Energy and Emergency Planning Integration Crosswalk (EEPIC)

Design & Integration

Design & Integration

MODULE OVERVIEW

Design and integration focuses on how energy stakeholders-states, grid operators, and federal partners-can align their priorities for energy planning and policy to support infrastructure development. This module helps translate grid design decisions from a purely technical exercise to one that incorporates shared processes on risk assessment, policy objectives, and long-term system needs.

This module is organized to help users understand stakeholders that shape grid design and infrastructure planning. It examines how each Energy Security Strategy (Diversification, Economic, and Resilience) translates into specific design priorities and planning considerations. This module does not prescribe a path for technical implementation, but is rather meant to help build shared understanding of infrastructure needs.

Outline

HOW TO USE THIS MODULE

This module is designed as a flexible reference that explains how each Energy Security Strategy translates into grid design decisions. It is not intended to be read in sequence, as each section is written to stand alone. The module is organized around the full arch of grid design decision-making, from understanding other states' successes to identifying key stakeholders, and the design implications of each strategy.

Step 1 — **Case Studies**. Explore real examples of how states have implemented each Energy Security Strategy through policy and infrastructure decisions.

Step 2 — **Stakeholder Mapping**. Identify the key stakeholders involved in grid design, understand their roles, and know how the state can engage with them.

Step 3 — **Implementation Strategy**. Understand the planning cycle through which states can advance their Energy Security Strategy.

Step 4 — **Strategy Approach**. Example of how each Energy Security Strategy shapes grid design priorities at the distribution, transmission, and generation levels.

Step 5 — **Resource Adequacy Nexus**. Analyze how the Energy Security Strategy addresses resource adequacy challenges and what levers are available to close adequacy gaps.

Design & Integration

OPPORTUNITY STATEMENT

Design and integration refers to the ability of the infrastructure planning process to align between state policy, regulatory requirements, utility design, and independent system/regional transmission operators (ISO/RTO) priorities and shape properly scaled transmission and distribution (T&D) infrastructure design and performance requirements. Specifically, this can be accomplished through shared understanding of state and federal codes, regulations, and policies; state energy risks and hazards-based performance needs; and utility and ISO/RTO infrastructure design processes. This module provides guidance for translating the Energy Security Strategy into design criteria that reflects both the state's goals and the priorities of other stakeholders, enabling states to move towards actionable design decisions.

GAPS

How Policy Impacts Infrastructure Design	State infrastructure planning is largely driven by informal standards and policies, such as carbon emissions standards or social legislation. However, these are enforceable goals, not design criteria, and they have little impact on grid performance or design at a technical level. This complicates planning for utilities, whose ability to meet these goals is dependent upon their ownership structure, capabilities, and if they operate across state lines. This results in inconsistent infrastructure design and system outcomes both within states and across state lines.
Stakeholders Have Different Grid Planning Priorities	Infrastructure planning decisions are shaped by differing priorities across energy stakeholders, often leading to misalignment. States tend to prioritize long-term policy outcomes and virtues (e.g., using clean energy to reduce emissions), whereas utilities focus on cost and cost recovery, reliability metrics, and operational feasibility. Utilities face the constant decision of "building back" (i.e., replacing) or "building back better" (i.e., building better replacements) after disasters or disruptions. These differing ideals result in fragmented planning and delayed infrastructure and investments.

MODULE GOALS

Help state offices achieve their energy goals through improved infrastructure planning processes.	Build understanding of who shapes grid design decisions and how to engage them effectively to advance the state energy security strategy.
Connect energy security strategy selection to concrete grid design priorities, understanding what implantation looks like in practice.	Translate each energy security strategy into specific design priorities across the system: distribution, transmission, and generation.

Design & Integration

CASE STUDIES: SUCCESSFUL GRID DESIGN POLICIES

Diversification Strategy

California

The *Electric Rule 21* establishes technical and procedural criteria for connecting inverter-based resources (IBRs) through regulated investor-owned utilities (IOUs). The regulation lowers interconnection barriers, enabling a wider variety of distributed energy resources (e.g., solar) to become part of the energy mix.

Virginia

The Clean Energy Economy Act set a goal of 100% clean energy by 2050 and a renewable portfolio standard, and required the retirement of fossil fuel generation. The policy creates pressure on integrating new resource types, preventing risk of concentration around single fuels.

Economic Strategy

Arizona

The Governor used executive action to establish the Arizona Energy Promise Taskforce, which delivered recommendations on lowering energy costs, easing project timelines, providing frameworks for large loads to protect ratepayers from cost shifts, and promoting opportunities for emerging energy technologies like nuclear.

Texas

Texas enacted PUC Rule 25.55 and Rule 25.62, requiring weatherization of generators and transmission facilities. It also requires utilities to submit resilience plans and allows for cost recovery for resilience improvements. The economic framing of these regulations demonstrate that upfront prevention costs are justified to avoid greater system failures.

Resilience Strategy

New Jersey

After Hurricane Sandy exposed fuel supply vulnerabilities, the state implemented the Retail Fuel Station Program grant to help gas stations install backup power (e.g., permanent generators and transfer switches). It later enacted requirements for gas stations to have transfer switches. This program focuses on the survivability of a critical cross-sector dependency.

Florida

The Senate Bill 796 builds on previous laws for IOUs to develop 10-year storm protection plans to harden infrastructure and establishes a separate cost recovery mechanism for storm protection activities. By doing so, the state incentivizes utilities to invest in large-scale infrastructure and improve long-term planning.

Grid Designer Roles

STAKEHOLDER MAPPING

Advancing an energy security strategy requires coordinating across a range of stakeholders, each with distinct authority, resources, and responsibilities in the grid design process. Understanding who these stakeholders are and how to engage with them is critical to translating policy goals into infrastructure outcomes. These stakeholder groups are state agencies and offices; federal partners; ISOs/RTOs; and utilities. The diagram below maps each key stakeholder group, their roles in grid design, and the primary ways to engage with them. This page discusses state agencies and offices and federal partners; the following page details the ISO/RTOs and utilities.

Stakeholders	Role in Grid Design	How State Offices Can Engage
State Agencies & Offices Set strategic direction and policy goals related to design, and coordinate across agencies to align energy and infrastructure priorities		
State Energy Office (SEO)	Leads energy security planning; Manages federal grants; Coordinates across agencies on infrastructure goals	Drive Energy Security Strategy through SEP/SESP development; Coordinate priorities with utilities and federal partners
Public Utilities/Service Commissions (PUC/PSC)	Regulates utilities; Sets enforceable performance and design standards; Approves utility planning documents	Align regulatory requirements with Energy Security Strategy goals through integrated resource plan (IRP) approval and other criteria
Emergency Management (EM)	Consequence management for energy emergencies and hazard mitigation	Coordinate to align grid infrastructure priorities with state hazard profiles
Governor's Office	Sets energy policy through EOs and legislative guidance	Advocate for and advise on incorporating energy goals into law, programs, etc.
Federal Partners Establish regulatory frameworks, standards, and funding programs that shape what grid designs, resources, and approaches can be used		
Department of Energy (DOE)	Provides technical assistance, research, and funding for grid modernization, resilience, and cybersecurity	Access grid modernization grants, funding, and guidances aligned with the Energy Security Strategy
Federal Energy Regulatory Commission (FERC)	Regulates interstate and wholesale markets; Issues transmission planning rules and interconnection standards	Monitor FERC orders to understand federal requirements and identify where state authorities can align
Federal Emergency Mgmt Agency (FEMA)	Provides hazard-based awareness and their impacts on energy infrastructure	Reference FEMA hazard plans to address energy infrastructure vulnerabilities

Grid Designer Roles

STAKEHOLDER MAPPING

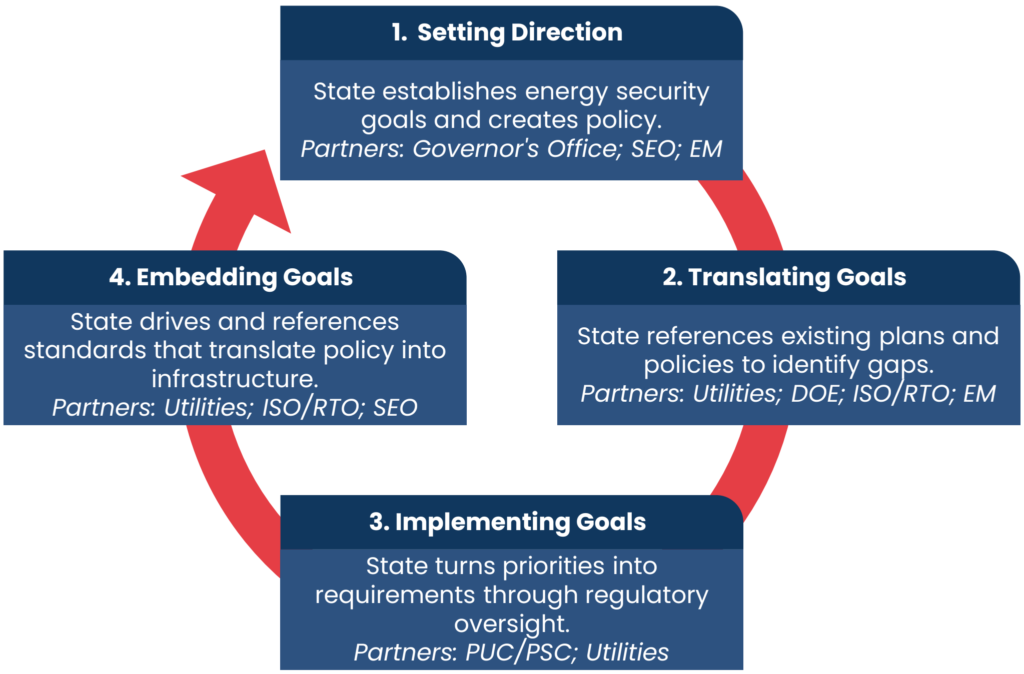
While government stakeholders like state agencies and federal partners establish the regulatory, policy, and funding environment needed for grid design, private partners like ISO/RTOs and utilities are responsible for the operations and planning and infrastructure decisions that ultimately determine whether state energy goals are realized in practice. These private stakeholders require different engagement approaches. For example, states lack direct oversight of ISO/RTOs, but have regulatory oversight over certain types of utilities. The diagram below maps each key stakeholder group, their roles in grid design, and the primary ways to engage with them.

Stakeholders	Role in Grid Design	How State Offices Can Engage
ISO/RTOs Manage bulk system by integrating regional priorities, market needs, regulation, and transmission planning considerations into grid design		
Regional State Committees (RSC)	Group of state PUC and appointed representatives in an RTO region, tasked to act as united voice and influence RTO priorities on transmission planning and operations	Coordinate with the state RSC representative to align on state Energy Security Strategy priorities and/or energy policy to ensure your state's position is reflected to the RTO
Utilities Design, build, and maintain grid infrastructure according to regulatory requirements, mandatory standards, market tariffs, and state/federal policy		
Investor-Owned Utilities (IOUs)	Own and operate transmission, distribution, and generation infrastructure; Develop IRPs for PUC approval; Regulated by state agencies	Work with government/state affairs representatives to achieve policy alignment; Engage technical and planning staff to ensure Energy Security Strategy Priorities are reflected in IRP submissions and utility planning and infrastructure design criteria
Electric Cooperatives & Municipal Utilities	Operate energy infrastructure (e.g., transmission, distribution, and generation assets) in rural or municipal areas; Not subjected to state regulation or oversight authority	Engage executive leaders and operations staff to understand organization's operational capacity and constraints to offer targeted support to help them execute state energy goals
Specialized Energy Partners (e.g., Joint Agencies, Green Banks, etc.)	Operate in the space between utilities and grid operators; Pools resources to purchase power, finance grid infrastructure projects, etc.	Coordinate with stakeholders to align partners' decisions with state energy goals; Identify funding opportunities for partners that support state priorities

Implementation Strategy

ADVANCING GRID DESIGN

Regardless of the energy security strategy a state pursues, the tools for advancing that strategy are the same. States work through four levers: policies, plans, regulations, and standards. Rather than thinking of these levers in isolation, they are best understood as a continuous cycle of planning and implementation, with flexible entry points, each phase building on the last, and infrastructure outcomes feeding back into setting direction. For each phase, the sections below describe the specific levers available, state actions in the phase, and key partners involved.



1. Setting Direction

Levers: *Legislative Policies; Plans (e.g., SEP/SESP)*

Role:

- Use existing risk assessments to identify high risk assets or areas to focus design efforts.
- Use SESP/SEPs or legislation to translate policies to planning priorities.
- Advise on legislation establishing energy goals.

2. Translating Goals

Levers: *Plans (e.g, IRPs, hazard mitigation plans); Federal programs or policies*

Role:

- Reference IRPs to identify where plans diverge from state goals.
- Use hazard mitigation plans to align grid design with risk priorities.

3. Implementing Goals

Levers: *Regulations (PUC/PSC); Plans (utility IRP & filings)*

Role:

- Review utility filings to identify where state direction can strengthen decisions.
- Work with PUC to codify priorities into requirements, explicitly or with incentives (e.g., grants).

4. Embedding Goals

Levers: *Standards (e.g., NERC, federal policies, utility frameworks)*

Role:

- Establish reporting requirements for utilities that surface instructure gaps and inform future planning.
- Adopt or reference federal or industry standards as the floor, or use to strengthen state guidelines.

Diversification Strategy Approach

OVERVIEW

Diversification focuses on reducing system-wide risk by incorporating a mix of generation sources, fuel types, and technologies. Pursuing this strategy requires balancing its objectives with operational realities, including fuel availability, resource costs (e.g., cost of natural gas or constructing utility-scale solar PV), and technical limits of the transmission and distribution system. Further, a diverse energy mix increases reliance on supporting systems and sectors, like communications. Therefore, it is important for states to account for these dependencies when planning, as diversification can shift or reduce risk, but not eliminate it. From a design perspective, diversification is less about adding indiscriminate capacity and more about maintaining options and flexibility for resources that help the grid run when certain assets or fuels are disrupted.

This section translates diversification into specific priorities across three levels of the grid: distribution, transmission, and capacity/generation. At each level, design criteria are shaped by the strategy's goals and advanced through the levers available to state offices. Refer to the examples in the diagram below to understand what implementing diversification looks like in practice and how your levers can be used at each level.

Distribution

- Set interconnection standards that make it easier for a variety of distributed resources to connect to the grid, reducing resource dependence.
- Use state policies (e.g., energy, emergency planning, etc.) to justify investment or support for critical facilities to have backup generation capability (e.g., rooftop solar, backup generator, microgrid) to ensure optionality in grid operations.

Transmission

- Require utilities to specifically demonstrate how their transmission plans account for growing resource diversity and locations of assets.
- Coordinate with ISO/RTOs and RSCs to reference regional transmission plans to identify where transmission constraints are limiting the ability to deliver or receive power; can also use findings to justify state investment or requirement setting at utilities.

Capacity/ Generation

- Use legislation or executive action (e.g., clean energy laws) to set measurable targets that require utilities to diversify their generation mix.
- Review utility IRPs requirements and PUC approval criteria to ensure that new generation assets increase both capacity and resource diversity on the system.

Economic Strategy Approach

OVERVIEW

The economic strategy approach prioritizes investment in infrastructure and specific energy sources, and ensures they are integrated into the system in a cost-effective manner. Economic stability depends on communications, energy, and transportation sectors, making cross-sector coordination essential to any effective strategy. From a design perspective, the strategy emphasizes investments in areas of the system where economic value can be maximized, such as connecting available and sufficiently-sized generators, supporting economically-critical loads (e.g., large loads, industry), and enabling deferment of more expensive projects. While this approach can accelerate the deployment of infrastructure, it can potentially defer risks to the future and reduce resilience capabilities.

This section translates economics into specific priorities across three levels of the grid: distribution, transmission, and capacity/generation. At each level, design criteria are shaped by the strategy's goals and advanced through the levers available to state offices. Refer to the examples in the diagram below to understand what implementing economics looks like in practice and how your levers can be used at each level.

Distribution

- Reference state economic development policies alongside existing PUC requirements to direct utility investment towards high-value loads (e.g., dense commercial areas) where outages can carry high economic costs.
- Use the VRA to identify the highest impact hazards and advise on cost-effective infrastructure upgrades (e.g., grid enhancing technologies) that can mitigate these hazards.

Transmission

- Establish cost recovery mechanisms or other financial offsets to make efficiency projects, like hardening infrastructure (e.g., undergrounding lines prone to storms), financially viable for utilities.
- Provide guidelines to utilities on performing comprehensive economic justification (e.g., avoided costs of future risks or projects) as part of planning processes.
- Work with ISO/RTOs to advocate for smoother interconnection processes to unlock lower-cost resources.

Capacity/ Generation

- Use state and federal incentive programs (e.g., tax credits, grants) to lower the cost of preferred generation types and make their investment feasible and attractive to utilities and independent power producer (IPPs).
- Use IRP approval authority to require utilities to demonstrate that generation additions are adequately sized to accommodate future projected load growth.

Resilience Strategy Approach

OVERVIEW

The resilience strategy approach treats resilience as a system-wide objective that transcends planned physical infrastructure by implementing innovative use of technologies, tools, and processes. The goal is not only to reduce the likelihood of disruptions, but also to assess hazard exposure, cross-sector interdependencies, and operational flexibility to limit the duration and consequences of disruptions when they occur by. However, a key risk of this strategy is the use of technology, which can introduce secondary risks, such as cyber and physical security risks. States should engage federal partners, particularly DOE, when assessing and mitigating these cyber and physical security risks using the tools and processes developed for risk assessment. Under the design framework, resilience emphasizes grid survivability when conditions are degraded and prioritizes capabilities that enable operations during these times. This section translates resilience into specific priorities across three levels of the grid: distribution, transmission, and capacity/generation. At each level, design criteria are shaped by the strategy's goals and advanced through the levers available to state offices. Refer to the examples in the diagram below to understand what implementing resilience looks like in practice and how your levers can be used at each level.

Distribution	• Reference state emergency plans (e.g., hazard mitigation plans, SESPs) to identify which areas face the greatest risk from specific hazards and use findings to direct where standards or hardening requirements should apply to first, or be designed to address. • Use PUC or state legislation to require asset hardening and redundancy measures (e.g., hazard-based infrastructure design like construction standards) at critical facilities so they can operate during degraded conditions.
Transmission	• Adopt federal or third-party (e.g., NERC) reliability standards as state minimums for transmission design, and either expand them in areas where vulnerability and risk assessments (VRAs) or other state plans identify greater hazard exposure or target investment in those areas. • Review and tie design standards to current hazard profiles (e.g., wildfire, flood risk) to ensure assets can withstand state-specific disruptions.
Capacity/ Generation	• Reference DOE technical assistance or research resources to identify appropriate advanced technologies that can be used as IRP approval criteria to enhance system management capabilities. • Require or advise utilities to include resilience analysis (e.g., model generation performance under extended disruptions, fuel supply constraints, winterization) in IRPs or other planning submissions to ensure resource adequacy accounts for survivability.

Resource Adequacy Nexus

GRID DESIGN & RESOURCE ADEQUACY

Resource Adequacy is a fundamental challenge in grid planning. It's not just about having enough capacity; it's also about whether the right resources are available, in the right place, at the right time. A grid that looks perfect under normal operating conditions can quickly fall short in the face of fuel supply chain disruptions or transmission constraints.

From a design perspective, resource adequacy appears as an outcome of the design decisions made by states and utilities. Because the generation mix, transmission infrastructure, and distribution systems all determine whether the system can meet demand, all design standards, planning requirements, and investment decisions become adequacy decisions. The Energy Security Strategy pursued further shapes how adequacy is defined and addressed, with each Security Strategy leading to different design priorities and levers for addressing gaps. This section examines how resource adequacy is shaped by each Energy Security Strategy: what adequacy challenges the strategy exposes, and what design levers or actions are available to dress them.

	Adequacy Challenges	Actions & Levers
Diversification	• Diverse energy mixes increase system complexity and shift risk; managing multiple resources creates coordination challenges for supply management. • Utilities may not be meeting diversification goals in practice (i.e., uses low capacity assets).	• Use IRP approval criteria to require utilities to demonstrate how their assets perform under stress. • Use design standards to ensure diversified resources are adequately sized to serve current demand, and are scalable/planned to address future load growth.
Economics	• Transmission is underinvested in, creating uneconomic cost constraints due to congestion and reducing access to cheap energy. • Economics favors large-scale assets, so any fuel supply or operational disruptions can cause cascading impacts to the system.	• Use PUC mechanisms (e.,g plans approvals, rate incentives) to ensure transmission plans account for redundancy and/or efficiency. • Explore regulatory authority over economic risk mitigation tools (e.g., require winterization) and use authority to reduce asset exposure that can cause economic harm.
Resilience	• Cross-sector dependencies have naturally occurring risks that might not be planned for (e.g., comms outages affecting system monitoring). • Adequacy isn't inherently resilient; having capacity for normal demand isn't always applicable to prolonged, disrupted operations.	• Require utilities to outline how their plans address prolonged disruptions and can sustain critical functions during cross-sector issues (e.g., degraded comms). • Through IRP requirements, utilities must demonstrate their capacity can perform under state-specific hazard scenarios.