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State Energy Offices' Engagement in Electric Distribution Planning to Meet State Policy Goals

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Contents

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Executive Summary

State and Territory Energy Offices develop plans, programs, policies, and projects that have a substantial impact on electric distribution systems. They also can participate in distribution system planning (DSP) processes to help ensure that utilities – consumer- and investor-owned – meet the state's future energy needs. This paper recognizes the wide spectrum of roles that State Energy Offices can play in DSP processes, including planning for distributed energy resources (DERs) and grid modernization.

While taking different engagement approaches across the country, State Energy Offices share a forward-looking policy focus to meet state goals, whether they target clean energy, economic opportunity, resilience, or affordable electricity. This sets State Energy Offices apart from public utility commissions (PUCs), which must ensure that regulated utilities, often focused on investor-owned companies, meet statutory requirements for providing safe, reliable, and affordable services in a non-discriminatory manner, typically at least cost.[1]

Source: Electric Power Research Institute

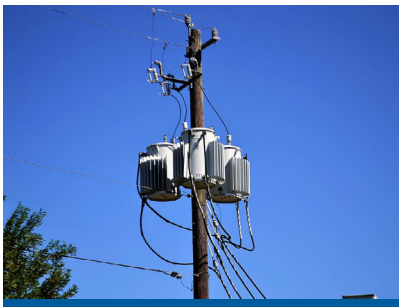
1 The degree to which state legislatures add mandates for utilities or PUCs, or charge State Energy Offices with running programs to meet state goals, varies widely.

Example State Energy Office Activities for Distribution System Planning

Supporting Activities

- Energy-related plans
- Studies and reviews
- Stakeholder engagement
- Grant programs

Source: iStockphoto/Laurence Dutton



Direct Distribution Planning Activities

- Evaluate electrification impacts on distribution
- Provide plan review guidance
- Establish advisory councils

Source: Electric Power Research Institute

Participation in Regulatory Proceedings

- Policy content
- Cost-effectiveness
- Reliability & resilience
- DER data

Source: iStockphoto/Douglas Rissing

State Energy Offices undertake many activities that support and significantly impact distribution planning:

- **State energy-related plans** - Comprehensive energy plans can inform and set the context for DSP and provide recommendations related to distribution system analyses and investments. State Energy Offices also may develop plans that address discrete issues for distribution systems, such as electrification and energy security. These plans support energy policy development and implementation across a wide range of energy sectors that directly inform and impact planning, such as transportation charging infrastructure, community solar, offshore wind energy, building energy efficiency, and building electrification. In addition, State Energy Offices in most states lead the development and implementation of State Energy Security Plans, covering threats to electricity infrastructure, including the distribution system.
- **Studies** - State Energy Offices conduct analyses that inform DSP, including studies related to grid modernization, energy efficiency, solar, and storage technologies. Examples include assessments of solar potential, evaluations of energy storage scenarios, and assessments of non-wires alternatives.
- **Stakeholder engagement and working groups** - State Energy Offices may facilitate stakeholder decision-making processes on energy topics such as energy efficiency, renewable energy, electrification, and storage that can inform DSP and grid modernization processes, or they may participate in working groups convened by others that can support these processes. In addition, because State Energy Offices generally do not regulate utilities, they are ideal convenors in resolving differences among stakeholders and the utilities. This can support faster resolution of issues being considered by PUCs and aid in making progress in distribution system planning.
- **Grant programs** - Some State Energy Offices administer grant programs to support grid modernization technologies. In many cases, this State Energy Office role is growing due to the significant federal funding under the Infrastructure Investment and Jobs Act (IIJA), such as the Grid Resilience and Innovation Partnerships Program.

In utility regulatory proceedings, State Energy Offices can contribute to frameworks that govern DSP processes, including planning goals and objectives. In particular, State Energy Offices' experience with administering programs for energy efficiency and other DERs prepares them to contribute to inputs and methodologies for load and DER forecasting and analysis of non-wires alternatives (NWA). In support of renewable and clean energy goals, State Energy Offices have an interest in improving the hosting capacity of distribution systems to accommodate growth of distributed solar, storage, demand flexibility, and managed electric vehicle (EV) charging. State Energy Offices also can represent state policy interests in electricity affordability, economic development, reliability, and resilience when considering proposed grid investments.

This document is divided into three sections:

1. **Overview of Distribution System Planning** – The first section describes the basic elements of distribution system planning.
2. **State Energy Office Activities Supporting Distribution System Planning Outside of the Regulatory Process** – The second section provides illustrative examples of State Energy Office activities that support distribution planning in many states across the country.
3. **State Energy Office Participation in State Utility Regulatory Proceedings** – The last section addresses explicit participation by State Energy Offices in utility regulatory proceedings, drawing on examples in four states — Colorado, Connecticut, Minnesota, and Rhode Island.

A glossary at the end of the paper defines key terms.

The information provided here can inform potential roles and activities that State Energy Offices may undertake in planning processes to modernize distribution systems to achieve state energy goals, depending on available State Energy Office resources and targeted level of effort. Berkeley Lab's integrated distribution system planning website offers additional resources.

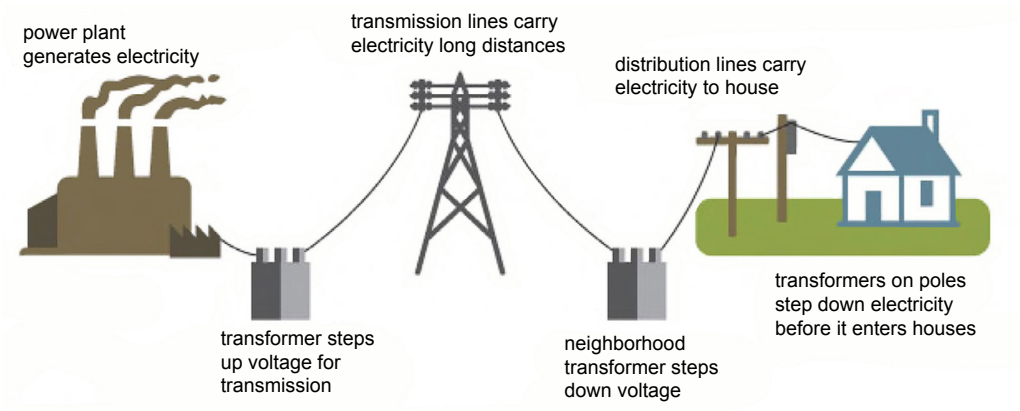
1. Overview of Distribution System Planning

Modernizing electricity systems is critical to achieving state energy goals such as reliability and resilience, affordability, economic development, clean energy resources, transportation electrification, and other environmental goals. Distribution system plans provide a utility's strategic roadmap for investing in grid technologies and systems to achieve the state's energy goals and objectives.

What Are Distribution Systems?

Electricity systems include distribution systems composed of medium-voltage lines, substations, feeders, and related equipment that transport electricity to and from homes and businesses. These local grids connect to high-voltage transmission lines that carry electricity long distances from large power plants (See Figure 1). The distribution system includes physical equipment as well as information, communications, and operational technologies. States have jurisdiction over distribution systems.

Figure 1: Electricity generation, transmission, and distribution

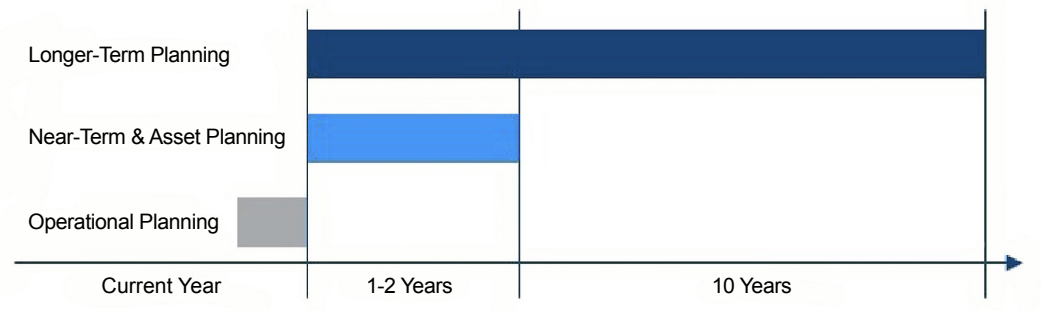


Source: Energy Information Administration

What Is Distribution System Planning?

Electric distribution system planning assesses needed physical and operational changes for the local grid. Electric utilities conduct annual planning for distribution system spending over the next year or two. They also conduct longer-term planning over a five- to 10-year planning horizon, updating these plans every one to three years (See Figure 2).

Figure 2: Distribution Planning Horizons

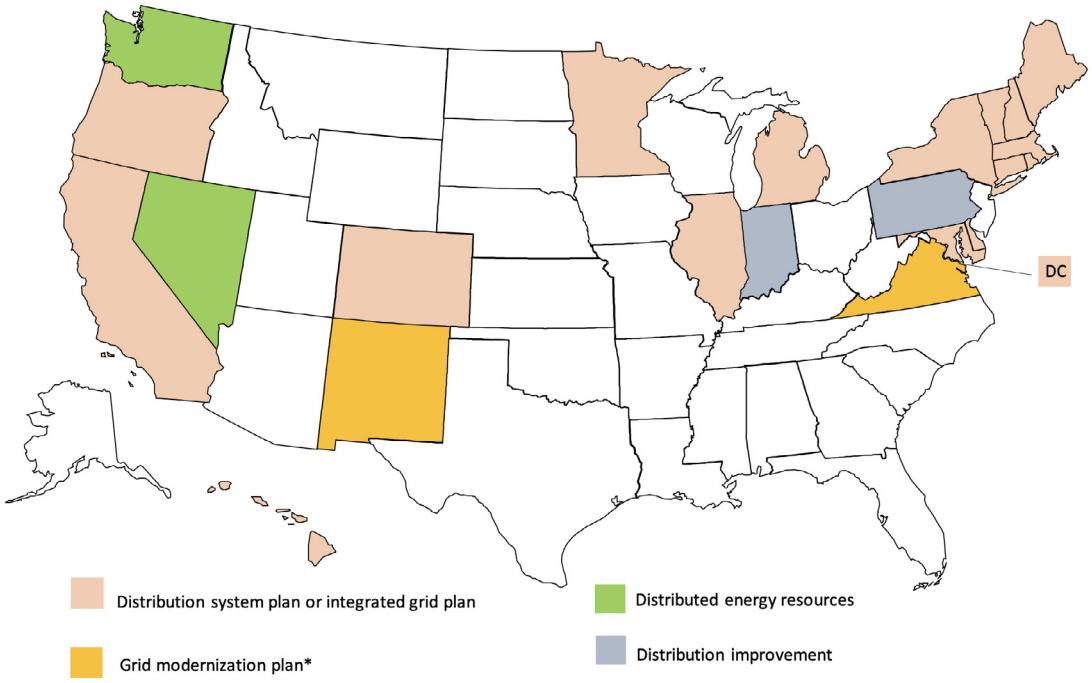


Source: U.S. Department of Energy 2020

While terminology varies by state, types of distribution plans generally fall into the following categories, typically ranging from narrow to broader scopes with respect to the types of information they cover (see map):

- **Transmission and distribution (T&D) improvement plan** - Enables expedited cost recovery as allowed by state law for certain electricity system improvements, covering state-jurisdictional high-voltage systems and local grids.
    - For example, utility plans submitted to the Indiana Utility Regulatory Commission under the state's Transmission, Distribution, and Storage System Improvement Charge can include new or replacement transmission, distribution, or utility storage projects for safety, reliability, system modernization, or economic development. Among eligible projects are advanced technology investments to support grid modernization, such as advanced metering infrastructure (AMI), information technology systems, and DER management systems. The plans cover a five- to seven-year period and are updated annually. Pennsylvania's Distribution System Improvement Charge can be used to recover reasonable and prudent costs to repair, improve, or replace eligible distribution property. Utilities must file Long Term Infrastructure Improvement Plans for review by the Public Utility Commission.

Figure 3: Types of Distribution System Plans

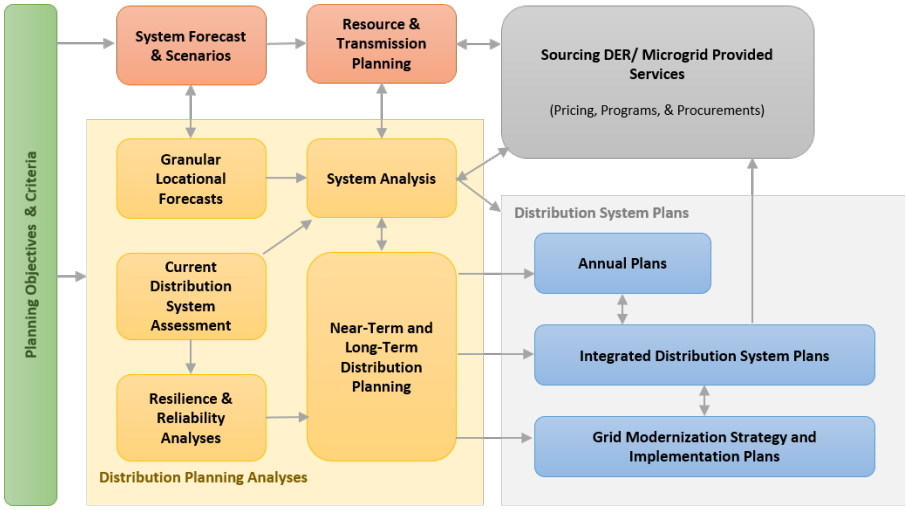


*Some states that require distribution system plans also require grid modernization plans (e.g., Minnesota and California).

- **Distributed energy resources plan** - Evaluates benefits and costs of DERs, considers ways to increase deployment of cost-effective DERs, and facilitates better integration of DERs in distribution planning.
    - For example, regulated utilities in Nevada must submit a Distributed Resource Plan to the Public Utilities Commission every three years as part of their integrated resource plan. Among other provisions, Distributed Resource Plans must evaluate locational benefits and costs of DERs, including distributed generation systems, energy efficiency, energy storage, EVs, and demand response technologies. Also required are forecasting and hosting capacity analyses that inform the utility's grid needs assessment and recommendations for deployment of utility infrastructure upgrades and NWA solutions to identified constraints.

- **Grid modernization plan** - Presents a reasoned strategy that links a proposed technology deployment roadmap to stated objectives. A primary focus is replacing aging infrastructure with advanced grid technologies. Plans may include utility requests for regulatory approval of grid modernization investments and programs.
    - For example, New Mexico's Grid Modernization Statute allows eligible public utilities to file an application with the state's Public Regulation Commission for approval of investments or incentives to facilitate grid modernization, rate designs, or programs that incorporate the use of technologies, equipment, or infrastructure associated with grid modernization, as well as customer education and outreach programs. Costs approved by the Commission may be recovered through a tariff rider or in base rates, or a combination of the two.
- **Integrated distribution system plan (or integrated grid plan)** - Provides a systematic approach to satisfy customer service expectations and state grid planning and utility design objectives related to reliability and resilience, safety and operational efficiency, and integration and utilization of DERs (See Figure 4).
    - For example, in Minnesota, both large and small regulated utilities file Integrated Distribution Plans every two years. Among other requirements, plans incorporate a 10-year Distribution System Modernization and Infrastructure Investment Plan with a five-year action plan including potential DER scenarios, projected distribution system spending over the five-year period, coordination with integrated resource planning, and NWA analysis for utility distribution system projects anticipated to cost more than $2 million. In Hawaii, the Public Utilities Commission provided guidance on a planning process to evaluate and optimize solutions across generation, transmission and distribution systems. Hawaiian Electric Company recently filed its second Integrated Grid Plan.

Figure 4: Integrated Distribution System Planning Framework and Components



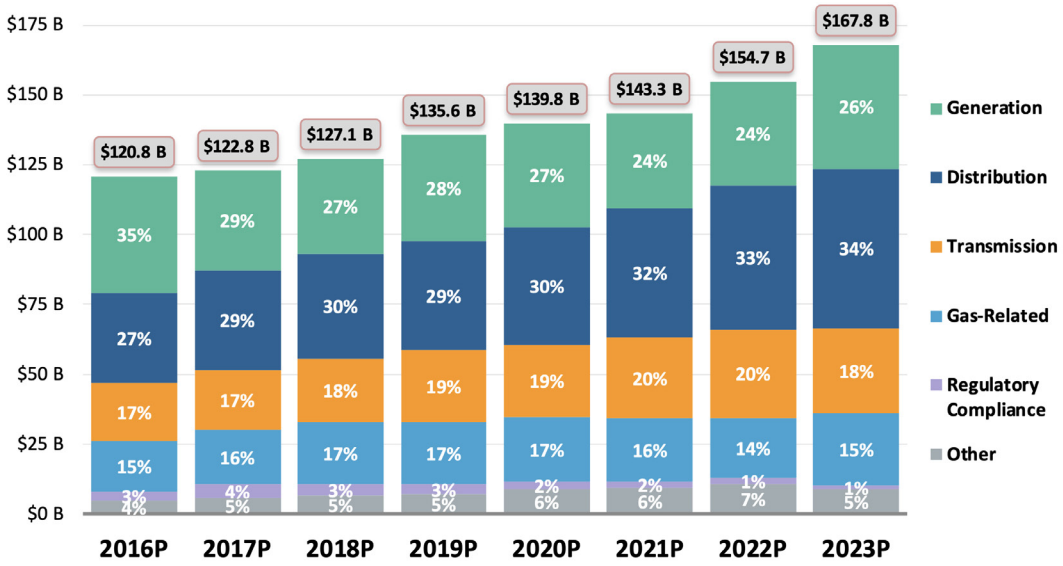
Other types of plans may inform distribution plans — for example:

- **Integrated resource plans** identify future investments to meet bulk power system reliability and public policy objectives at a reasonable cost.
- **Transmission plans** identify future transmission expansion needs and options.
- **Electrification plans** inform grid needs for EV charging or electrification of the building sector, or both.
- **State Energy Security Plans** include strategies to address energy security and resilience to physical and cybersecurity threats.
- **Demand-side management plans** specify capabilities that distribution technologies and systems need to provide to achieve multi-year targets for demand flexibility and energy efficiency.
- **State energy plans** provide an assessment of current and future energy supply and demand, examine existing energy policies, and identify emerging opportunities.

State Distribution Planning Context

An increasing number of U.S. states — nearly half — require regulated electric utilities to file some type of distribution system plan.[2] This is motivated in part by the large and growing percentage of utility capital expenditures on distribution infrastructure (See Figure 5). Publicly filed plans provide transparency into the utility's vision for the future grid before utilities make major grid investments. Utility regulatory proceedings on the plans enable engagement by State Energy Offices and stakeholders.

Figure 5: Total Functional Spending of U.S. Investor-Owned Electric Utilities



Source: Edison Electric Institute

Some consumer-owned utilities make their distribution plans publicly available to their boards and members. For example, in Vermont, municipal utilities are required to file an Integrated Resource Plan (IRP) with the Public Utilities Commission every three years. The plans must document how the utility will provide distribution services that are 'adequate, reliable, safe, secure, efficient, and environmentally sound at the lowest present-value life-cycle cost' (30 V.S.A. Section 218c(a)(1)). Some municipal utilities in Vermont also engage stakeholders in the planning process and use the IRP requirement as an opportunity to lay out a comprehensive decision-making framework for evaluating cost-effective resource options that can meet customer needs. Alternatives evaluated may include strategic electrification platforms, energy efficiency or advanced demand response initiatives and customer-sited or utility-scale distributed energy resources.

State Energy Offices are required to engage in transmission and distribution planning as a requirement for State Energy Program funding under Section 40109 of the IIJA. According to guidance provided by the U.S. Department of Energy (DOE), State Energy Offices are encouraged to submit T&D plans that define new or enhanced activities and clearly document how state priorities are aligned with T&D planning efforts in the state or geographical region.

2 See Berkeley Lab's forthcoming catalog of state distribution planning requirements on its Integrated Distribution System Planning website.

Comprehensive Electricity Planning Task Force

In 2019, the National Association of Regulatory Utility Commissioners (NARUC) and the National Association of State Energy Officials (NASEO) convened a two-year initiative called the Comprehensive Electricity Planning Task Force, which included PUC and State Energy Office participants from 15 states. This effort addressed the increasing growth of DERs and new electricity planning needs to account for the quantity, location, capabilities, and load shapes of resources added to distribution and bulk power systems. The initiative supported State Energy Offices and PUCs in analyzing these impacts on electricity planning and planning changes that may be needed to achieve state energy goals, such as more resilient, efficient, and affordable grids. The initiative developed a comprehensive set of resources to support state decision-makers in advancing coordinated processes for electricity system planning. A Blueprint for State Action also was developed, and 12 states announced plans to adopt some of the principles and strategies identified through this process.

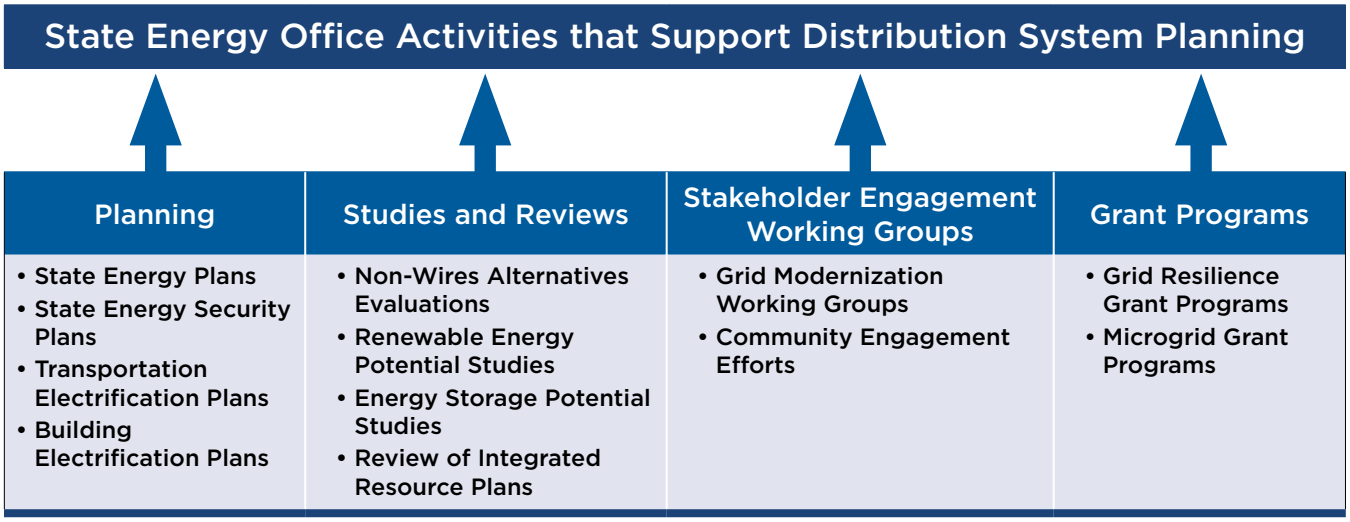
What Is Included in Distribution Plans?

Procedural requirements. These include elements such as frequency of filing, planning horizon, stakeholder engagement, data sharing, and treatment of confidential information.

Substantive requirements. Examples include information on the current state of the distribution system, load forecast, DER forecast, risk analysis, budget for planned capacity projects, distribution operations including vegetation management and management of reliability and resilience events, hosting capacity analysis, grid needs assessment, NWA analysis, grid modernization strategy, and the utility's short-term action plan. Additional requirements may include describing how the utility coordinates distribution system planning with other types of electricity planning, proposals for pilots, and strategies for engaging utility customers, community-based organizations, and other stakeholders.

2. State Energy Office Activities Supporting Distribution System Planning Outside of the Regulatory Process

State Energy Offices lead a variety of planning processes, conduct studies that inform grid planning, organize stakeholder engagement activities, and administer programs that advance grid modernization. Following are illustrative examples.



Prepare Plans

Legislatures or governors frequently task State Energy Offices to develop comprehensive state energy plans. Often, the goal is a framework to address current and future state energy needs in a cost-effective manner, enhance energy system reliability, expand economic opportunity, and address environmental quality. These plans set the context for and inform future distribution planning and may include recommendations on distribution system analyses and investments. Examples of such energy plans that include distribution planning considerations or impacts include:

- 2021 Washington State Energy Strategy – Included in its recommendations are several that address the need to establish a smart and flexible grid, specifically developing a better understanding of the value of DERs and the capacity of distribution systems to host them.
- 2019 North Carolina Clean Energy Plan – Several recommendations address grid modernization in support of clean energy resource adoption and grid resiliency and flexibility, among other outcomes.
- 2019 New Jersey Energy Master Plan – Among the plan's recommendations are requiring integrated distribution plans to identify the need for distribution system upgrades that enable the state to prepare for the growth of DERs and EVs.

State Energy Offices are also engaging in planning for the electrification of transportation. The IIJA provides $5B over fiscal years 2022-2026 for the deployment of EV charging infrastructure through the National Electric Vehicle Infrastructure (NEVI) Formula Program. The program requires states to submit applications for DOE approval that involve both state transportation departments and State Energy Offices and consider distribution system upgrades. It is not yet clear how implementation of the NEVI plans will affect distribution system planning. However, it is likely that state agencies or operators of NEVI-funded infrastructure will engage with utility-driven distribution planning processes.

One such example is the New York State Energy Research and Development Authority (NYSERDA), the State Energy Office, addressing distribution planning as part of its transportation electrification planning. The agency released its Transportation Electrification Distribution System Impact Study in May 2022. The report examined the load and cost impacts on the state's electric distribution systems of various clean transportation scenarios under consideration in NYSERDA's New York Clean Transportation Roadmap. Specifically, the impact study evaluated the scenarios with and without managed EV charging, along with assumptions about end-use load growth, energy efficiency, photovoltaic solar, energy storage, and building electrification. Ultimately, the study assessed the costs of needed distribution system upgrades due to transportation electrification.

As referenced earlier, the IIJA also addresses State Energy Office engagement in DSP through changes in eligibility requirements for State Energy Program funding. States must demonstrate to DOE that they are engaged in T&D system planning. The Act provides several options for compliance, including transmission line feasibility studies, permit and design preparation, stakeholder outreach, and support for Indian Tribes and local governments.

Also under the IIJA, each state is developing a State Energy Security Plan. In consultation with owners and operators of energy infrastructure in the state, the plan must assess existing circumstances in the state and propose methods to strengthen its ability to:

- Secure energy infrastructure against all physical and cybersecurity threats;
- Mitigate the risk of energy supply disruptions;
- Enhance the response to, and recovery from, energy disruptions; and
- Ensure that the state has reliable, secure, and resilient energy infrastructure.

Specific resilience-related requirements include addressing physical and cybersecurity threats and vulnerabilities, providing a risk assessment of energy infrastructure and cross-sector interdependencies, and developing a risk mitigation approach to enhance reliability and end-use resilience. These plans provide valuable information for DSP processes, which includes outlining how distribution planning and investments can impact and enhance resilience. The Kentucky Energy Security Plan, for example, highlights the role of DERs in mitigating risk both in the short- and long-term. The Idaho State Energy Security Plan highlights the linkage with electricity planning by encouraging "Idaho utilities to include resiliency components and risk profiles specific to their service territory in their Integrated Resource Planning processes." The plan also highlights the resilience benefits of energy efficiency measures that utilities can implement to decrease overall energy demand in the state.

Described further below, State Energy Offices not only lead the development of State Energy Security Plans, but in most states also administer the implementation of DOE's Grid Resilience State/Tribal Formula Grant Program (40101(d)). As the security plans are the foundation of the grid investment resilience planning under the IIJA and highlight states' risks and priorities for investments to enhance the grid, they provide insights into potential priority investments by utilities in distribution systems and associated funding streams.

Conduct Studies and Reviews

State Energy Offices can conduct studies and publish reports or policy papers to inform DSP and grid modernization plans for their state. Report recommendations can cover any aspect of DSP, such as planning objectives, procedural requirements, cost recovery, reliability and resilience, coordination with other proceedings, and data needs and analysis. Studies also can identify the need for legislation or regulatory actions to establish or advance DSP processes as well as technical and administrative barriers and ways to overcome them.

One example of analysis initiated by a State Energy Office comes from the District of Columbia's Department of Energy and Environment. In response to a utility-proposed grid modernization project in 2017, the Department commissioned a study to assess the need for a proposed new substation in the District. This included review of the utility's load forecasts and an assessment of the potential of NWA to avoid or defer the need to build the substation. The analysis found that the proposed substation project had not sufficiently accounted for the potential of cost-effective, targeted DER solutions or future building codes. While the Commission ultimately approved the building of the proposed substation, this analysis resulted in a directive to require analysis of NWA for future distribution system projects.

District of Columbia Electrification Roadmap

The District of Columbia's Department of Energy and Environment also led development of an electrification roadmap for buildings and transportation in the District, consistent with its carbon neutrality policy and objective to reduce energy use in buildings by 50 percent by 2032. The study assessed load impacts associated with the electrification pathway in both sectors and examined grid impacts of electrification on several distribution substations and circuits in 2032. The analysis also estimated the potential for energy efficiency, demand response, and battery storage measures to mitigate potential distribution grid constraints and compared the resulting portfolio with traditional solutions — reconductoring and construction of new feeders. The Department filed the report with the Public Service Commission in April 2023 in Cases 1130 and 1167. Among the findings:

- The utility's system is expected to be able to accommodate building and vehicle electrification during the study period.
- None of the modeled electrification loads are expected to exceed substation capacity in 2032, although they approach the maximum in some cases.
- The majority of feeders analyzed are not expected to experience overloads, even when considering summer ratings. While many feeders do not require investment for at least another decade, certain feeders could experience constraints from electrification loads in 2032, which can be mitigated by either traditional grid investments or NWA.
- Local resilience needs could shape investment patterns.
- The Commission should adopt a benefit-cost test that accounts for all societal costs and benefits, including greenhouse gas emissions, air quality impacts, and resilience, to appropriately value the role of DERs in addressing future electrification constraints.

The Colorado Energy Office (CEO) is another example of a State Energy Office conducting analysis to inform distribution planning. The CEO commissioned a study in 2019 that modeled four scenarios for potential expansion of energy storage in the state. The evaluation resulted in several policy recommendations, including establishing a process to identify and screen for opportunities for NWA such as energy storage to meet load growth and reliability objectives.

State Energy Offices also can sponsor studies to estimate solar potential, which can set expectations and bounds on DER forecasts in DSP. For example, in 2020 the Rhode Island Office of Energy Resources commissioned a study of solar potential for the state for a number of siting categories. In addition to compiling estimates of generation potential, solar costs, and avoided greenhouse gas emissions, the study assessed distribution system hosting capacity.

In Massachusetts, the Department of Energy Resources commissioned a Technical Potential of Solar Study to assess the potential for solar development throughout the Commonwealth. This effort, which launched in 2022 and included public workshops, mapping, and greenhouse gas analysis, is expected to result in a list of policy considerations. Utilities can use the resulting potential solar adoption levels and scenarios in DSP, or stakeholders can use them as complements or points of comparison to utility forecasts of solar adoption.

State Energy Offices also can characterize the technological baseline for existing local grids. For example, the New Mexico Energy Conservation and Management Division of the Energy, Minerals, and Natural Resources Department developed a Baseline Report of New Mexico's Electricity System. This report, resulting from the Department's Energy Grid Modernization Roadmap, provided a foundational assessment of the state's electric grid and infrastructure, against which progress will be measured.

While not focused on distribution systems, some State Energy Offices are tasked with the review of integrated resource plans prepared by utilities. One such example is the South Carolina State Energy Plan process conducted between 2016 and 2018, which included a subcommittee on integrated resource planning and resulted in documents intended to both guide and provide best practices for the development of integrated resource plans. State Energy Offices could play a similar role for DSPs.

Facilitate Stakeholder Engagement

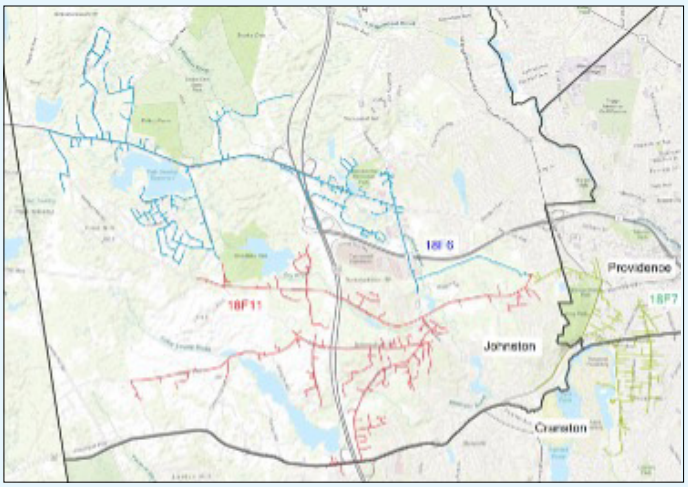
State Energy Offices can convene stakeholder groups to review and develop recommendations for DSP processes. In this position, State Energy Offices can advocate for DSP processes that further state energy policy goals, such as an increase in clean distributed resources, greater transportation electrification, and improved affordability. Some State Energy Offices have undertaken stakeholder planning processes that may not directly involve distribution system planning but serve to inform those plans.

An example of such a stakeholder initiative is the Hawaii State Energy Office's Energize Kakou initiative. In 2022, the agency hosted a series of statewide workshops to share information and gather input to empower community participation in the clean energy transition. The workshops were designed to provide community members with an understanding of Hawaii's energy landscape, inform industry stakeholders on community concerns and interests, and offer insight and guidance to communities, stakeholders, and policymakers in energy planning. The process resulted in several reports, including:

- **Siting Perspectives Report** - Summary of community perspectives on renewable energy development siting
- **Community Engagement Report** - Overview of the process and recommendations resulting from the nine-month stakeholder engagement initiative

Using Local Stakeholder Information to Inform Grid Planning in Rhode Island

Rhode Island has generally experienced flat or declining load growth over the past several decades and limited integration of distributed generation. But the state is likely to experience substantial load growth from beneficial electrification of space heating and transportation and accelerated DER development to meet its ambitious goals for reducing greenhouse gas emissions.



Source: Rhode Island Energy

The Office of Energy Resources is collaborating with Rhode Island Energy, the town of Johnston, and local stakeholders to help prepare for these changes. The team is exploring the potential role of local stakeholder information in the grid planning process to better integrate renewable distributed generation and newly electrified loads.

The project will identify areas where additional distributed generation and load growth are likely. The utility will analyze grid solution sets for investments they could make incrementally as renewable energy development and load growth occur, as well as for investments made all at once in anticipation of grid needs. The analysis focuses on a representative feeder, selected for its combination of urban and suburban development and moderate hosting capacity for solar PV, and considers near- and long-term scenarios.

As another example, the New Mexico Energy Conservation and Management Division of the Energy, Minerals, and Natural Resources Department formed a Grid Modernization Advisory Group after legislation tasked the agency with developing a state roadmap for grid modernization. The Advisory Group included experts across the electricity sector, such as industry representatives, researchers, and utility consumer and environmental advocates. The group identified actions to improve the grid's reliability, resilience, and efficiency and encourage fair and equitable cost distribution to enable clean and beneficial electrification. This stakeholder initiative resulted in a series of action-oriented whitepapers to inform the development of a Grid Modernization Roadmap, outlining potential actions to modernize the state's grid over the subsequent eight years. Among the actions identified in the roadmap are recommendations for advanced metering infrastructure, increasing energy storage, interconnection rules, and advanced inverters.

Another State Energy Office-led stakeholder engagement process is the Massachusetts Grid Modernization Advisory Council (GMAC), established by the state's 2022 climate law. The legislation in part requires investor-owned electric distribution companies to develop electric-sector modernization plans to address grid upgrade needs to support storage and other DERs, renewable resources, electrification, reliability, and resilience, while minimizing customer costs and maximizing customer benefits. The law also requires transparency and stakeholder engagement, as well as an expedited timeline, in the grid planning process.

The GMAC will review and provide recommendations on electric-sector modernization plans filed by the states' electric distribution companies. The composition of the GMAC reflects a broad spectrum of stakeholders, including representatives from state government, consumer advocates, Community Action Agencies, the clean energy industry, environmental advocates, the electric vehicle industry, regional planning organizations, and large commercial and industrial customers, among others.

Administer Grant Programs

State Energy Offices can directly advance grid modernization by administering grant programs that fund projects supporting the deployment of enabling technologies. The New Mexico Energy Conservation and Management Division of the Energy, Minerals, and Natural Resources Department oversees such a fund for municipalities, universities, state agencies, and hospitals. The Grid Modernization Grant Program, under the state's 2020 Energy Grid Modernization Roadmap Act, is designed to enhance electric distribution or transmission grid reliability, grid security, demand response, customer service, and energy efficiency and conservation. The program funds research and development on electric grid modernization as New Mexico transitions to a zero-carbon electricity system. For example, the City of Albuquerque was awarded a grant in 2022 for an automated energy, water, renewable energy, and asset management data interface, facilitating real-time demand response.

In February 2023, the Colorado Department of Local Affairs, with support from the Colorado Energy Office, launched the Microgrids for Community Resilience Grant Program, created by Assembly House Bill 22-1013. The program is designed to build community resilience by minimizing grid disruptions in rural communities. The first phase of grants is for microgrid projects for cooperative electric associations and municipal utilities. The program is focused on strengthening resilience of essential infrastructure and community-based anchor institutions, such as schools, libraries, health-care facilities, law enforcement, emergency medical service providers, and other public safety agencies.

The IIJA provides multiple funding opportunities for grid resilience. In the majority of states, Governors designated State Energy Offices as the lead agency for implementation of formula grants to States and Tribes under IIJA Section 40101(d) to prevent outages and enhance electric grid resilience. The program will provide approximately $471.6 million in the first year and $459 million annually over four years to States and Tribes to improve the resilience of electric grids against disruptive events. State and Tribal grant programs will fund a wide range of resilience measures to mitigate the impact of disruptive events, such as weatherization technologies, fire-resistant technologies, undergrounding electrical equipment, utility pole management, relocation or reconductoring of power lines, vegetation and fuel-load management, and enhancing system capacity. Eligible entities include electrical grid owners and operators of electric grids and transmission, electricity generators, and distribution providers, including all types of electric utilities. As State Energy Offices are setting up their grant programs, they have reached out to many of the eligible entities and in particular to small utilities, which will receive a certain percentage of the grant funding as provided by the law.

In addition, DOE's Grid Deployment Office is administering a $10.5 billion Grid Resilience and Innovation Partnerships Program to enhance grid flexibility and improve the resilience of power systems against growing threats of extreme weather and climate change. States are eligible to apply for the Grid Innovation Program, which provides $5 billion for FY 22-26 to support projects that use innovative approaches to transmission, storage, and distribution infrastructure to enhance grid resilience and reliability. DOE also seeks to fund projects that enhance collaboration on grid resilience between eligible entities and private and public sector owners and operators, including alignment with regional resilience strategies and plans. Projects can be focused on transmission or distribution systems, or both. Many State Energy Offices have participated in or are leading applications for this funding opportunity.

Participate in Working Groups

State Energy Offices throughout the country participate in working groups on such DSP-related topics as building and transportation electrification, DER interconnection, NWA, and equity.

For example, the Rhode Island Office of Energy Resources serves on Narragansett Electric Company d/b/a Rhode Island Energy (formerly d/b/a National Grid) System Reliability Procurement Technical Working Group, alongside the Division of Public Utilities and Carriers, nongovernmental organizations, and members of the state's Energy Efficiency and Resource Management Council and its consultant team. The System Reliability Procurement Working Group identifies cost-effective and reliable NWAs for electric distribution systems. Among the topics the Technical Working Group discusses are methodologies for considering NWAs, locational incentives, and benefit-cost analysis modeling. The State Energy Office also participates in the utility's Power Sector Transformation Advisory Group. This group was convened to assess and review the electric system investments needed to increase the capacity for distributed generation, energy storage, and other emerging technologies. The working group convened in 2022 leading up to the filing of the utility's Advanced Metering Functionality and Grid Modernization plans. The working group will be on hiatus while these plans are considered through the regulatory review process.

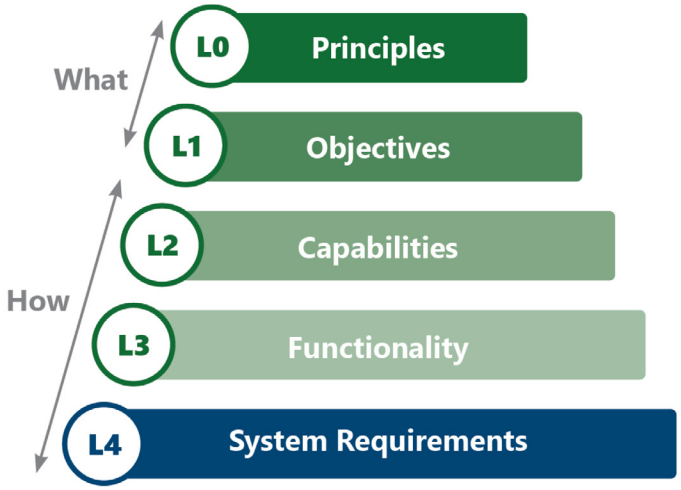
Source: istockphoto/Jeremy Poland

3. State Energy Office Participation in State Utility Regulatory Proceedings

Planning Goals and Objectives

Distribution system planning starts with states setting goals and objectives that define long-term, high-level outcomes and steps to achieve them. In turn, these determine the capabilities, functionality, and system requirements.

Figure 6: DSP Framework



Source: U.S. Department of Energy 2020

Goals for DSP include traditional regulatory aims (e.g., safety, reliability, and affordability) as well as newer policy goals (e.g., transportation electrification, renewable resources, and emissions reductions) and related outcomes such as greater asset utilization and improved DER integration.

A natural role for State Energy Offices is advocating for planning consistent with state energy policies and recommending specific planning goals and objectives aligned with these policies. For example, the Colorado Energy Office recommended that the Public Utilities Commission establish clear objectives for utility distribution plans, including: increase transparency with regard to the current state, investment needs, and hosting capacity of the distribution system; expand customer choice and use of DERs; promote innovations that help the state achieve its policy goals; and modernize the distribution system without sacrificing reliability and safety. The Colorado Public Utilities Commission's final DSP requirements identified increasing transparency and expanding DER adoption among the purposes of DSP. Similarly, in comments on Northern States Power Company's (Xcel Energy's) 2018 Integrated Distribution Plan (IDP), the Energy Division of the Minnesota Department of Commerce, the State Energy Office, proposed an additional planning objective — to understand the short- and long-term costs and benefits of the plan. The Minnesota Public Utilities Commission included this objective in its order on DSP filing requirements.

State Energy Offices also can leverage planning objectives to advocate for changes in filing requirements. For example, in its comments on Northern States Power Company's (Xcel Energy's) 2018 IDP, the Energy Division of the Minnesota Department of Commerce recommended that future plans explain how their contents align with the Minnesota Public Utilities Commission's planning objectives, including details on how the utility has made efforts to better fulfill the planning objectives and suggestions on how changes to filing requirements would make it easier to achieve planning objectives. The Minnesota Public Utilities Commission ordered that these recommendations be part of subsequent IDP filings.

Procedural Requirements

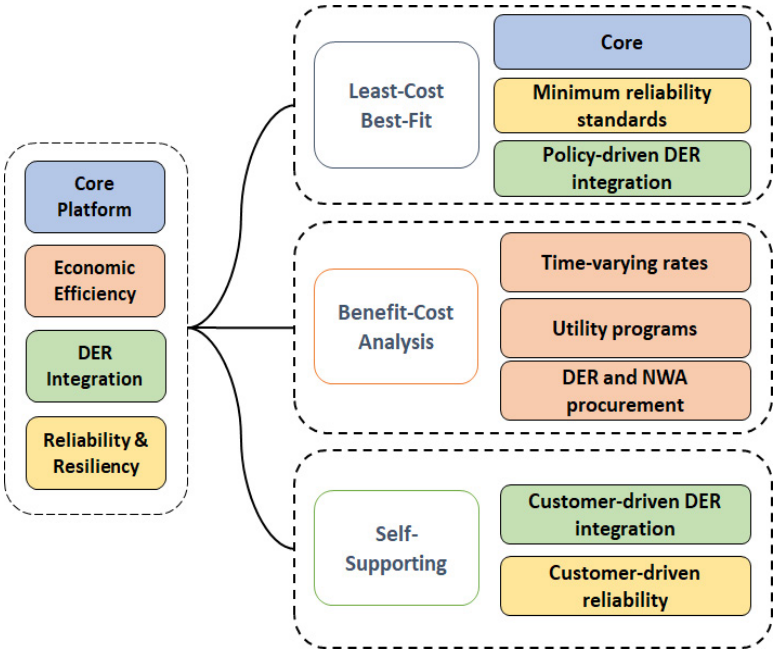
State Energy Offices are well positioned to assess how DSP procedural requirements fit into a broader policy framework. Among the areas that State Energy Offices can address are filing requirements, coordination with other proceedings, and stakeholder engagement. For example, State Energy Offices can comment on the frequency of DSP filings (Colorado Energy Office) and interim updates (the Energy Division of the Minnesota Department of Commerce) so that plans keep up with economic and technological trends and align with the timing of other proceedings where DSP results may be relevant, such as integrated resource planning. Similarly, State Energy Offices can comment on DSP planning horizons (the Energy Division of the Minnesota Department of Commerce) so that the data the plans provide informs long-term state policy development.

State Energy Offices can address the alignment of DSPs with other proceedings by requesting common definitions and forecasts and recommending the integration of related proceedings (the Energy Division of the Minnesota Department of Commerce). State Energy Offices can comment on how utilities engage with relevant stakeholders, including state and municipal agencies, as the Rhode Island Office of Energy Resources did in response to Narragansett Electric Company d/b/a Rhode Island Energy (formerly d/b/a National Grid) National Grid's 2022 Electric Infrastructure, Safety, and Reliability Plan.

Cost-Effectiveness Evaluation

Utility DSPs should include an evaluation of the cost-effectiveness of major planned investments. Utilities typically use a *least-cost, best fit* approach for most distribution infrastructure investments and platform software investments (See Figure 7). This approach seeks the lowest cost way to achieve the capabilities and functionality needed to meet goals and objectives. Utilities use *benefit/cost analysis* (BCA) for distribution system investments such as advanced metering infrastructure and NWA. This type of analysis determines whether an investment would enhance welfare (benefits exceed costs) for all or a subset of customers, comparing lifetime costs and benefits of investments against alternatives.

Figure 7: Cost-Effectiveness Methods



Source: U.S. Department of Energy 2020

Under a BCA approach, the utility defines scenarios, identifies relevant costs and benefits, sets a time frame, selects a discount rate, and explains methods and assumptions. State Energy Offices can comment on any of these methodological decisions. Given their position in state executive branches, State Energy Offices are well suited to evaluate whether BCA aligns with state policy goals. For example, the the Energy Division of the Minnesota Department of Commerce proposed discount rates that reflect societal interests. In addition, the experience of State Energy Offices with administering energy efficiency and distributed generation programs, such as rebates for efficient appliances, loans for renewable energy projects, and energy-saving performance contracting, prepares them to comment on potential benefits and criteria for evaluating BCA. Connecticut DEEP, for example, addressed both the avoided costs of energy supply and minimum benefit-cost ratios. Similarly, Colorado Energy Office commented on the definition of cost-effectiveness.

Cost Recovery, Certification, and Funding Sources

While prudence determinations typically are made in general rate cases, depending on state law and regulatory practice, DSP proceedings may consider eligibility and project certification for cost recovery and funding sources for proposed investments. Impacts of utility investments on consumers and achievement of state energy goals may motivate State Energy Offices to address such decisions in DSP proceedings. For example, the Energy Division of the Minnesota Department of Commerce took positions on certification based on a project's expected reliability improvements, comparisons to alternative investments, and reported costs and benefits. State Energy Offices can also address how utilities pay for proposed investments by commenting on whether proposed DSP investments should be considered as regulatory assets and identifying non-ratepayer funding sources (e.g., federal funds).

Grid Modernization

A modern grid has:

- Greater ***resilience*** to hazards of all types
- Improved ***reliability*** for everyday operations
- Enhanced ***security*** from an increasing and evolving number of threats
- Additional ***affordability*** to maintain our economic prosperity
- Superior ***flexibility*** to respond to the variability and uncertainty of conditions at one or more timescales, including a range of energy futures
- Increased ***sustainability*** through energy-efficient and renewable resources

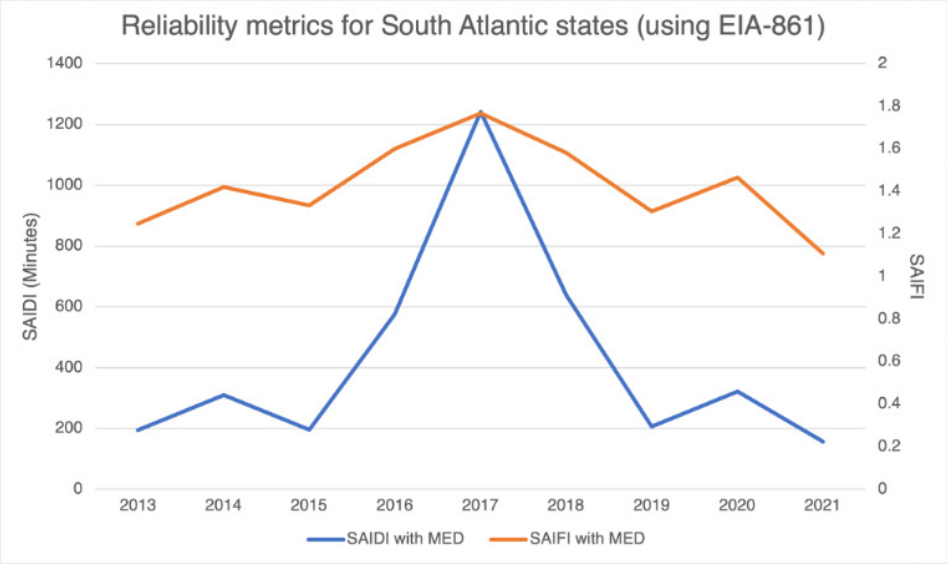
All State Energy Offices are engaged in activities relevant to at least some of these objectives and many can contribute expertise and information in grid modernization proceedings or broader DSP cases that encompass grid modernization investments.

For example, the Minnesota Public Utilities Commission requested in Docket No. 17-797 (Sept. 27, 2019) "that the Commissioner of Commerce seek authority from the Commissioner of Minnesota Management and Budget to incur costs for specialized technical professional investigative services… The purpose is to investigate the potential costs and benefits of grid modernization investments proposed for recovery by Xcel in its next rate case or TCR (Transmission Cost Recovery) filing, and to assist the Department in providing recommendations to the Commission regarding any such investments."

The Energy Division of the Minnesota Department of Commerce conducted a request for proposals for these technical services, selected a contractor, and submitted the resulting report in Docket 21-814 to support the analysis of grid modernization investments, *Review and Assessment of Grid Modernization Plans: Guidance for Regulators, Utilities, and Other Stakeholders*. The guidance document distills related Minnesota Public Utilities Commission orders into recommended filing requirements for utility grid modernization proposals with respect to economic evaluation that is necessary to establish whether the proposed investments are in the public interest and describes best practices for conducting economic evaluation of grid modernization investments. The report also incorporates the Department's earlier filing, *Methods for Performance Evaluations, Metrics, and Consumer Protections for AMI and FAN*, in Docket No. 20-627 (Dec. 1, 2020).

In particular, given the importance of reliable and resilient distribution systems to state economic welfare, it is appropriate for State Energy Offices to address the development and reporting of metrics for these attributes when commenting on utility DSP filings. For example, State Energy Offices have proposed that utilities report numerous metrics, including the Rhode Island Office of Energy Resources (OER) recommending the System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) (see figure with example metrics in another region), and the Connecticut Department of Energy and Environmental Protection suggesting Customers Experiencing Long Interruption Durations (CELID) and Customers Experiencing Multiple Interruptions (CEMI). Further, State Energy Offices have recommended that utilities report these metrics at different geographic levels, including for municipalities (Rhode Island Office of Energy Resources) and substations (Colorado Energy Office). In comments on the content of vulnerability studies, the Connecticut DEEP addressed the risks of climate change to reliability and resilience and ways state agencies can contribute to those studies. Finally, State Energy Offices can address cybersecurity threats by recommending that utilities describe how they manage their risks in DSP (Colorado Energy Office).

Figure 8: Reliability Metrics



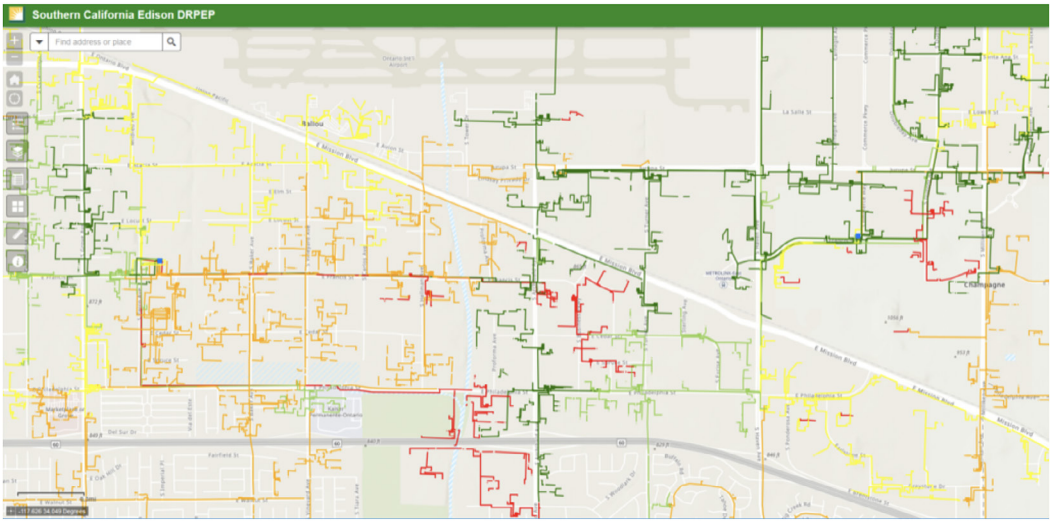
Source: U.S. EIA (2023); MED - Major Event Day

Data and Analysis to Assess Infrastructure Needs and DER Solutions

Utility DSPs describe planned distribution system investments to maintain reliable service and support DER adoption. Assessing infrastructure needs involves developing load and DER forecasts with varying locational granularity (e.g., substation or feeder) over short-term and longer time frames. Administration of energy efficiency and distributed generation programs prepares State Energy Offices to address how these forecasts account for changes in technologies. More broadly, State Energy Offices can comment on how forecasts account for relevant state policies. The Rhode Island Office of Energy Resources has addressed both of these topics in DSP proceedings.

DSPs also may include Hosting Capacity Analysis (HCA) (See Figure 9, showing capacity constraints in yellow and red), which quantifies the additional amount of DERs — in most states, focused solely on distributed PV — that the distribution system can accommodate at a given time and location under existing grid conditions and operations. State Energy Offices have an interest in commenting on HCA methods as they relate to achieving DER goals in state renewable portfolio standards and state distributed generation and EV programs. In addition, State Energy Offices may have related planning responsibilities, such as statewide electrification planning.

Figure 9: Hosting Capacity Analysis



Source: Southern California Edison

In particular, State Energy Offices can comment on HCA use cases (Colorado Energy Office), frequency of HCA updates (the Energy Division of the Minnesota Department of Commerce, Colorado Energy Office), and publication of HCA data and maps (Colorado Energy Office). State Energy Offices also can propose that utilities perform analyses that build on HCA. For example, the Colorado Energy Office proposed that Xcel Energy's DSP for Colorado identify circuits based on metrics not included in its HCA (peak to off-peak load ratio) to help distributed generation developers better prioritize the location of their projects. Similarly, the Energy Division of the Minnesota Department of Commerce asked Xcel Energy if it could report how to increase hosting capacity based on the constraints identified through HCA.

State Energy Office interest and expertise in DERs also relates to NWA analysis — considering where and how DERs might cost-effectively defer or avoid certain types of upgrades in distribution system infrastructure. State Energy Offices can address key decisions in NWA frameworks, including suitability criteria such as cost and timing of investments in traditional distribution system infrastructure (Colorado Energy Office, the Energy Division of the Minnesota Department of Commerce) and criteria for competitive solicitations (Connecticut DEEP).

Conclusion

State and Territory Energy Offices differ dramatically from state to state regarding their roles in distribution system planning. While some may engage fully in the public utility regulatory process, others may be prohibited from doing so or play a smaller role. This paper summarizes the full spectrum of State Energy Office engagement in the distribution system planning process. It highlights various examples of non-regulatory activities by State Energy Offices including planning, conducting studies, convening stakeholder processes, and implementing programs that inform and contribute to distribution system planning. It also provides examples of State Energy Offices' engagement in proceedings before their respective public utility commissions. As State Energy Offices face myriad challenges associated with meeting state policy goals, preparing for anticipated rates of distributed energy resource deployment, addressing concerns regarding grid reliability and resilience, and recommending and making long-term investment decisions, the examples provided through this guide can serve as a resource in navigating those challenges.

Source: Shutterstock/oo3asy60lfoo

Glossary

Section 1 of this paper defines distribution systems and various types of related plans. Following are definitions of other key terms in distribution system planning, as used in this paper. DOE's Modern Distribution Grid includes a glossary of additional industry and technology terms.

Distributed energy resource - A resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity, or ancillary service needs of the distribution grid. The resources, if providing electricity or thermal energy, are small in scale, connected to the distribution system, and close to load. Examples of different types of DERs include solar photovoltaic, wind, combined heat and power, energy storage, demand response, electric vehicles, microgrids, and energy efficiency. (NARUC, DER Rate Design and Compensation).

Hosting capacity analysis - Also called integration capacity analysis, it is used to establish a baseline of the maximum amount of DERs an existing distribution grid (feeder through substation) can accommodate safely and reliably without requiring infrastructure upgrades. (Grid Modernization Laboratory Consortium, State Engagement in Electric Distribution System Planning, 2017).

Non-wires alternatives - Non-traditional investments or market operations that may defer, mitigate, or eliminate the need for traditional transmission and distribution investments. (Grid Modernization Laboratory Consortium, State Engagement in Electric Distribution System Planning, 2017).

Microgrid - A group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected and island modes. (DOE, Modern Distribution Grid, Vol. IV).

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