-front and sustained costs relative to the expected, long-term benefits should be considered. The result of this analysis is a Benefit-Cost Ratio (BCR). A measure is considered cost-effective when the BCR is rated at 1.0 or greater. This means that the benefits of the mitigation measure are equal to or greater than its costs. This type of analysis can help decision-makers prioritize different mitigation measures based on their cost-effectiveness.[1]

[1] https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis/full-bca#download

Appendix A. Energy Sector Stakeholder Engagement Questions

The below set of example questions may be asked for Risk Mitigation related to [SPECIFIC THREATS] such as hurricanes, earthquakes, flooding, etc. Examples of specific energy infrastructure asset or system types are electric substations, natural gas pipelines, petroleum refineries, etc. State officials are encouraged to edit and customize the below questions to meet the specific needs of their state.

RISK MITIGATION QUESTIONS

1. What mitigation measures have been taken to protect against or offset the impacts to energy infrastructure or systems caused by [SPECIFIC THREAT]? For example, have specific hardening measures (e.g., buried power lines) or have system contingencies (e.g., energy storage) been put in place?
    - How effective are these measures and how long can they be utilized?
    - What would make these resources more effective?
    - What State actions, policies, or programs could help?
2. What additional mitigation measures could be taken to protect against or offset the impacts to energy infrastructure or systems caused by [SPECIFIC THREAT]?
    - How effective are these resources and how long can they be utilized?
    - What are the challenges in implementing these measures?
    - What State actions, policies, or programs could help?
3. What contingency measures or emergency actions do critical consumers take when energy service or supply is lost? For example, do end-use consumers have emergency power generators or energy storage systems that allow them to operate for a time when service/supply is lost?
    - How effective are these measures and how long can these measures be sustained?
    - What would make these measures more effective?
    - What State actions, policies, or programs could help?
4. What additional contingency measures or emergency actions could critical consumers take when energy service or supply is lost?
    - How effective are these measures and how long can they be sustained?
    - What are the challenges in implementing these measures?
    - What State actions, policies, or programs could help?
5. What other State programs or policies could help address energy infrastructure or system risks from [SPECIFIC THREATS]?
    - How effective are these measures and how long can they be sustained?
    - What are the challenges in implementing these measures?

Appendix B. Risk Mitigation Approach Template

The following template may serve as an outline for how to prepare your state's Risk Mitigation Approach following the steps identified in the Guidebook.

INTRODUCTION

This section should describe the state's Risk Mitigation approach at a high-level, including what's most important to the state from a risk reduction and resilience perspective. Consider how the Approach builds from both the risk assessment output and existing mitigation work happening at the state and local level. This section should also identify potential capabilities, interests, and barriers for investing in risk mitigation solutions as well as a framework for evaluation. Examples of evaluation criteria include (but are not limited to) effectiveness of the measure at reducing overall risk, high priority infrastructure, cost effectiveness, ability to mitigate multiple hazards, and eligibility for funding.

RISK ASSESSMENT OUTPUT

This section should present the Risk Problem Statements that were developed as part of the Risk Assessment along with any additional information on Risk Scenarios gathered through stakeholder engagement and review of other relevant state and local plans.

Risk Scenario A: [Threat] / [Energy Asset or System]	
THREAT	▪ Probability of occurrence on an annual basis, typically on a scale of 0 to 100%.
VULNERABILITY	▪ May be interpreted as the expected outage duration from exposure to a given threat. ▪ Typically, specific to asset type and region. ▪ Should include interdependency considerations.
CONSEQUENCE	▪ Specific to asset or system, often based on total energy or number of customers affected. ▪ Should consider indirect or secondary consequences to the society, including impacts to critical energy users and/or vulnerable communities.
RISK	▪ Overall summary of risk considering threat probability, vulnerability (duration), and consequence of the Risk Scenario.

RISK MITIGATION MEASURES

This section presents Risk Mitigation Measures that various agencies and stakeholders may implement to address the Risk Problem Statements.

Exhibit 9: Mitigation Measures Summary Table

Risk Problem Statement	Risk Mitigation Measure	State Action	Risk Reduction	Estimated Cost to State	Funding Source	Asset Owner	Estimated Timeline	Participating Orgs	Source

RISK MITIGATION EVALUATION CRITERIA

This section should describe the methodology and criteria the state will use to evaluate and prioritize the proposed Risk Mitigation Measures. Reminder to use or build from the framework identified in the State's Hazard Mitigation Plan. See 10 below for reference.

Exhibit 10: STAPLEE Review and Selection Criteria

STAPLEE Review and Selection Criteria
Social: The public must support the overall implementation strategy and specific mitigation actions, and the mitigation actions are evaluated in terms of community acceptance.
Social Acceptance: Is the action socially acceptable to the state or jurisdiction and surrounding community?
Affect Segment of Population: Are there equity issues involved that would mean the action could adversely affect one segment of the population?
Social Disruption: Will the action cause social disruption (e.g., disrupt established neighborhoods, cause the relocation of lower income people, etc.)?
Technical: It is important to determine if the proposed action is technically feasible, will help to reduce losses in the long term, and has minimal secondary impacts. This category evaluates whether the alternative action is a whole or partial solution, or not a solution at all.
Technical Feasibility: Will the action be effective in avoiding or reducing future losses?
Long-Term Solution: Does the action solve the problem or only a symptom?
Secondary Impacts: Will the action create more problems than it solves?
Administrative: This category examines the anticipated staffing and maintenance requirements for the mitigation actions to determine if the state or jurisdiction has the personnel and administrative capabilities to implement the actions or whether outside help will be necessary.
Staffing (sufficient number and mix of staff): Does the state or jurisdiction have the capacity (number of staff) with the right mix of capabilities (training, experience, and technical expertise) to implement the action? Consider the following: Is there someone to coordinate and lead the effort? Is there sufficient funding, staff, and technical support available?
Operations & Maintenance: Can the state or jurisdiction provide the necessary resources to perform required operations & maintenance?
Political: This considers the level of political support for mitigation activities and programs.
Political Support: Is there public support both to implement and to maintain the action? Consider the following: Have political leaders participated in the planning process so far?

STAPLEE Review and Selection Criteria
Public Support (stakeholders): Is there enough public support to ensure the success of the action? Consider the following: Have all the stakeholders been offered an opportunity to participate in the planning process?
Local Champion or Plan Proponent (respected community member): Is there a local champion willing to help see the action to completion?
Legal: Whether the state or jurisdiction has the legal authority to implement the actions, or whether the state or jurisdiction must pass new laws or regulations, is important in determining how the mitigation action can be best carried out.
State Authority: Does the state have the authority to implement the action?
Existing Local Authority: Are proper laws, ordinances, and resolutions in place to implement the actions?
Potential Legal Challenge: Are there any potential legal consequences? Consider the following: Is there a technical, scientific, or legal basis for the mitigation action (i.e., does the mitigation action "fit" the hazard setting)? Is the action likely to be challenged by stakeholders who may be negatively impacted?
Economic: Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt to a community.
Benefit Relative to Cost: Does the cost seem appropriate relative to the size of the problem and the likely benefits? Consider the following: What are the budget and revenue impacts of this action? Are initial, maintenance, and administrative costs accounted for? How will this action affect the fiscal capability of the state or jurisdiction? What burden will be placed on the tax base or local economy to implement this action?
Contributes to Economic Goals: Does the action contribute to other state or jurisdiction economic goals, such as capital improvements or economic development?
Funding Allocated: Has funding been secured for the proposed action? If not, can it be readily obtained?
Outside Funding Eligibility: If funding has NOT been secured, is this action eligible for other funding source(s)? Consider the following: What are the potential funding sources (public-federal or state, nonprofit, private)?
Environmental: Impact on the environment is an important consideration due to public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), need to be kept in mind when using federal funds.

STAPLEE Review and Selection Criteria
Effect on Environment: Will this action negatively impact the natural habitat (e.g., land, water, etc.)?
Effect on Endangered Species: Will this action negatively impact endangered species?
Consistent with State and Local Environmental Goals: Is this action consistent with state and local environmental goals?
Regulatory Requirements/Approval: Does this action meet state and local regulatory requirements? Will the action require environmental regulatory approvals?
Consistent with Federal Laws: Is this action consistent with federal laws (e.g., NEPA, National Historic Preservation Act, etc.)

STAPLEE Table Instructions:

1. Use the following template to create an evaluation table assessing each of the Mitigation Measures above.
2. Fill in the proposed mitigation actions under "Alternative Actions" column.
3. Score each action using a "1" for favorable evaluation of each consideration, a "-1" for less favorable evaluation, and "0" for considerations that do not apply.
4. Add scores for ranking actions for prioritization by score.

STAPLEE Mitigation Action Evaluation Table		
STAPLEE Scoring Criteria		
"1" = Favorable	"-1" = Less Favorable	"0" = Not Applicable
	Alternative Actions	**Score**
S (Social)	Social Acceptance	
	Effect on Population Segment	
	Social Disruption	
T (Technical)	Technically Feasible	
	Long-Term Solution	
	Secondary Impacts	
A (Administrative)	Staffing	
	Operations & Maintenance	
P (Political)	Political Support	
	Public Support	
	Local Champion	
L (Legal)	State Authority	
	Existing Local Authority	
	Potential Challenges	

STAPLEE Mitigation Action Evaluation Table		
STAPLEE Scoring Criteria "1" = Favorable	"-1" = Less Favorable	"0" = Not Applicable
E (Economic)	Benefit Relative to Cost	
	Advances Economic Goals	
	Funding Allocated	
	Eligible for Outside Funding	
E (Environmental)	Effect on Environment	
	Effect on Endangered Species	
	Effect on Endangered Species	
	Meets Regulatory Requirements	
	Consistent with Federal Laws	
	Total	

Exhibit 11: SWOT Framework

SWOT Evaluation Framework	Sample Questions	Answers
Strengths	What are the benefits that this mitigation measure provides?	
Weaknesses	What are the potential negative impacts that could be associated with this mitigation measure?	
Opportunities	Does this mitigation measure cover a unique challenge or pave the way for further improvements?	
Threats	What potential roadblocks are there to enacting this mitigation measure?	

Exhibit 12: PESTLE Framework

PESTLE Evaluation Framework	Sample Questions	Answers
Political	What regulations and policies impact the mitigation measure?	
Economic	What are the potential financial costs and benefits from installing this mitigation measure?	

PESTLE Evaluation Framework	Sample Questions	Answers
Social	What communities and stakeholders are impacted by this measure and how are they affected?	
Technological	How does this mitigation measure improve or pave the way for emerging technologies?	
Legal	What laws and regulators need to be involved for the installation of the mitigation measure?	
Environmental	What impacts will the mitigation measure have on the environment?	

Appendix C. Risk Mitigation Example Measures

This appendix offers examples of mitigation measures; however, these examples are not exhaustive and are not tailored to any state. These example measures should be viewed as a foundational guide that can aid in the development of a more comprehensive, state-specific Risk Mitigation Approach. They can help initiate the process of identifying and implementing mitigation measures to address the unique hazards and concerns of a particular state. While this appendix provides a useful starting point, it is essential to refine and expand upon these measures to accurately reflect the specific needs and requirements of the state.

SESP use: The mitigation measures should not be simply inserted into a SESP without careful consideration as each state may have unique challenges and regulations that these examples may not fully address. Providing a list of mitigation measures does not constitute a Risk Mitigation Approach.

Existing regulations that apply to portions of the system should also be considered (e.g. North American Electric Reliability Corporation Critical Infrastructure Protection (NERC CIP) standards for the bulk power system and the Transportation Safety Administration (TSA) Security Directives for Pipelines.

In most states and territories, energy infrastructure is owned and operated by private industry and any measures taken to enhance energy infrastructure security and reliability (including many of the measures listed in this appendix) are at the discretion of those private sector owners and operators. State and local governments can encourage the adoption of these measures through policy/governance, regulation, planning and studies, incentive programs, coordination and convening, or grants and direct funding (See Exhibit 6). Comprehensive risk mitigation typically requires a combination of measures, particularly for effective cyber and physical protection.

LEGEND

Electricity	Liquid Fuel	Natural Gas

ALL-HAZARDS RISK MITIGATION MEASURES

Robustness

Measure	Description
Demand response programs	Demand response programs relieve pressure on electric or natural gas delivery systems by reducing or time-shifting customer energy usage. Demand reduction during peak periods reduces the chance of system overload and service failure. In addition to enhancing reliability, demand response can also help reduce generator or supplier market power and lessen price volatility.
System segmentation	Energy systems (power grids, gas pipeline networks, and liquid fuels pipeline networks) can be sub-divided to isolate damaged areas more efficiently, allowing undamaged segments to continue serving customers. By segmenting networks, service isolations can be more targeted and affect fewer customers.
Undergrounding power lines	Placing transmission lines underground protects them against external threats, including high winds and falling branches, wildfires, extreme heat or cold, icing, dirt/dust/salt accumulation, and animals. Buried lines may be more vulnerable to flooding if located in low-lying areas and may be more difficult and expensive to maintain and repair.

Redundancy

Measure	Description
Backup generators	Fixed or portable backup generators can provide backup power to critical facilities when grid-supplied power is interrupted. Backup generators may be designed to power emergency functions, such as emergency lighting, fire suppression, or stormwater removal, or may be designed to power some or all a facility's operational functions. Mobile generators can power utility or emergency responder base camps (sites where response personnel and equipment are staged). Backup generators require adequate fuel supply to operate.
Battery storage	Battery energy storage can be used to provide backup power during electric grid outages. Batteries can be deployed at utility-scale as front-of-the-meter systems, providing services like utility load peak shaving or behind-the-meter by customers.
Microgrids	A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid. It can connect and disconnect from the grid to operate in grid-connected or island modes. Microgrids can improve customer reliability and resilience to grid disturbances.
Ties between gas pipelines	Natural gas system operators can add ties between gas distribution lines or "mains" to diversify the transmission system and allow additional pathways to route natural gas in the event some sections of transmission mains are damaged.

Rapid Detection/Recovery

Measure	Description
Advanced distribution management systems	Advanced distribution management systems integrate numerous utility systems and provide automated outage restoration and optimization of distribution grid performance. These functions improve the resilience of the distribution system and decrease the length of customer outages.
Artificial intelligence analysis	Artificial intelligence analysis can augment the abilities of subject matter experts to prioritize transmission line operations, identify defects, and update asset management systems.
Distribution automation	Distribution automation uses digital sensors and switches with advanced control and communication technologies to automate feeder switching; voltage and equipment health monitoring; and outage, voltage, and reactive power management.
Drones for asset inspection	The use of drones to inspect pipelines, transmission lines, or other assets allows for safer and more frequent inspections, enhanced asset information, reduced operational costs and failure rates, and extended asset lifetimes.
LiDAR for vegetation management	Vegetation is the primary cause of overhead power line outages. "Light Detection and Ranging" (LiDAR), is remote-sensing technology that can measure how close vegetation is to power lines. LiDAR units can be deployed on the ground, drones, or aircraft, to enable more effective vegetation management reducing the impact of storms on electric infrastructure.
Remote-operated valves	Remote-operated valves more efficiently isolate systems during disruptions or peak event load management (e.g., temporarily disconnecting gas customers).
Smart meters	Smart meters can provide near-real-time visibility into customer outages and help utilities allocate resources and restoration activities more efficiently.
Supply chain resilience planning	Assessing current supply chains and working with relevant stakeholders to strategically plan for the continuity and rapid restoration of those supply chains after major disruptions improves supply chain resilience.
Weather Station	Weather stations can provide critical information about wind speed, precipitation, and temperature in remote areas of the state which allows for rapid detection and monitoring of natural hazard events.

HAZARD-SPECIFIC RISK MITIGATION MEASURES

Cold Weather Protection Measures

Measure	Description
Pipeline insulation & trace heating	Fiberglass insulation used to enclose piping can protect against freezing. Additionally, an electrical heating element installed along the length of a pipe and covered by thermal insulation can be used to maintain or raise the temperature of the pipe during cold weather.
Water line management	Draining water lines prevents rupturing that would otherwise be caused by the freezing water caught inside. Water lines that cannot be drained can be set to drip. The small amount of flow caused by the steady drip can help prevent the water inside the lines from freezing and rupturing the lines.
Heating & pitch adjustment for wind turbines	Wind turbine blades and lubricant housings can be fitted with heating elements that prevent ice accumulation that would otherwise impair operations. Wind turbines can also be configured to operate in winter ice operation mode, which changes the pitch of the blades to allow continued operation as they accumulate ice.
Thermal enclosures	Instrumentation can be enclosed and heated to ensure functionality and operational continuity during extreme cold conditions.

Extreme Heat & Drought Resistance Measures

Measure	Description	Sector
Advanced water-cooling technologies	Power plants require significant volumes of water for thermoelectric cooling. Asset owners can employ approaches to reduce their water use to make them more resilient to drought conditions. Alternative approaches include recirculating cooling, dry cooling (highlighted below), and wet-dry hybrid cooling technologies. Cooling equipment capable of using alternative water sources (e.g., brackish water, wastewater) can reduce the impact of droughts.	
Dry cooling	Nearly all thermal generation, including nuclear and coal-fired power plants, requires large quantities of water for cooling. Extreme heat can lead to water shortages or make the water used for cooling too warm, forcing power plant operators to curtail electricity output. Dry cooling technologies use air-cooled heat exchangers and other technologies to significantly reduce water use.	
Hydropower reservoir capacity	Increasing reservoir storage capacity at hydroelectric power plants can offset the effects of precipitation variability.	
Turbine efficiency	Higher-efficiency hydroelectric turbines require less water per unit of electricity generated and are more resilient to drought.	

Seismic Protection Measures

Measure	Description	
Base isolation transformer platform	Substation transformers can be placed on platforms designed to absorb the shaking from earthquakes that would otherwise damage the equipment.	
Culverts	Placing fuel pipelines within buried concrete trenches, called culverts, significantly reduces the fracturing, buckling, and other damage caused to buried pipelines during an earthquake.	
Flexible joints	Flexible joints between steel pipe segments absorb the deformations caused during an earthquake and lessen the damage caused to pipeline infrastructure.	

Flood Protection Measures

Measure	Description
Elevate equipment	Elevating equipment located in low-lying areas can protect it from flooding that would otherwise damage or destroy it.
Environmental management	Preserving certain kinds of natural habitats (e.g., coastal wetlands) provides a natural barrier to lessen the impact of storm surge.
Flood walls/gates	Installing flood walls, gates, and/or barriers can protect essential equipment in flood prone areas from water intrusion and avoid restoration delays after major storms and floods.
Relocate assets	Relocating energy assets away from flood-prone areas can reduce or eliminate their exposure to flooding and inundation threats.
Stormwater pumps	Stormwater pumps can remove flood water and help prevent equipment from being submerged.
Submersible equipment	Equipment located in flood-prone areas, such as underground power distribution systems in low-lying areas, can be modified or replaced with equipment that is designed to continue functioning when subjected to flooding from water containing typical levels of contaminants such as salt, fertilizer, motor oil, and cleaning solvents.
Vent line protectors	A vent line protector (VLP) protects gas regulator vent lines from encroaching water. The VLP is usually open, but if water enters the vent line via the VLP, a float will seal the vent line shut. The float will drop when the water recedes, re-opening the vent to its normal position.
Vented manhole covers	In flooding scenarios, manhole covers can dislodge, and the exposed manhole creates a hazard for pedestrians and vehicles. Proper vent design can allow for the flow of excess water without dislodging the cover.

Wildfire Protection Measures

Measure	Description
Covered conductors	To mitigate wildfire risk, utilities can replace bare wire overhead conductors on high-voltage transmission lines with conductors that have a plastic covering (also called tree wire). Covered conductors greatly reduce the number of faults, and the risk of ignition. Similar products include spacer cables and aerial cables.
Fire-resistant poles	Wood poles can be replaced with ones made from fireproof materials, or wrapped in fireproof sheaths (e.g., wool-ceramic fiber).
Line-break-protection systems	Automated monitoring equipment, called phasor measurement units, installed on transmission lines can detect a voltage change associated with the breakage of a power line. The system can respond in near real-time by de-energizing that segment of the transmission line so that the broken power line does not spark a fire as it falls to the ground.
Pre-treat assets in path of fire	Pre-treating infrastructure (e.g., by applying flame retardant coatings or wrapping assets such as utility poles in flame retardant sheaths) decreases wildfire damage and expedites restoration of service.
Reconductoring	Reconductoring is the process of installing new conductor wires on existing towers to increase transmission capacity, thus reducing propensity for high loads and line sag, which can cause ignition. Reconductoring typically involves replacing traditional steel-reinforced lines with composite core lines.
Fire Spread Modeling	Fire Spread Modeling allows for the prediction of potential scenarios during a wildfire. This includes mapping of fuels, vegetation conditions, and populations affected.

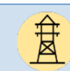
Wind Protection Measures

Measure	Description
Breakaway service connectors	A breakaway service connector is designed to disconnect when the power line it is attached to is pulled by a falling limb or other debris. This avoids damage caused when a service wire is pulled down in a way that damages the meter receptable. Meter receptables are not owned by the utility, and a private electrician is needed to first make repairs, delaying service restoration.
Dead-end towers	Dead-end towers (also called anchor towers or anchor pylons) are self-supporting structures made with heavier material than suspension towers. Dead-end towers are used where a transmission line ends; where the transmission line turns at a large angle; on each side of a major crossing such as a large river, highway, or large valley; or at intervals along straight segments to provide additional support. Suspension towers are typically used when the transmission line continues along a straight path. When the weaker suspension towers are compromised or topple, the stronger dead-end structures can stop a domino effect that takes down multiple towers. Reducing the spacing between dead-end structures can limit the impacts of domino effect failures.
Stronger utility poles	This can involve reinforcing wood poles, replacing wood poles with concrete ones, or replacing wood cross-arms with fiberglass ones.
Vegetation management and enhanced vegetation management	Clearing vegetation away from transmission and distribution lines helps prevent damage (e.g., falling tree branches) to power lines that cause outages.
Public Safety Power Shutoffs	During high-risk periods where conditions are more likely to cause wildfires, utilities may deenergize lines to reduce risks. To reduce impacts during these events companies may increase distribution sectionalization, transmission switching and distributed generation and microgrids to reduce the impact from these events.

Physical Security

Measure	Description
Perimeter Security	Installation of perimeter fencing or other physical barriers to prevent or delay attackers from entering the facility. Installation of ballistic shielding or obscuring of the line of sight to protect critical components from being targeted from a distance. Providing sufficient lighting for human or technological recognition of intrusion into facility perimeter or critical areas. Use of penetration resistant physical barriers, such as concrete jersey-style barriers or other barriers can mitigate the use of vehicle as a weapon.
Physical Security Control	Physical access can be controlled, monitored, and logged to prevent unauthorized access. Methods can include controlling, physical access via card keys, special locks, or other authentication devices; monitoring physical access via alarm systems or human observation of access points; and logging physical access via computerized logging, video recording, or manual logging.
Security Monitoring	Infrastructure owners can ensure security, operations, or maintenance personnel check facilities on a regular basis, and possibly on a varied timetable, so that attackers cannot take advantage of a predictable schedule. Regular site visits, along with a generally well-maintained substation site (both inside and outside the fence line), are important deterrents.
Personnel Training	Infrastructure operators can provide security awareness briefings, including insider threat mitigation, to all personnel upon hiring and refresher training at regular intervals.
Intrusion Monitoring and Detection	Deploying video surveillance, motion detectors, glass break sensors, or other systems that detect intruders attempting to pass through exterior access points, like fences, checkpoints, and access control gates can enable quick response times and limit potential damages. Intrusion detection systems may be designed to automatically alert response authorities or to engage intrusion prevention measures when an intrusion has been detected. Video surveillance should be recorded to enable better post-incidence forensics.
Intrusion Prevention	Critical infrastructure is equipped with systems designed to automatically shut down security breaches when detected (e.g., doorway entry system with lockdown capabilities).
Physical Security Assessment	Periodic review and inspection of physical security measures, by the infrastructure owner/operator, to evaluate their effectiveness. This will be useful in post-incident forensics, along with the development of written procedures to ensure security equipment is in functioning order with deficiencies addressed promptly.
Local Responder Coordination	Conducting outreach with local first responders to ensure they are aware of each facility's criticality/significance and which facilities are the most important. Attending periodic security drills or exercises (conducted by critical facilities) in coordination with emergency responders.

CyberSecurity

Measure	Description			
Cybersecurity Best Practices	Implementing CISA's Cybersecurity Best Practices can help energy companies manage common cyber risks.			
Cybersecurity Baselines for Electric Utilities	Adopting the Cybersecurity Baselines for Electric Distribution Systems and DER can mitigate cybersecurity risk and enhance grid security. These baselines define the minimum set of cybersecurity controls that should be considered, without defining any specific procedures or technologies on how any specific baselines might be met.			
Cybersecurity Risk Assessment	Ensure infrastructure owner/operators are regularly conducting risk assessments of energy sector-dependent IT and OT assets and developing plans to address specific asset vulnerabilities.			
Energy Supply Chain Cybersecurity Principles	Support and adopt DOE's Supply Chain Cybersecurity Principles for industrial control systems (ICS) manufacturers and end users. The Principles characterize the foundational actions and approaches needed to deliver strong cybersecurity throughout the vast global supply chains that build energy automation and ICS.			
Share Cyber Threat information	Foster and maintain industry relationships to communicate cyber threats and cybersecurity best practices. Encourage industry to join sector specific information sharing programs, such as the Electricity Information Sharing and Analysis Center (E-ISAC) and the Oil and Natural Gas Information Sharing and Analysis Center (ONG-ISAC)., as well as the Downstream Oil and Natural Gas Information Sharing and Analysis Center (DNG-ISAC).			
State and Local Cybersecurity Grant Program	Collaborate with state-owned, municipal, and tribal utilities to apply for grant funding from CISA's State and Local Cybersecurity Grant Program, which awards grants to eligible entities to address cybersecurity risks and cybersecurity threats to information systems owned or operated by, or on behalf of, state or local governments, there is a separate Tribal Cybersecurity Grant Program for Federally recognized tribes.