Energy and Emergency Planning Integration Crosswalk (EEPIC)

Prepared for the Midwestern Governors Association by Converge Strategies

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About this Material

The effort to create this framework stems from the recognition by the Midwestern Governors Association (MGA) that there's a need for enhanced state coordination and alignment in emergency planning, particularly in response to grid events. MGA aimed to develop a resource that encompasses existing state plans and policies addressing these challenges. This effort builds off the success of the MID-GRID initiative that sought to unify and enhance state energy resilience efforts.

This framework was created by pooling expertise from Midwestern states, including state energy offices, electric sector representatives, and emergency management authorities, who advised on the content and challenges they felt should be addressed. Their input was provided during meetings and workshops convened over the course of a year.

The goal of the material is to align policy, regulatory, and operational strategies into a framework that supports energy security, maximizes the impact of energy policies, enhances resilience, and promotes development in the Midwestern region.

ABOUT MIDWESTERN GOVERNORS ASSOCIATION

The Midwestern Governors Association (MGA) is a non-profit, bipartisan organization that brings together governors and their staff to address public policy issues of significance to the region. The MGA provides governors and state staff with the opportunity to foster regional development and exchange best practices.

Learn more about MGA at https://midwesterngovernors.org/.

ABOUT CONVERGE STRATEGIES, LLC

Converge Strategies, LLC (CSL) is a consulting company focused on the intersection of energy, resilience, and national security. CSL works with civilian and military partners to develop new approaches to energy resilience policy and planning in the face of rapidly evolving threats, vulnerable infrastructure, and determined adversaries.

Learn more about CSL at www.convergestrategies.com.

Introduction

EXECUTIVE SUMMARY

The rapid transformation of the electric grid, combined with a growing number of threats, requires a more sophisticated approach to energy security. MGA created the State Energy and Emergency Planning Coordination project to improve emergency planning and preparedness for regional grid emergencies.

This product - the Energy and Emergency Planning Integration Framework (EEPIC) - is designed to support multi-stakeholder planning and increase energy security at the state and regional scales. It provides a structured approach for developing new state energy strategies and for aligning existing planning processes with policy priorities. However, the EEPIC Framework does not replace existing plans required for state agencies or utilities under statute or regulation.

Objectives

SUPPORT ALIGNMENT

Align Governors' policy, regulatory, planning, operational, and legislative capabilities to support state energy strategy.

MAXIMIZE IMPACT

Improve energy policy decision-making to support energy resilience, equity, and economic development.

BUILD CAPABILITY

Improve interregional resource planning to accelerate investment in priority infrastructure and reduce grid vulnerabilities.

PURPOSE

KEY TERM: ENERGY SECURITY. Defined by the U.S. Department of Energy as, "having enough energy to meet demand and having a power system and infrastructure that are protected against physical and cyber threats. Energy security enhances national security, American competitiveness, and economic standing."

The Midwest electric grid is facing unprecedented electricity demand growth, increasingly frequent and severe weather, and the growing threat of physical and cyber attacks.

Energy security planning requires a collaborative and integrated approach to mitigate the breadth of risks confronting the electric grid that no single entity can fully address. Building a complete understanding of current grid conditions and future risk projections requires improved visibility into a variety of planning processes that currently reside in multiple public and private sector organizations. Utilities and energy service companies provide electricity to consumers, regional grid operators maintain the reliability of the bulk power system, and states have responsibility for public health and safety, and for electricity sector regulation and policy.

The purpose of the EEPIC Framework is to enable states to align their policy goals through a more collaborative and holistic approach to state energy security policy and emergency operations planning. Each module of the framework is designed to guide users through a specific aspect of energy security with the goal of creating tailored but scalable approaches to planning.

User Guide

Review Existing Plans and Map Stakeholders

EXISTING PLANS | The EEPIC Framework builds on plans, policies, and procedures developed by state utility commissions, energy offices, and emergency management agencies **(See Annex B)**. Users should identify and review current documents to ensure alignment.

STAKEHOLDERS | There are many public and private sector organizations that influence energy security planning **(See Annex B)**. Users should identify the stakeholders that require sustained engagement and partnership as part of the planning and integration process.

Navigating the Framework

STEP 1 — Energy Strategy Crosswalk

Before proceeding to individual modules, users should develop a State Energy Security Strategy utilizing the provided **Crosswalk.** The Strategy should set priorities and guide planning decisions for each of the modules to follow.

STEP 2 — Module Selection

Each of the four planning modules can function as a stand-alone guide, or they can be used together to develop a consolidated energy security resource. Interpret the module(s) using your chosen strategy as a guide.

STEP 3 — Planning Review

Reference existing plans and policies while navigating the modules to identify areas of alignment and gaps based on users' interpretation of the modules and chosen strategy. This can result in new or updated plans or policies.

STEP 4 — Integrated Planning

The completed framework module should serve as a guide for future efforts related to mid- and long- term infrastructure planning, state energy policy development, and emergency response planning.

Special Considerations

Electricity-Focused

Energy security includes considerations for infrastructure, assets, and integrated systems that extend beyond electricity. This can include natural gas, liquid fuels (including LNG, propane, etc) and oil. For the purpose of this framework, the planning and analysis will be limited to electricity systems, with consideration given to other energy infrastructure as part of the **Interdependency Planning Module**.

Data Sharing

Several planning modules in the EEPIC Framework benefit from planners having access to information that is not publicly available because it is proprietary or protected from disclosure. While this information would be beneficial to the analysis, it is also not required. Users should engage through existing processes or use resources such as the **NARUC Grid Data Sharing Playbook** to share information that would advance energy security planning.

Resource Adequacy

Resource adequacy is defined as, "the ability of a power system to supply enough electricity — at the right locations — to keep the lights on during all hours of the year." This Framework does include a resource adequacy module since there are multiple, well-established methods and processes to assess it. However, each module will identify the resource adequacy impacts of each topic area.

State Energy Strategy

State Priorities

Given the complex nature of the electricity grid and the diversity of public and private stakeholders, it is essential to determine what the guiding principle will be to drive legislation, policy, regulation, planning, operations, and the allocation of scarce financial resources. Below are three strategies, each with specific benefits to all stakeholders, that can be applied to the energy security planning process to serve as a driver for the grid transformation.

Strategy Descriptions

Diversification	Using diversification as the primary driver of an energy security strategy reduces dependence on any single energy source, thereby enhancing the stability, resilience, sustainability, and reliability of energy infrastructure. The presence of multiple energy sources on a system mitigates multiple levels of risks, especially those associated with supply chain, price volatility, and regulatory changes.
Economics	Economics as a driver of energy security leverages the financial perspective for risk mitigation by prioritizing investment in infrastructure and/or specific energy sources. This approach may stem from communities that rely on a particular energy asset, from political decision-makers, or from the private or public sector. An economic driver may also encourage additional support for investments in certain energy sources or infrastructure projects.
Resilience	Resilience promotes an energy security strategy that uses innovative technologies, tools, and processes to reduce risk and enhance the security of the system. The level of resilience and the methods needed to achieve resilience can be determined through analysis of current vulnerabilities and future threats, as driven by infrastructure needs, laws, or regulatory requirements.

STATE GUIDANCE | Review existing variables highlighted below to understand what drives decisions.

Policies	Plans	Stakeholders	Funding
What state policies, legislation, or regulations govern the electric grid?	Local, state, and regional planning resources and processes.	Public and private entities & personnel needed to build and operate the grid.	Investment from ratepayers, private organizations, and government sources.

EEPIC Framework Modules

OVERVIEW

Given the many facets of energy security and energy emergencies, the EEPIC Framework focuses on specific challenges associated with the subsets of plans, procedures, and activities related to a prioritized few. The MGA State Energy and Emergency Planning Coordination Group identified four specific topic areas that are central to state planning where improved alignment could maximize the effectiveness of the framework. The four modules below are designed to address each topic.

PLANNING MODULES

MODULE 1: Energy Risk and Criticality

Energy risk and criticality is the potential for energy infrastructure to be impacted by a broad range of hazards as well as the relative importance of assets to the reliable operation of the grid. This includes susceptibility to hazards, impacts of a disruption on connected systems, presence or lack of redundancy, and the asset's historical performance. The framework will suggest how organizations can develop shared, standardized assessment methods to address system-level risk.

MODULE 2: Restoration Prioritization

Restoration priorities determine how, when, and to whom energy will be restored, considering the availability of capacity resources infrastructure. States, RTOs, and utilities have different prioritization and response plans, some of which depend on one another. Additionally, organizations may not be aware of how these priorities and plans affect them. This framework will share insights for building a energy security prioritization method, incorporating successful resource planning and emergency response.

MODULE 3: Interdependency Planning

Interdependency planning helps regions develop robust emergency response plans as energy is crucial to other critical lifelines (e.g., natural gas, water, communications, transportation). Understanding how these sectors interact is key to achieving regional resilience. This framework will help users establish requirements within their organization and suggest methods for interdependency mapping with external partners and systems.

MODULE 4: Design and Integration

Design and integration refers to the ability of the infrastructure planning process to align between state policy, regulatory requirements, utility design, and ISO/RTO priorities. This can shape properly scaled T&D infrastructure design and performance requirements. The framework will provide guidelines for building uniform infrastructure design criteria that consider multiple organizational priorities and processes.

Diversification

Strategy: Diversification

STATE OBJECTIVES

SPREAD OUT RISK	CLEAN ENERGY	SYSTEM OF SYSTEMS
Reduce the risk of state dependence on a single energy source, fuel type, or physical asset that, if left unaddressed, can become a single point of failure in a system by increasing redundancy through scaled and balanced investment.	Provide legislative, regulatory, or economic incentives to drive investment in clean energy resources as a means of building optionality into the capacity portfolio. Effective Implementation should include multiple resource types.	Adopt a "tactical" approach to segment energy systems through the deployment of microgrids, behind-the-meter generation, long duration energy storage and flexible power such as vehicle-to-grid technology for transportation electrification.

Advantages. Opportunity for carbon reduction, community-scale projects and improved reliability.

Drawbacks. Fewer energy market incentives and more complex deployment with utilities.

POLICY LEVERS

State Energy Office	State Legislation	Emergency Mgmt	Regulators	Owner/ Operator
Integration of redundancy and balance of the capacity resource mix into the State Energy Security Plan (SESP)	Provide grant funding and tax incentives for distributed energy resource deployment and permitting	Incorporate energy diversification into risk measurement, prioritize grant funding for deployment of BtM assets	Enact regulation to simplify the deployment of small-scale energy resources and incent rate-based investment	Develop Integrated Resource Plans (IRP) that include a focus on microgrid integration and the deployment of DER assets

MODULE NAVIGATION

Risk and Criticality Module. Identify risks that are directly addressable through added redundancy, as well as identifying critical assets to support

Restoration Prioritization. Look for opportunities to co-locate new energy resources with critical loads

Interdependency. Seek ways to reduce dependencies on bulk fuel infrastructure (i.e. oil or natural gas)

Design and Integration. Create and implement criteria for microgrid design and DER integration.

Economics

Strategy: Economics

STATE OBJECTIVES

LOW COST OF ENERGY	LARGE LOAD CUSTOMERS	LARGE SCALE INVESTMENT
Leverage energy and wholesale market competition to keep the cost of electricity as low as possible to minimize financial impacts to consumers and incentivize business investments in the state	Position the state to receive a larger share of projected load growth in business sectors including data centers and manufacturing by maximizing the amount of energy available to current and future customers	Drive additional public and private investment in infrastructure in order to successfully implement the strategy at scale. Lowest cost of energy delivery model will require balanced investment

Advantages. Lower overall cost to consumers can drive population and business growth.

Drawbacks. Less incentive for reliability and resilience. Diminished IOUs due increased market competition.

POLICY LEVERS

State Energy Office

Increased emphasis on transmission and bulk fuel delivery into the State Energy Security Plan (SESP)

State Legislation

Focus on expediting siting and permitting of Bulk Electric System (BES) assets to accelerate and scale development

Emergency Mgmt

Integrate large energy loads and capacity resources into risk planning to support effective restoration prioritization

Regulators

Align regulations with organized markets for large-scale energy deployment and minimal impact to ratepayers

Owner/ Operator

Develop Integrated Resource Plans (IRP) that include a focus on bulk transmission and new generation resources

MODULE NAVIGATION

Risk and Criticality Module. Identify and emphasize the risks to fuel delivery systems (i.e. natural gas) and large capacity resources

Restoration Prioritization. Incorporate key economic loads into planning for major events to limit business disruptions and incentivize reserve margins

Interdependency. Improve planning around gas/electric system coordination and interregional transmission connections with neighboring systems

Design and Integration. Maximize the use of grid enhancing technologies to harness for energy from existing infrastructure at lover cost

Resilience

Strategy: Resilience

STATE OBJECTIVES

ALL HAZARDS	CRITICAL LIFELINES	ASSET HARDENING
Improve the survivability of the electric grid to a full range of natural and man made threats. Tight integration of security systems and protocols between public and private sector, with special consideration for state-specific threats.	Identify and integrate the specific community lifelines that will reduce the human toll of energy emergencies (i.e. public health, public safety) to support disaster response operations and planning form the city level to the state level.	Upgrade current assets and construct additional infrastructure designed for the purpose of withstanding the impacts of severe weather events and targeted cyber and physical attacks on essential systems

Advantages. Higher system reliability and much lower risk of widespread, long-duration grid outage.

Drawbacks. Market structures don't currently incentivize resilience and costs can be higher.

POLICY LEVERS

State Energy Office

Use Vulnerability and Risk Assessment (VRA) as a targeting mechanism for infrastructure investment

State Legislation

Leverage state funding and grant programs to defray the costs of resilient infrastructure investments and balance benefits

Emergency Mgmt

Provide insight to community lifeline planning methods and support capture of federal grants for infrastructure

Regulators

Enable ideas such as performance - based regulation to support reliability and resilience outcomes and investment

Owner/ Operator

Develop Integrated Resource Plans (IRP) that emphasize system survivability and support of state security priorities

MODULE NAVIGATION

Risk and Criticality Module. Concrete connections between risk and investment, including reducing the criticality of assets through hardening

Restoration Prioritization. Identification of energy loads and customer types that support public health and safety

Interdependency. Emphasize connections between systems with the greatest human impact(i.e. water/wastewater, communications)

Design and Integration. Development of enhanced infrastructure requirements for threat-specific risks

Applying the State Strategy

Applying the Strategy

1. Review state plans, policy, legislation and regulation
2. Assess the value of each strategy as a function of risk
3. Determine state priorities for mid and long-term planning and investment
4. Partner with stakeholders to evaluate strategy
5. Utilize the selected strategy as a guide for each framework module

Select the strategy that best represents your state's priorities that will guide your navigation of the EEPIC planning modules

- **Diversification**
- **Economics**
- **Resilience**

Use the strategy to guide the completion of each module individually or in their entirety

Energy Risk and Criticality

Determine how the strategy impacts state planning regarding:

- ❑Prioritization of grid assets based on their relative criticality
- ❑Incorporation of risk and vulnerability Assessments
- ❑Identification of risk mitigation options to pursue through policy

Restoration Prioritization

Determine how the strategy impacts state planning regarding:

- ❑Alignment with existing plans and processes for grid outage events
- ❑Understand the impact of risk and vulnerability on decisions
- ❑Identify customer and facility types to prioritize

Interdependencies

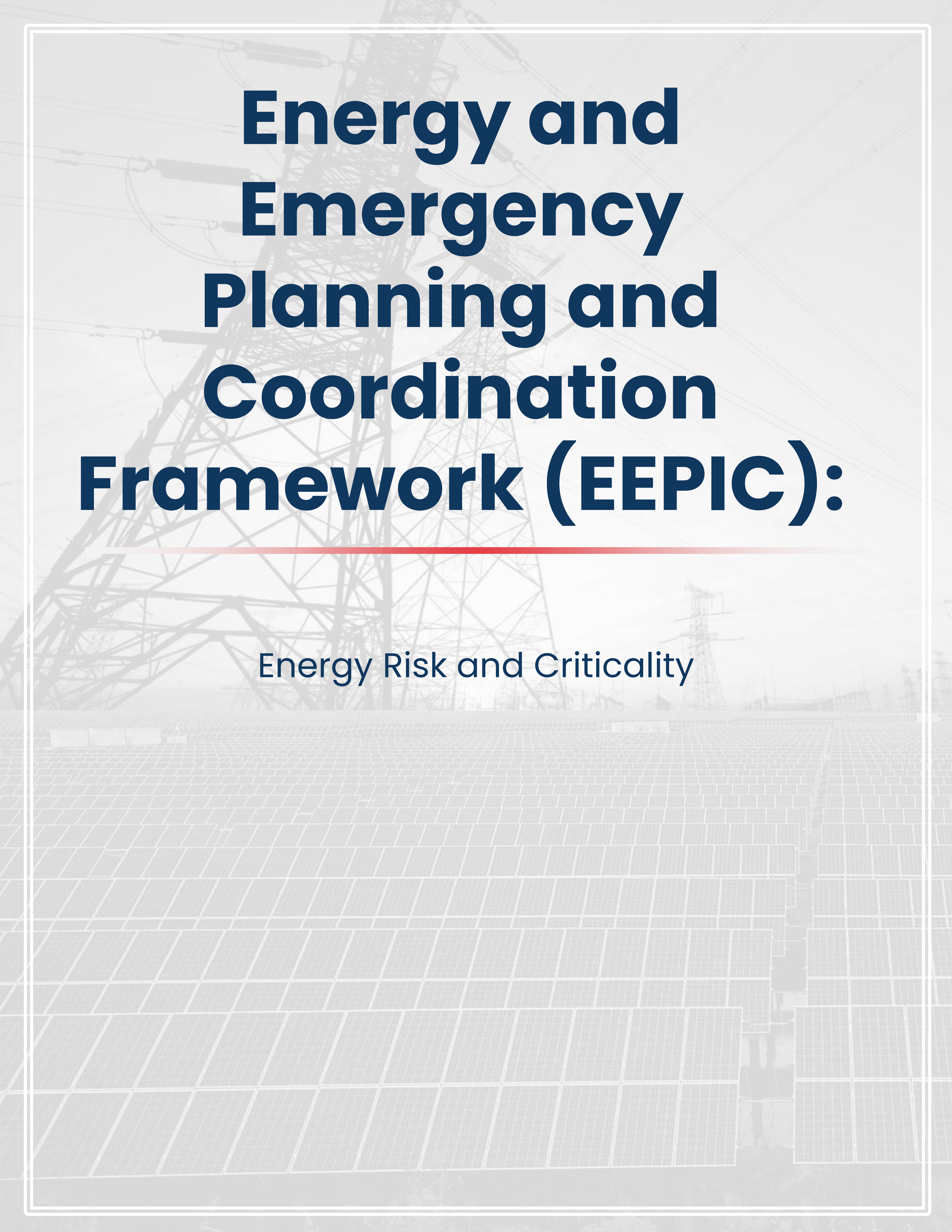
Determine how the strategy impacts state planning regarding:

- ❑Extent of electric grid dependencies on other infrastructure systems
- ❑Identify public and private stakeholders for policy engagement
- ❑Inform join planning priorities across industries

Design and Integration

Determine how the strategy impacts state planning regarding:

- ❑Development of integrated design processes and specifications to achieve policy goals
- ❑Incorporate existing planning criteria and processes
- ❑Align physical systems with strategy objectives



Energy and Emergency Planning and Coordination Framework (EEPIC):

Energy Risk and Criticality

Energy Risk and Criticality

OVERVIEW

Energy risk and criticality is the potential for energy infrastructure assets to be impacted by natural and man-made hazards due to its susceptibility to hazards, impacts of its disruption on connected systems, presence or lack of redundancy, and the asset's historical performance.

Understanding energy risk and criticality is important because natural or human-made risks to energy infrastructure affect security, reliability, and resilience. If these risks are determined in disparate, poorly communicated ways, then it can cause gaps in planning and resources for many stakeholders. This section aims to enable better communication between government and private stakeholders by suggesting a standardized method for assessing system-level risk.

Outline

HOW TO USE THIS FRAMEWORK SECTION

This module suggests a method of addressing the lack of uniformity in risk assessment methods, using a resources called the Consolidated Risk Spectrum. The Consolidated Risk Spectrum, as previewed below, is a four-step process that enables users to build a shared risk assessment method within their organization the considers multiple disparate processes. It can also be used to set expectations and create a shared understanding between stakeholders. Users are able to use results of Steps 2-4 to assess or understand the best choice for Step 1. Alternatively, the choice in Step 1 can be used to heavily influence decision-making in Steps 2-4.

Step 1 — **Communicating Criticality:** Understand how the Energy Security Strategy chosen in the User Guide affects how you address and communicate energy criticality.

Step 2 — **Risk Assessment:** Consider multiple aspects of risk.

Step 3 — **Dimensions of Energy Risk:** Analyze the effects these risks will have on the system.

Step 4 — **Criticality Matrix:** Determine how critical an asset is.

Energy Risk and Criticality

OPPORTUNITY STATEMENT

There is no uniform method for determining risk or the certainty of service criticality levels of energy infrastructure assets. If this alignment were achieved, it would help organizations build a general understanding of how specific circumstances might impact what is considered essential.

To address this challenge, this section will enable users to develop a Consolidated Risk Spectrum. The Consolidated Risk Spectrum is a multi-step process integrating multi-resource planning and provides essential decision points for evaluating risk, suggesting to users how to develop a shared, standardize risk assessment method for addressing system-level risk.

GAPS

No Single Method for Assessing Risk	Different organizations calculate risk differently. This leads to disparate energy planning processes and standards across the state. These differences can be the result of varying decision-making processes. First, the difference can be due to beliefs about what risks the organization believes exist and how best handle them. Secondly, it can also be due to the organizations' operational, technical, or financial ability to mitigate the risks. For example, if a state office lacks personnel with the technical expertise to evaluate certain best practices then it may pursue more relaxed standards that it can understand and articulate but will add a higher level of risk to the system.
Uncertainty of Service for Critical Functions	The lack of uniform risk assessment methods is further challenged by the lack of clarity regarding service for critical functions. More specifically, there's no uniform method to determine or communicate what makes an asset "critical". This distinction is important because how risk is determined and mitigated directly affects the measure of asset criticality.

MODULE GOALS

Share ideas on what organizations can do after assessing critical infrastructure risk.	Understand the differences between system-level vs individual risks.
Explain how organizations can define risk for their own critical infrastructure.	Navigate various risk tolerances across multiple entities & assets.
Recommend ways organizations can work together to create a standardized risk assessment process.	Improve outdated methods of identifying and mitigating risk, esp. regarding interregional connections.

STEP 1

Communicating Criticality

ENERGY STRATEGY AND CRITICALITY NEXUS

It's important for state officials to understand how their chosen Energy Strategy addresses system criticality and how their decision-making processes might differ from that of infrastructure owner/operators. It's normal for the state to address criticality issues through policy measures, regardless of the chosen energy strategy. Sometimes, this may differ from infrastructure owner/operators and other state offices, who may choose actions that don't fully accomplish state goals. The table below analyzes how how criticality is addressed and implemented through each Energy Strategy.

As suggested in the User Guide, officials are encouraged to choose their energy strategy prior to beginning the Consolidated Risk Spectrum. By doing so, the risk calculation created by the Consolidated Risk Spectrum will be better understood as a result of the desired strategy. However, the strategy can be chosen after conducting the Consolidated Risk Spectrum by analyzing which strategy is the best fit for the results.

Energy Strategy	Definition	How Criticality Is Addressed	Implementation
Diversification	Reducing risk of dependence on a single energy source or asset that, if left unaddressed, can become a single point of failure in a system by implementing redundancy of assets	Ensuring one type of energy source or asset that's susceptible to a particular risk type doesn't dominate system generation capacity by promoting buildout of excess generation assets, through financial or regulatory policy initiatives	Infrastructure owner/operators internally implements renewable energy build out in IRPs to be in compliance with state regulations or supports developers in interconnection processes
Economics	Prioritizing risk mitigation of certain energy types, assets, or system nodes based on its economic contribution	Identification of nodes or assets that need to be strengthened or hardened due to economic importance (e.g., military installation); or, providing subsidies for an energy type due to its economic/quality of life importance to a community	Infrastructure owner/operators increase generation capacity, regardless of type, to serve and protect new/increased load such as a data center
Resilience	The strengthening of an energy system through use of innovative technologies, tools, and processes	Seeking to protect system, assets, or loads from hazards by instituting specific policy measures (e.g., requiring battery storage be paired with all upcoming solar energy projects over a certain MW)	Infrastructure owner/operators manage demand challenges on system by implementing demand response measures for energy efficiency

STEP 2

Risk Assessment

HOLISTIC RISK

This Risk Assessment process builds off existing resources to help users consider multiple aspects of risk, including determining what risks to prioritize as a function of likelihood and impact, identifying the thresholds of acceptable risk to establish mitigation targets, and integrating current government and private sector plans to maximize compatibility. There are several factors that users should consider during the Risk Assessment process. These include external factors like weather, outages, and differing definitions of risk across organizations.

First, the type of outage, whether it's controlled (i.e., the loss of assets on the system isn't deliberate) or uncontrolled (i.e., the loss of assets on the system isn't deliberate), and the cause (e.g., cold weather, derechos, and floods), can affect risk calculations based on their relative severity and impacts to assets. However, these considerations shouldn't be major drivers of decision-making because these risks are inherently uncontrollable. The mitigation of these risks, particularly those affecting infrastructure, is ultimately the responsibility of the infrastructure owners and operators. Rather, officials should focus on mitigating measures, such as how they can best determine what risks exist and how they can assist in mitigating and communicating risks through policy, regulation, or financial assistance. Additionally, it's important to understand that risk may be defined differently across state resources and infrastructure owner planning processes. Users should analyze these differences to identify commonalities that can be used to shape interpretations of risk.

This process is dependent on thorough analysis and gathering documents from state offices, including the THIRA, SESP, and others. The following page outlines how to best maximize the Risk Assessment process, including how to best utilize these documents and key factors and questions to consider when analyzing the documents.

Probability vs Impact Matrix	+	Risk Tolerance Level	+	Vulnerability and Risk Assessment Outputs	=	Holistic Risk
Integrate current risk assessment processes from government and private sector (i.e. THIRA, ISO/RTO Alerts, NERC Reliability Assessments) to determine what vulnerabilities drive risk.		Consider the thresholds for risk mitigation relative to the availability and performance of energy infrastructure and service delivery to meet state energy security priorities.		Identify and incorporate the results of current State Energy Security Plans (SESP) and Vulnerability and Risk Assessments (VRA) to ensure alignment.		Determine how critical an asset is through an understanding of its characteristics.

STEP 2

Risk Assessment

OPTIMIZING THE PROCESS

Components Of The Risk Assessment	How This Informs The Risk Assessment Process	Considerations	Guiding Questions
Probability vs Impact Matrix	• Resources like the THIRA identify what state has already highlighted as hazards and can be used to determine impacts to a specific asset • NERC Reliability Assessments examine overall potential risks and impacts to the system and can be used to better inform analysis of risk probability and impacts to assets	• How assets are affected by varying risks (e.g., asset is vulnerable to fuel supply challenges but not floods) • The extent to which future risk is considered in present-day assessments • How impacts of a risk effect interpretation • How to reconcile resources that identify or interpret risks differently	• Are there other resources you can use to determine risk or analyze additional ones? • Which is more important: the probability or impact of a risk?
Risk Tolerance Level	• Influences how individual risks are evaluated and prioritized • Essentially defines “risk” (i.e., risk threshold is amount of risk you’re willing to accept)	• How future potential risk impacts present-day tolerance level • Impacts to infrastructure (e.g., resource/fuel availability, lifecycle, etc.) • How risk manifest itself (e.g., degradation or destruction of system)	• How high can risk tolerance be before system operations are severely degraded? • How might this decision impact asset performance and availability standards in the future? • How is tolerance varying by risk type?
Vulnerability And Risk Assessment Outputs	• SESPs can be used to validate or further analyze results and findings from previous components (e.g.., provides risk/hazard profiles and assessment, mitigation measures, etc.)	• How to reconcile different results between SESPs and other resources like THIRA • Consider cross-sector impacts	• What does it mean if a risk is presented multiple times across or within documents? What if a particular asset (type) is repeatedly affected?

STEP 3

Dimensions of Energy Risk

DRIVERS AND VARIABLES OF RISK

The Dimensions of Energy Risk helps users analyze the effects four different risk variables can have on the energy system. Users will need various pieces of information to conduct this analysis, including demographics and asset-specific information such as its location in the system and (inter)dependencies. This section aims to help users analyze the connections between state-identified priorities and key assets.

The first two risk variables are 'geographic scale' and 'duration'. These variables force officials to view risk in a more encompassing way by analyzing specific assets on a system level. Within each variable are specific characteristics to help officials further understand each energy risk type and how an asset is affected by it. The second set of risk variables are 'societal change' and 'cross sector impact'. It's important to understand how the loss of an asset might be felt by communities. However, your understanding of risk for these categories may change based on circumstances. For example, a lost asset affecting only transportation for vulnerable populations for 48 hours might be low risk, but if this outage occurs during Thanksgiving weekend, it might be deemed more high risk. If this is a concern, then follow-on plans will need to be made to strengthen such an asset.

The following pages discuss each of the variables and their characteristics in greater detail to better aid users in their analysis in understanding what drives risk across their energy system. The variable's characteristics are color-coded in red, yellow, and green to denote low, medium, and high risk, respectively. These color designations, seen below, will be useful in analyzing the results of the Consolidated Risk Spectrum.

Variable #1: Geographic Scale

Evaluate how the impacts of risk increases proportionally to the scale of the energy systems impacted in an event.

Variable #2: Duration

Assess thresholds for time-driven disruptions that result in cascading impacts to people and interdependent systems.

Variable #3: Societal Change

Understand the severity of impact based on tiers: 1) Population Vulnerability, 2) Public Health/Safety, 3) Potential for permanent relocation/ mass migration.

Variable #4: Cross Sector Impact

Crosswalk the FEMA Community Lifelines to assess extent of multi-sector impacts due to asset or system degradation, disruption, or destruction.

Low Risk	Medium Risk	High Risk

STEP 3

Dimensions of Energy Risk

VARIABLE 1: GEOGRAPHIC SCALE

Risks to infrastructure impact the energy system differently depending on the "level" of the grid the asset lies on. Understanding these risks allows you to better determine the actions you should take to mitigate them. There are three main levels of scale along the energy system to consider: local (distribution infrastructure), state (transmission and generation), and multi-jurisdictional (regional Bulk Electric System).

The table below provides examples of how low, medium, and high risks to assets can impact the system at each grid level. Each risk level provides further examples of what types of risk exist and the ways in which they impact energy systems. While low levels of risk to any asset have little effect on the energy system outside of the local level, high risk levels can cause profound impacts from the community to the national level.

	Asset Risk Level		
System Level	**Low** *Maintenance issues, localized outages, slight changes in supply and demand, supply chain delays, accidents*	**Medium** *Critical equipment failure, environmental events, regional demand spikes, cybersecurity, policy change*	**High** *Large-scale environmental events, cybersecurity, resource scarcity, physical attacks, safety incidents, significant policy change*
Local	Brief, localized outages impact community lifelines and functions Delays in maintenance; may cause significant issues over time	Harm businesses and quality of life Little to no redundancy if asset becomes inoperable; can stress wider system	Devastation of communities, particularly over long periods (e.g., blackouts, damage, hazards like pipeline explosion)
State	Frequent/repeating issues on individual assets may impact compliance and overall cost for operators	Physical harm to people and equipment Needs for replacements and upgrades cause serious disruptions to energy delivery	Widespread outages and economic loss Impedes emergency response and impact other infrastructure systems
Multi-jurisdictional	Minimal impact, even when aggregated due to size and interconnectedness of systems	Reliance on interregional transfers, assuming connections work or exist Cost/price volatility	Stress to regional and national grid can impede interregional transfers and economics (e.g., factories can't produce export goods)

STEP 3

Dimensions of Energy Risk

VARIABLE 2: DURATION

The length of time a grid asset is inoperable can seriously impact the performance of other grid assets within a connected system, including the energy customers the asset serves. Longer duration outage events lead to a higher overall risk of substantial impacts to people and systems as performance degrades over time.

This variable is broken into three timeblocks: 6-24 hours; 24-72 hours; and over 72 hours. Each time frames carries its own set of corresponding impacts to people, operations, and physical infrastructure as a result of the extended power outage. While there may be common themes between the timeblocks, the severity of the effects and impacts increases with the outage duration.

Utilize the diagram below to analyze and understand the risk of an extended outage. What energy customers and connected infrastructure depend on that asset's operation, and what happens when electricity service is lost? How do these timelines affect your state's priorities for energy emergency response planning?

	Effects	Impacts to Infrastructure
6-24 Hours	Common timeframe primarily impacting quality of life (e.g., loss of home energy, businesses) Minor health & safety concerns (e.g., food spoilage, electrical medical equipment)	Backup battery on communications towers last ~8 hours, restricting time for power restoration Reliance on backup generation, if equipped
24-72+ Hours	Moderate impacts to health & safety, economics, and infrastructure (e.g., certain functions cease due to lack of power, loss of communications) Extended planning/resources may be required to protect and provide for population	Typical stored fuel for backup generation is only enough for ~72 hours and may begin to run out, depending on use Long term impacts to non-operating infrastructure (e.g., bugs at wastewater treatment plant die if not "fed")
72+ Hours	Severe impacts to population health & safety and economics (e.g., businesses close, slow/no transportation, poor/low medical care access) Property damage due to lack of heating/cooling	Outages over this timeframe are eligible for federal assistance Requires extensive coordination across sectors and organizations to restore system safely

STEP 3

Dimensions of Energy Risk

VARIABLE 3: SOCIETAL IMPACT

Energy is one of the most important tools we have to sustain societal functions. While numerous modeling tools exist to help us understand the technical underpinnings of losing a grid aseet, societal impact, helps users of this framework interpret how the loss of electrical service can affect the essential services people rely on. Societal impact is divided into the three categories below, which describe the ways in which people are impacted. These categories include Population Vulnerability, which primarily deals with quality of life; Public Health and Safety; and Permanent Relocation/Mass Migration, which describes the lasting socioeconomic impacts of outages.

Notice below how the severity increases for each category, demonstrating how more critical grid assets with higher overall risk reflects a rapid escalation of impacts to the populations they provide services to. For example, if a small business is without power for 2 weeks, they are far more likely likely to permanently close, even when power is restored. These lasting impacts meaning that societal change is a high risk for the generating asset.

Population Vulnerability

Endangers public safety through slow or absent transit options, safety enforcement resources like LEOs may be engaged in other activities

Impacted quality of life (e.g., economic well being, loss of electricity for food storage, medical supplies, essential services like water might also be impacted)

Public Health & Safety

Grid disruptions to medical facilities including hospitals, clinics, nursing homes, and pharmacies can result in poor quality medical care or the complete loss of services.

Water infrastructure may also be affected, leading to reduced access to potable water and causing the spread of infectious diseases.

Permanent Relocation/Mass Migration

Businesses closing for multiple weeks due to extended power outages undercuts financial stability, resulting in job losses for the local population and a long-term loss of tax revenue for local governments. If outages are long and/or reoccuring in a region, pre-existing business may close, and new businesses may avoid the area, harming the overall economic well being of communities

STEP 3

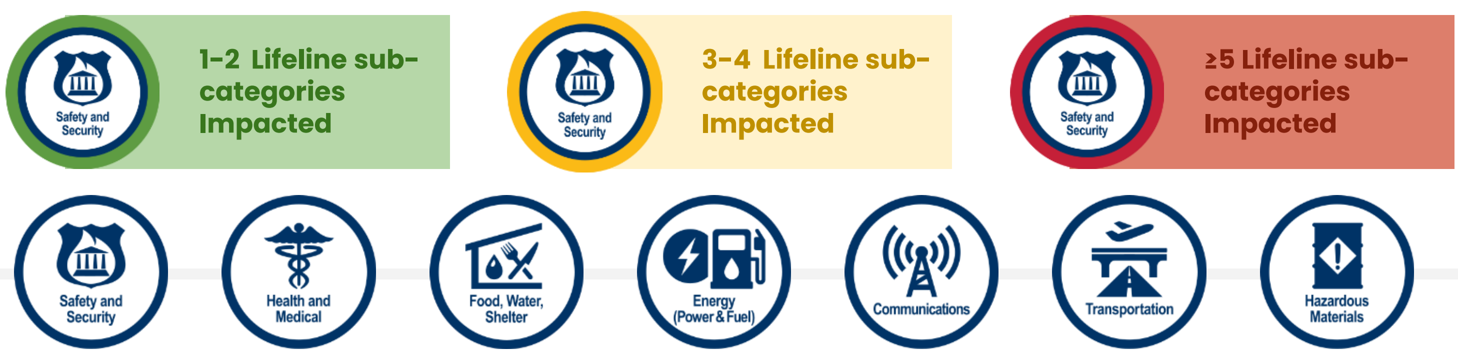
Dimensions of Energy Risk

CROSS SECTOR IMPACTS

As previously discussed, energy is utilized is almost every aspect of our daily lives. Numerous systems are dependent on energy: transportation, communication, and health. When the loss of an asset prevents energy transmission, the effects reverberate across multiple sectors.

The final variable of the Dimensions of Energy Risk analyzes cross sector impacts using the FEMA Community Lifelines to understand the cross sector role of an asset and how communities and the system are affected. Below, the diagram shows the increasing severity of risk when more than 1 Lifeline is affected. Note that this section is agnostic to which specific lifeline is affected. However, outside of this process, users are encouraged to conduct further analysis of the subcategories in each lifeline to gain full understanding of the risks to other sectors.

Users should refer to Annex A for the full list of the FEMA Community Lifelines.



EXAMPLE: DETERMINING DRIVERS OF RISK

Step 3 of the Consolidated Risk Spectrum allows officials to determine what is driving risk calculations in their state.

The table to the left demonstrates how to interpret the results using the example of an asset operating in cold weather.

In this scenario, the primary driver of risk is the scale of impact from the loss of this asset, which is high. However, the over risk level is medium because the outage duration is relatively short-term and will affect few people and sectors.

Scenario: Cold Snap

Scale	Local T&D	BES	Regional
Duration	<24 Hours	24-72 Hours	72+ Hours
Population	Vulnerable	Health & Safety	Mass Migration
Cross-Sector	1-2 Lifelines	3-4 Lifelines	≥5 Lifelines

Risk Level: Medium

STEP 4

Criticality Matrix

INTEGRATING RISK METHODS

The Criticality Matrix is the final step in the Consolidated Risk Spectrum. Here, users determine how critical an energy asset is relative to other infrastructure by identifying and assessing its overall risk and performance as part of the larger energy system. To best complete this matrix, users may need to work with infrastructure owners/operators to gather data on resources and historical performance of assets. In the matrix, there are some examples of key questions officials should ask of themselves when determining asset criticality. The process described in the following pages is not entirely prescriptive and users should feel welcome to adjust the process to suit their needs.

The first step of the matrix is to gather your findings and external resources from previous steps of the Consolidated Risk Matrix. These will be used as inputs in the matrix. Then, using the example questions below, analyze your findings from both the Risk Assessment (Step 2) and Dimensions of Energy Risk (Step 3). Finally, using data regarding infrastructure performance and resources, analyze the performance of the asset.

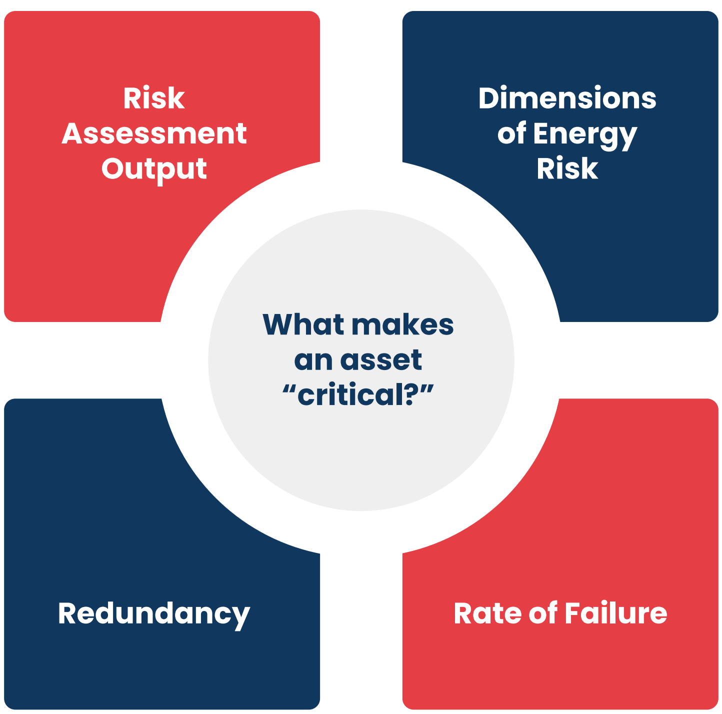
The Criticality Matrix utilizes a 10-point system, symbolizing low (1) to high risk (10), that can be used to rank the findings of each category, based on the occurrence of issues in each. For example, an asset that is high performing would rank with 1; however, if the asset has a high capacity and few others on the system can match it, then its redundancy score could be an 8. The points for each category should be added together to determine the criticality of the asset. In general, an asset is critical if the total score is over 30, or if a single category is ranked at 8 or more.

Susceptibility to Risk

What was the outcome of the risk assessment? An asset with a high likelihood of experiencing a risk that you can't reasonably tolerate should be rated as highly critical.

Risk Drivers

What is the primary aspect of risk? Does the asset serve a densely populated area? Is it an important regional asset? Would it take a long time to repair or replace?



Single Point of Failure

Can the functions on this asset be supplemented or replaced by another resource, asset, or capability with minimal impact?

Historical Performance

What is this asset's historical performance? What stage of lifecycle is this asset in? Think about what risks an aged asset poses to system operations.

Criticality Matrix

STEP 4

USING THE CRITICALITY MATRIX

Below is the scoring method for understanding the results of the Criticality Matrix for both individual assets and the overall score.

Individual Asset Score	Low Risk *(1-3)*	Medium Risk *(4-6)*	High Risk *(7-10)*

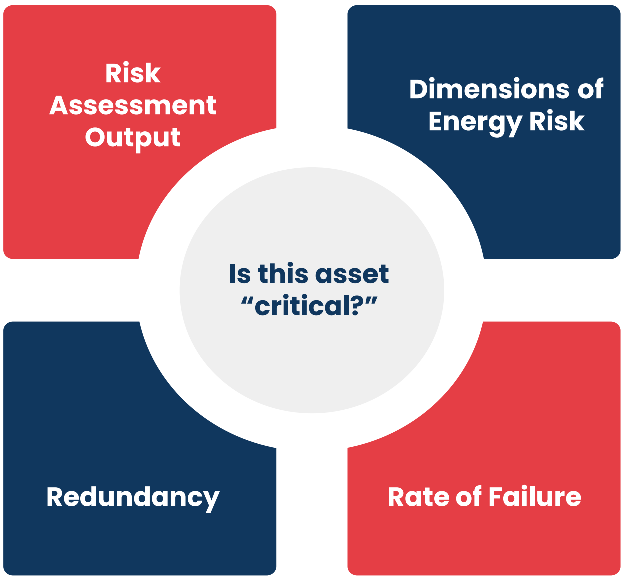
Criticality Score	Low *(1-10)*	Medium *(11-20)*	Concerning *(21-30)*	*Critical (31-40)*

EXAMPLE: DETERMINING CRITICALITY

Below is an example of how to best conduct the Criticality Matrix. Here, we will analyze a wind power plant in the Midwest.

The wind farm is exposed to few risks and is unlikely to have a reduced fuel source due to the climate. However, concerns remain over equipment supply chains and know-how.

The wind farm is a major producer for this part of the system. Excess energy produced crosses state lines. Its loss would impact over 6 Lifelines.



This is a high capacity asset with a high capacity factor. If lost, only 2 other assets can together come close to producing the same amount, but loads will have to be shed.

This asset is fairly new and never failed.

	Risk Assessment Output	Dimensions of Energy Risk	Redundancy	Rate of Failure	Criticality Score
Score	3	8	6	1	18

Result

This asset criticality score is “medium” due to its low risk, the existence of redundant assets, and nonexistent rate of failure. **However,** it is still critical and poses a high risk to the system due to its risk drivers, particularly its extensive cross sector impact.

STEP 4

Criticality Matrix

UNDERSTANDING THE CONSOLIDATED RISK SPECTRUM

The final step of the Consolidated Risk Spectrum is to analyze and interpret the inputs of each step to understand the results of the overall risk assessment. This will allow officials to do two things. First, this process produces a common understanding of what "risk" means- a definition. Secondly, this new definition can be used to communicate to utilities what energy issues the state is concerned about and how it wants to address it. The table below helps officials better interpret meaning behind the inputs in each step of the Consolidated Risk Spectrum process. However, this table is not prescriptive and should be used as a guiding tool during and after the analysis process.

	Risk Level		
Consolidated Risk Spectrum	**Low**	**Medium**	**High**
Energy Security Strategy	Chosen strategy existed in policy prior to conducting module and is already implemented or in progress; Further efforts will improve existing plans and likely will not require significant, new resources	Chosen strategy existed in policy to some degree prior to conducting module and is partially implemented or in progress; Further efforts will improve plans or take new direction, likely requiring new resources	Chosen strategy did not exist prior to module; All efforts to achieve the strategy will require significant resources
Risk Assessment	Common definition of "risk" exists between state and utilities; low probability of risk, or risks are known and already mitigated (e.g., state is prone to flooding and regs. already exist); Risk tolerance is appropriate for existing vulnerabilities	Some common definition of "risk" exists; several risk types aren't mitigated, leaving asset(s) vulnerable; General lack of alignment between different risk assessment processes; Risk tolerance may need to lower across key vulnerabilities	Disparate definitions of "risk" exist across state, utilities, and risk assessment processes; Existing risks are not or are inadequately mitigated; Risk tolerance is higher than appropriate for existing vulnerabilities
Dimensions of Energy Risk	Low/minimal risks to the system that are either easily mitigated or are already mitigated through existing policy or regulation; Further efforts to protect system will be based on improvements	Notable risks to the system are identified, and are mitigations will need to be identified or strengthened through existing policy or regulation	Severe risks to the system that are not currently or thoroughly mitigated; Concentrated efforts in policy and regulation are needed to address challenges
Criticality Matrix	Asset(s) deemed not critical due to low risks identified across all categories	Asset(s) deemed critical due to moderate to severe risks across at least 1-2 categories; Requires stakeholder engagement and some policy or regulatory changes	Asset(s) deemed critical due to high level of risk across at least 3 categories; Requires extensive stakeholder engagement and policy or regulatory changes

Resource Adequacy Nexus

RISK-DRIVEN PLANNING

Energy risk and criticality and resource adequacy are closely related issues that can significantly impact the performance of the energy system. To mitigate these risks, effective resource planning is essential to ensure that load demands can be met. This approach not only improves the performance of assets but also increases the diversity of generation resources and redundancy. The risk assessment conducted in this module aids in identifying which of the assets require further attention.

A key aspect of understanding an asset's criticality is to determine its historical performance and presence of backups that can match its generation contribution to the system. If an asset is failing in these attributes, then conversations around resource adequacy become crucial. In particular, you should address how to incentivize infrastructure owner/operators to replace or perform maintenance on the asset, which mitigates the risk this asset poses to the system.

During conversations about resource adequacy, many officials and infrastructure owner/operators point to interregional transfers and transmission as the best solution to managing energy supply and demand needs. However, it's important that assets which play major roles in the bulk electric and/or regional systems are thoroughly assessed for any risks they may pose or be affected by.

For example, an aging fossil fuel power plant located in a storm-prone area is a high risk and critical asset. This asset serves several critical loads, including a military base. If weather challenges caused it to fail without sufficient backups, there would be cascading impacts across the system. This module would help identify this issue and communicate the need for appropriate resource planning to make the system less reliant on this asset.

What does it look like in practice?

Identification of Problem

An aging, outage prone natural gas plant exists in the central but rural part of the state. The closer it gets to full capacity, the more it breaks. Meanwhile, several assets (fossil fuels and DER) are either in utility connection queues across the state or are being built.

Solutions Brainstorming

Two problems exist: a poorly maintained asset and a large generation queue. It's determined that state policy should: support prioritizing assets in queue that'll serve critical loads/nodes, particularly the one in question; and allow for rate increase to support the cost of maintenance on the natural gas plant.

Impact on Systems & Policy

State mitigates risks to the energy system, both broadly and to the natural gas plant itself, by ensuring generation assets can access and provide service to the grid.

While this example leans towards a "resilience" strategy, more work can be done by users to ensure methods validate chosen security strategy.

Energy and Emergency Planning and Coordination Framework (EEPIC):

Restoration Prioritization

Restoration Prioritization

MODULE OVERVIEW

The order in which electricity customers are restored carries substantial weight in determining the extent of impact from a grid outage. The longer an outage persists for any individual energy load, the more effects will be felt from a public safety, public health, and economic perspective. The pre-designation of priority loads can accelerate the restoration of services deemed critical by utilities and government authorities by adjudicating the allocation of finite resources. Advanced planning will streamline decision-making processes during energy disruption events that would otherwise be ad-hoc. Building a prioritization model requires an understanding of how and why specific electric loads are selected for restoration based on grid conditions, contractual agreements, and their function in support of community lifelines.

Outline

HOW TO USE THIS MODULE

This module provides a means align the broad patchwork of methods within the public and private sector to determine how critical electricity loads and customers are identified and selected for priority restoration. Users will begin with an understanding of gaps in current planning, which create disparities in how electricity customers within the same state are impacted differently by the order in which their service is restored. This will support users in navigating Step 2 and the concepts of defined "tiers" of energy customers, which generally reflect the function of the energy customer (i.e. a hospital), or if importance to supporting grid systems (i.e. telecommunications). The final two steps will guide users to apply multiple frameworks to generate their own priorities.

Step 1 — **Communicating Priorities:** Know the roles and responsibilities of various stakeholders in setting and executing priorities.

Step 2 — **Prioritization Tiers:** Understand the physical and operational characteristics of the grid that affect decisions.

Step 3 — **Prioritization Crosswalk:** Identify the existing plans and policies that impact this process to find alignment.

Step 4 — **Strategy Integration:** Apply the State Energy Security Strategy to identify the electricity customer types that support your goals.

Restoration Prioritization

OPPORTUNITY STATEMENT

Developing a clear process to identify the types of energy loads that align with a State Energy Strategy can reduce the impact of future energy emergencies on the lives and livelihoods of people within your state. The hallmarks of grid disruptions include complex technical challenges, shortfalls in trained personnel and equipment, incomplete or inaccurate information regarding the extent of impact, and conflicting goals between government and private sector stakeholders. To address this issues, this module will enable users to develop a Prioritization Crosswalk that incorporates the State Energy Strategy selected at the beginning of this framework . The Prioritization Crosswalk is a multi-step process that integrates a variety of planning methods to anticipate essential decision points encountered by utilities and government leaders during a grid outage. While energy emergencies will always create unexpected, event-driven impacts, the vast majority of challenges can predicated and addressed through detailed planning.

GAPS

Who has the responsibility to determine priorities?	At the foundational level, electricity utilities carry the responsibility of determining which customers will be restored first following a service disruption. However, government leaders at the local, state, and federal level have unique authorities granted to them in times of emergencies, or in the case where the utility is government owned and operated as is the case with municipal or “public power” utilities.
How are priorities currently set in plans and procedures?	Each utility has a formal or informal restoration prioritization plan that identifies which segments of their system will be restored first. This can be as granular as individual customers, or determined at the “feeder” or substation level. Priorities reflect a variety of factors including grid stability (i.e. critical substation), community needs (i.e. police station), or contractual obligations.

MODULE GOALS

Understand how effective prioritization can reduce the impact of grid outages	Navigate the roles and responsibilities of public and private sector stakeholders
Identify the policies, plans, and resources available to enable decision-making	Improve your knowledge of grid system functions and limitations
Learn how to apply your State Energy Strategy to determine priorities.	Develop an integrated method for identifying and communicating priorities.

Restoration Prioritization

ROLES AND RESPONSIBILITIES

No single organization or unit of government has sole authority to direct every aspect of power restoration following a grid outage. Operational decision-making is a reflection of several formal and informal processes designed to reflect the priorities of all stakeholders impacted by the event - including the customer themselves. However, it is important to understand these roles in context.The diagram below identifies the types of priorities most directly influenced by each stakeholder based on their responsibilities.

Utility

Makes decisions based on available assets, personnel, infrastructure, and grid conditions immediately following an event

Elected Officials

Elected officials can intervene in grid restoration efforts based on authorities granted in laws or based on public influence

Emergency Mgmt

As the primary response authority for disasters, EM can direct the efforts of resources essential to grid restoration

Regulators

State regulation can dictate some aspects of customer prioritization (i.e. natural gas goes to home heating first)

State Energy Office

The State Energy Security Plan (SESP) identities critical grid energy assets including energy loads to inform restoration

Grid Survivability Priorities

The assets and infrastructure essential for the stable operation of the grid. Loss of these loads or facilities can result in additional outages.

+

Strategy-Focused Priorities

Energy loads identified by the State Energy Strategy that limit impacts to specific sectors or customers (i.e. wastewater facilities for resilience)

+

Event-Specific Priorities

Customers and facilitates that are uniquely important to the nature of the outage based on the operating conditions (i.e. cooling centers during heat wave)

=

Integrated Restoration

Consolidating the needs from each prioritization type to mitigate the aggregated impact of an energy outage event

Communicating Priorities. Each category of priority should not be developed in isolation. All stakeholders have a responsibility, regardless of role, to share the planning methodologies used to develop requirements. Having access to a list is not the same as having an understanding of the means by which the list is developed. This should include discussion of guiding principles for developing an integrated restoration plan, including the role of the State Energy Strategy.

Step 1

Prioritization Tiers

INFRASTRUCTURE AND RESOURCE LIMITATIONS

Identifying every customer on a grid system for prioritization is infeasible. Instead, priorities should be categorized by tiers, which identify customers of a certain type or function. Multiple, ranked tiers are needed to provide enough structure to ensure strategy alignment while providing the flexibility needed in a dynamic operating environment. However, the decision to prioritize one electricity customer over another is not made in a vacuum. Furthermore, it is not solely a reflection of authority or policy. Energy emergencies create constraints on physical assets and operational systems that may inhibit or eliminate the choices of utilities or government authorities. This idea relates to two important aspects of the grid:

Balance must be sustained. Energy supply and energy demand must always remain in balance. Periods of imbalance, depending on their severity, can trigger a “cascading outage” that is beyond the control of the utility to prevent.

The grid is a series of building blocks. Electricity cannot “jump” from one location to another, it must be carried on physical wires to the user and any portion of the grid cannot be re energized without direct access to capacity resources.

Constraint	Definition	Impact on Restoration	Prioritization
T&D Infrastructure	The vast majority of outages are caused by disruptions to distribution lines, however damage is transmission is responsible for wider spread, longer duration outages	Connectivity between segments of the grid and capacity resources is essential for restoration. Without the connection, priorities cannot be executed	Planning methods need to account for the highest priority tier that is “available,” indicating the T&D assets needed to deliver the energy are intact
Capacity Availability	The amount of electricity being actively generated and ready for consumption. This fulfills the supply side of the aforementioned need for sustained balance on the grid	The forecasted and real-time availability of generation is an essential aspect of restoration as no new loads will be added until capacity is available to match it	During events when capacity is severely limited, prioritization is even more vital, and cannot follow a method of “the most customers restored in the least amount of time”
Operational Limitations	The finite availability of trained personnel and equipment needed to execute the restoration.	The logistical requirements of restoration are extensive and their availability will determine the pace and scale of the restoration	The accessibility of roads, functionality of communications, and safety of personnel all much be factored in to how many loads are targeted for restoration

Step 1

Prioritization Tiers

ENERGY LOAD THRESHOLDS FOR OUTAGE DURATION

SImilar to the duration variable discussed in the Energy Risk and Criticality Module, the extent of impact to a energy customer is closely related to the length of time they are without electricity. Facilities that perform essential functions such as a tower for wireless communications are nearly always equipped with some form of backup power to ensure their continuity of service during short-term grid outages. However, the majority of these backup systems are batteries, and they only last for 4-8 hours before the tower needs to have electricity restored to prevent a communications service disruption.

This factor should be considered during the prioritization process to limit the number of duration-based disruptions to energy customers with essential community lifeline functions to perform. Accomplishing this will require more detailed information from specific energy customers that are considered a high-tier priority. Additional consideration should be given to the time-based consequences to energy customers identified in your State Energy Security Strategy.

	Description	Prioritization Tier
72 + Hours	Facilities that can maintain functionality for up to 72 hours based on the operating capabilities or the presence of backup systems. Typical stored fuel for backup generation is only enough for ~72 hours and may begin to run out, depending on use	**Low. Loss of power is an inconvenience, but it does not have broader community impacts** **Example.** Individual homes (weather dependent) and commercial customers with the ability to curtail service.
24-72 Hours	Moderate impacts to health & safety, economics, and infrastructure (e.g., certain functions cease due to lack of power, loss of communications) Facility can operate in a degraded mode that doesn't require off-site electricity.	**Medium. Customer has moderate ability to self-sustain, failure is not imminent.** **Example.** Nearly all hospitals have backup generators and have protocols for operating without grid electricity (must have water)
1-24 Hours	Severe and rapid impacts to population health & safety and economics (e.g., businesses close, slow/no transportation, poor/low medical care access). Near immediate loss of essential facility functions when grid disruptions occur	**High.** An outage lasting a day has near-immediate impacts to facility functions and the community **Example.** Only half of water/wastewater facilities have backup power and they are very difficult to restart

Step 1

Prioritization Tiers

DETERMINING YOUR TIERS

Assigning energy energy loads to tiers should integrate each of the variables outlined in Step 1 of the Module. A customer that rates high in the Priority Type (i.e. an asset essential for grid survivability) will place high unless there is an additional constraint that reduces its relative importance (i.e. there is sufficient capacity available even if the asset were brought back online).

Prioritization Tier	Type	Constraint	Duration	Result
TIER 1	❑ Survivability ❑ State Strategy ❑ Event-Specific	❑ T&D Infrastructure ❑ Capacity Availability ❑ Operational Limitations	❑ 1-24 Hours ❑ 24-72 Hours ❑ 72+ Hours	
TIER 2	❑ Survivability ❑ State Strategy ❑ Event-Specific	❑ T&D Infrastructure ❑ Capacity Availability ❑ Operational Limitations	❑ 1-24 Hours ❑ 24-72 Hours ❑ 72+ Hours	
TIER 3	❑ Survivability ❑ State Strategy ❑ Event-Specific	❑ T&D Infrastructure ❑ Capacity Availability ❑ Operational Limitations	❑ 1-24 Hours ❑ 24-72 Hours ❑ 72+ Hours	

Example. A water treatment facility serving a city of 115,000 people experiences an outage due to a derecho storm during a period of extreme heat. Your state strategy is **Resilience,** the region is experiencing a **Capacity Shortfall,** and the facility has backup generators with **24 hours** of fuel on-site.

Priority Type:
Survivability > No
Strategy > Yes
Event > Yes

Constraint:
T&D > No
Capacity > Yes
Operational > No

Duration threshold
24 hours: HIGH

Tier Identification:
TIER 1

Step 2

Prioritization Crosswalk

Organization	Title	Description	Impact on Prioritization
State Emergency Management Agency (EMA)	Threat and Hazard Identification and Risk Assessment (THIRA)	Describes various types of risks state has identified to inform vulnerability and risk assessment process	❑ State Emergency Management / homeland security has visibility into DHS Critical Infrastructure databases that can inform decisions ❑ The state can provide resources (transportation, security, generators, etc) to support utility restoration efforts ❑ The identified plans contain information on Continuity of Government (COG) with a corresponding list of critical government facilities
	Emergency Operations Plan (EOP)	A comprehensive, all-hazards framework for preparedness, response, and recovery, establishing lines of authority and coordination to ensure an effective response to reduce negative impacts.	
	Power Outage Incident Annex (POIA)	A detailed plan or section within the EOP that specifically addresses the coordination, response, and recovery efforts for a prolonged power outage	
State Energy Office (SEO)	State Energy Security Plans (SESP)	Help understand state energy resilience priorities and risks as a function of pre-identified state-level hazards to infrastructure	❑ The VRA includes the identification of critical assets and sites that support energy infrastructure systems ❑ The SESP contains listings of priorities for the state to address through planning and investment
	Vulnerability and Risk Assessments (VRA)	Informed by THIRAs to help understand susceptibility to risks and hazards	
Utilities	Internal Prioritization Process	Varies by company, but identified priority down to the distribution feeder level	❑ Detailed planning and information on grid asset criticality and vulnerability to better understand the Survivability Tier ❑ Real-time visibility into ❑ What risks have seen growth in frequency?
	Black Start Plans	NERC-Mandated planning for BES critical loads and designated generators	
State Strategy	Inherent Risk Assessment (IRA) Guide	Helps NERC identify compliance measures using a common risk assessment method	❑ How can system vs individual-level risks be differentiated?
	Energy System Resilience	Provides methodologies for assessing resilience postures and building quantifiable frameworks to model resilience metrics	❑ How can renewable energy, sustainability measures, and efficiency planning be used to mitigate disaster planning?

Step 3

Strategy Implementation

DIVERSIFICATION

The State Energy Strategy helps develop priorities and inform decision-making processes. In some instances, this thought paradigm may differ from that of infrastructure owner/operators. Decisions will need to be made regarding the order in which customers are restored regardless of the outage cause. As described in the introduction to this module, first priority must go to any assets essential to the continued operation of the grid. Such sites can include critical substations, generation facilities that require external power for startup, or infrastructure that supports grid operation (i.e. control centers). When it comes to identifying electricity customer types that align with the state strategy, it is important to consider how the strategy translates to action. Diversification, which emphasises technologies like DER and microgrids, would place a priority on these areas of impact:

COMMUNITY ASSETS	DISTRIBUTED LOADS	INTERCONNECTIVITY
Facilities that are essential to sustaining the essential functions of communities including access to food and water, sheltering during extreme weather conditions, and energy systems needed for mobility	The deployment of distributed energy resources will also require the restoration of loads necessary to maintain system balance during recovery. That includes facilities that provide balancing "ties" between capacity resources	Data and communications connectivity are needed to sustain the remote grid visibility and dispatchability needed for flexible resources deployed across service territories, placing an emphasis on communications

EXAMPLE: DIVERSIFICATION

Utilizing the FEMA Community Lifelines framework **(Annex X),** emphasis can be placed on energy customers that reflect state priorities. The flowchart below analyzes how how prioritization is addressed and implemented through a Diversification Strategy:

Communications

Critical Facilities - Communications. Sites the provide direct support to data and cellular communications including **wireless towers, fiber optic relay facilities, LTE switching sites, and repeater stations.**

Food, Water, Shelter

Critical Facilities - Food, Water, Shelter. Sites within this category such as **water/wastewater treatment, heating or cooling centers, and grocery stores** often have backup generation, but require restoration within 24 hours to avoid disruptions that will cause community impacts.

Energy (Power & Fuel)

Critical Facilities - Energy. The accessibility of diverse and distributed capacity resources requires the rapid restoration of **transmission substations,** and the recharging of **grid scale storage** for load "smoothing" during restoration.

Step 3

Strategy Implementation

ECONOMICS

The State Energy Strategy helps develop priorities and inform decision-making processes. In some instances, this thought paradigm may differ from that of infrastructure owner/operators. Decisions will need to be made regarding the order in which customers are restored regardless of the outage cause. As described in the introduction to this module, first priority must go to any assets essential to the continued operation of the grid. Such sites can include critical substations, generation facilities that require external power for startup, or infrastructure that supports grid operation (i.e. control centers). When it comes to identifying electricity customer types that align with the state strategy, it is important to consider how the strategy translates to action. Economics, which emphasises large-scale energy deployment, would place a priority on these areas of impact:

ENABLING INFRASTRUCTURE	RAPID SCALING	FIRM SERVICE CUSTOMERS
The continued functionality of businesses is reliant on access to essential infrastructure systems, specifically communications and transportation, to support the stability and operation of financial systems	Many of the facilities vital to economics are also large-load customers, requiring substantial amounts of electricity. This includes data centers, manufacturing facilities, product distribution, and cold storage	Customers with the ability and willingness to provide financial incentive for prioritization and serve as load “anchors” for nearby restoration efforts so other key sites in the vicinity can benefit from the presence of crews

EXAMPLE: ECONOMICS

Utilizing the FEMA Community Lifelines framework **(Annex X),** emphasis can be placed on energy customers that reflect state priorities. The flowchart below analyzes how how prioritization is addressed and implemented through a Economics Strategy:

Communications

Critical Facilities - Communications. Sites the provide direct support to data and cellular communications including **wireless towers, fiber optic relay facilities, LTE switching sites, and repeater stations.**

Transportation

Critical Facilities - Transportation. Multi-modal transportation to support economic activity, including **airports, seaports, train yards, traffic control systems,** and **electrified public transportation.**

Energy (Power & Fuel)

Critical Facilities - Energy. Rapid load scaling and large-load customers will require the restoration of **transmission assets, large capacity resources,** and grid operations facilities.

Step 3

Strategy Implementation

RESILIENCE

The State Energy Strategy helps develop priorities and inform decision-making processes. In some instances, this thought paradigm may differ from that of infrastructure owner/operators. Decisions will need to be made regarding the order in which customers are restored regardless of the outage cause. As described in the introduction to this module, first priority must go to any assets essential to the continued operation of the grid. Such sites can include critical substations, generation facilities that require external power for startup, or infrastructure that supports grid operation (i.e. control centers). When it comes to identifying electricity customer types that align with the state strategy, it is important to consider how the strategy translates to action. Resilience, which emphasises the survivability of life support systems, would place a priority on these areas :

ESSENTIAL INFRASTRUCTURE	EMERGENCY SERVICES	VULNERABLE POPULATIONS
Life support systems which underpin the ability of communities to sustain essential services provide the necessary stability to avoid a worst-case outcome for impacted populations following a disaster	The ability to provide for basic needs including public safety, access to emergency medical services, and short-term sheltering for impacted populations bridge the long-term restoration off full services	Addressing life-saving and life-sustaining needs of underserved communities, functional needs, and elderly populations through an emphasis on critical care and shelter-in-place needs

EXAMPLE: RESILIENCE

Utilizing the FEMA Community Lifelines framework **(Annex X),** emphasis can be placed on energy customers that reflect state priorities. The flowchart below analyzes how how prioritization is addressed and implemented through a Resilience Strategy:

Safety and Security

Critical Facilities - Safety and Security. Continuity of operations for essential services including **police stations, fire stations,** and **government buildings** supports the basic needs of impacted communities

Food, Water, Shelter

Critical Facilities - Food, Water, Shelter. Access to potable water requires support of **water/wastewater treatment, grocery stores** for food distribution, and short-term **shelter locations** for temporary housing.

Health and Medical

Critical Facilities - Health and Medical. Reducing injuries and fatalities during outages requires prioritizing **hospitals, medical clinics, nursing homes,** and access to daily medicines at **pharmacies.**

Annex A

Annex A: FEMA Community Lifelines

RESILIENCE

LEGEND

3-5 Lifeline sub-categories Impacted

1-2 Lifeline sub-categories Impacted

No Lifeline sub-categories Impacted

Annex B: Stakeholder List

Organization	Title	Description	Questions to consider
Emergency Management	Threat and Hazard Identification and Risk Assessment (THIRA)	Describes various types of risks state has identified to inform vulnerability and risk assessment process	How can standardized risk calculation language be used to inform common planning and assessment processes?
	Vulnerability and Risk Assessments (VRA)	Informed by THIRAs to help understand susceptibility to risks and hazards	How do varying circumstances affect the definition of "risk"?
State Energy Office	State Energy Security Plans (SESP)	Help understand state energy resilience priorities and risks as a function of pre-identified state-level hazards to infrastructure	How did prioritization of assets affect the risk assessments? What perspectives/drivers are evident throughout the SESP assessment? How are stakeholders' inputs incorporated into the process?
Department of Energy	State and Regional Energy Risk Profiles	Identifies regional and state level risks to energy infrastructure	How can we adapt the risk quantification scales for threat probability, duration, and consequence?
	Office of Cybersecurity Energy Security, and Emergency Response (CESER) Risk Assessment Essentials for state Energy Security Plans	Used as aid to develop SESPs	What energy sectors are most affected in our state? Are they the most dominate? What risks have seen growth in frequency?
North American Electric Reliability (NERC)	Inherent Risk Assessment (IRA) Guide	Helps NERC identify compliance measures using a common risk assessment method	How can system vs individual-level risks be differentiated?
	Energy System Resilience	Provides methodologies for assessing resilience postures and building quantifiable frameworks to model resilience metrics	How can renewable energy, sustainability measures, and efficiency planning be used to mitigate disaster planning?