



Federal Resilience Resources for State Energy Offices

The U.S. Department of Energy's Weatherization and Intergovernmental Programs Office in the Office of Energy Efficiency and Renewable Energy has established two lists of free and publicly available resources for state energy offices to utilize.¹

The **Resilience Guides, Frameworks and Toolkits** list consists of resources helpful for planning natural disaster hazard mitigation and improving overall resilience. These qualitative frameworks, toolkits, and roadmaps are intended to guide state energy resiliency planning activities when assessing the vulnerability and risk of hazards from natural disasters.

The **Energy Resilience Valuation Tools** list aggregates quantitative tools that can be used to help develop energy efficiency or renewable energy projects and achieve state resilience goals. These resources span a wide spectrum of project types, which range from building portfolios and energy infrastructure to system-wide application. Note that the Energy Resilience Valuation Tools is accompanied by the **Resilience Valuation Tools Table** (<https://www.energy.gov/eere/slsc/downloads/resilience-valuation-tools-table>). The table is available as an Excel file, which includes more detailed information about each quantitative tool. For example, the table categorizes technology types and which questions each tool is designed to answer for particular projects. These tools are meant to provide the data needed to fully implement state disaster mitigation and resilience plans.

All resources are available to the public and can help facilitate future investment in mitigation against natural disasters and build resilience projects for state energy offices and relevant stakeholders.

Resilience Guides, Frameworks and Toolkits

U.S. Department of Energy

Regional Vulnerabilities and Resilience Solutions

The **Regional Vulnerabilities and Resilience Solutions Report** (https://toolkit.climate.gov/sites/default/files/Regional_Climate_Vulnerabilities_and_Resilience_Solutions_0.pdf) examines the current and potential future impacts of climate change and extreme weather on the U.S. energy sector at the regional level. It provides illustrative examples of climate resilience interventions that have been taken and identifies potential opportunities and challenges to develop and deploy resilient energy technologies. This report also supports communities in their preparedness and resilience planning.



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Guide to Community Energy Strategic Planning

The **Guide to Community Energy Strategic Planning** (<https://www.nist.gov/topics/community-resilience/planning-guide>) is a 10-step guide on how to create a long-term blueprint to focus and guide efforts toward a defined energy vision. Initial energy successes in a government can be enhanced with this guide by moving single projects and programs to comprehensive, long-term energy strategy.

Climate Change and the Energy Sector: Guide for Climate Change Resilience Planning

The **Guide for Climate Change Resilience Planning** (https://toolkit.climate.gov/sites/default/files/Regional_Climate_Vulnerabilities_and_Resilience_Solutions_0.pdf) gives users an approach to resilience planning through the assessment of system vulnerabilities to extreme and fluctuating weather. Planners, decision makers, and utilities can create planning-level documents with specific actions in energy mitigation by completing key steps in the guide.

¹Note that this is not an exhaustive list and some federal agencies and laboratories may have other quantitative tools that are under development and may not be available at the time of this publication.



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Energy Transitions Initiative Islands Playbook

The **Islands Playbook** (<https://www.eere.energy.gov/islandsplaybook/>) is a guide for islands to successfully initiate, plan, and complete a transition to an energy system that primarily relies on local resources to eliminate a dependence on imported fuels. The guide includes templates and worksheets for planners to utilize and distribute as a way to invigorate constructive dialogue and actionable planning for the future of island(ed) communities' energy portfolios.

Argonne National Laboratory

State Energy Resilience Framework

The **State Energy Resilience Framework** (<https://www.energy.gov/sites/prod/files/2017/01/f34/State%20Energy%20Resilience%20Framework.pdf>) is a five-step process that enables state and local governments—in conjunction with energy utilities—to identify resilience concepts, challenges, and vulnerabilities so they can implement proven and cost-effective resilience enhancement options.

National Renewable Energy Laboratory

Resilience Roadmap

The **Resilience Roadmap** (<https://www.nrel.gov/resilience-planning-roadmap/>) is intended to provide a replicable process for federal, state, and local entities to effectively utilize for resilience planning. The intended intergovernmental and multijurisdictional approach can identify data sets, shared interdependencies, vulnerabilities, and strategies to address at a regional level. The Roadmap specifically highlights energy and water measures. The online tool has been designed to assist with convening stakeholders and contains worksheets and facilitation questions for planners. A detailed technical report is also available, which describes the process taken within the state of Colorado to create the Roadmap.

Power Sector Resilience Planning Guidebook

The **Power Sector Resilience Planning Guidebook** (<https://www.nrel.gov/docs/fy19osti/73489.pdf>) is an introduction to the key concepts and steps involved in developing resilience in the power sector for power sector investors, planners, and energy-sector stakeholders. Users can apply this knowledge to proactive planning and investment of power sector plans and processes to

increase power sector resilience. The Guidebook also includes activities and slideshows for information-sharing. While written for an international audience, the Guidebook can also be applied to a utility territory or state.

Environmental Protection Agency

Power Resilience Guide

The **Power Resilience Guide** (<https://www.epa.gov/communitywaterresilience/increase-power-resilience-your-water-utility>) provides water and wastewater utilities with information and strategies for strengthening relationships with their electricity providers and increasing their resilience to power outages.

National Institute of Standards and Technology

The Community Resilience Planning Guide

The **Community Resilience Planning Guide** (<https://www.nist.gov/topics/community-resilience/planning-guide>) provides a practical and comprehensive approach to resilience improvement by setting priorities and allocating resources to manage risks for prevailing hazards. Volume 1 of the Guide describes the six-step planning process and provides an illustrative example of the process. Volume II describes how to characterize the social and economic dimensions of the community, dependencies and cascading consequences, and building and infrastructure performance.



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Community Resilience Economic Decision Guide and EDGe\$ Online Tool

Designed to support community-level resilience planning, the powerful online **EDGe\$ Tool** (<https://edges.nist.gov/>) assists in selecting cost-effective community resilience projects. EDGe\$ provides a standard economic methodology for evaluating investment decisions required to improve the ability of communities to adapt to, withstand, and quickly recover from natural, technological, and human-caused disruptive events. The tool helps the user identify and compare the relevant present and future resilience costs and benefits associated with new capital investment, including consideration of co-benefits of resilience investments (e.g., economic, social co-benefits), versus maintaining a community's status quo.

National Oceanic and Atmospheric Administration

The U.S. Climate Resilience Toolkit

The U.S. Climate Resilience Toolkit (<https://toolkit.climate.gov/>) provides resources to identify climate risks and broad steps towards resilience. It contains risk assessment resources, diverse case studies, reports, state climate summaries, and climate data tools to benefit the development of a resilience plan. Sorted by topic, the energy sector page offers tailored information geared toward energy resilience. Energy sector information is supported with a story map ([Climate Information for Electric Utilities](https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=e94f511d57cb459195f85d68c3e742a9) (<https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=e94f511d57cb459195f85d68c3e742a9>)) and a database gallery (Energy Data Gallery (<https://toolkit.climate.gov/topics/energy/energy-data-gallery>)).

Energy Resilience Valuation Tools

U.S. Department of Energy

Distributed Generation (DG) for Resilience Planning Guide

The DG Guide for Resilience Planning (<https://dg.resiliencguide.lbl.gov/>) provides information on how DG can complement work toward meeting resilience goals and includes two assessment tools: (1) [CHP Site Screening Tool](https://dg.resiliencguide.lbl.gov/CHPScreener) (<https://dg.resiliencguide.lbl.gov/CHPScreener>) and (2) [Resilience Risk Evaluation Tool](https://dg.resiliencguide.lbl.gov/resilience-risk-evaluation-tool) (<https://dg.resiliencguide.lbl.gov/resilience-risk-evaluation-tool>). These assessment tools help users to determine where DG can be a good fit in resilience plans and critical infrastructure applications.

Energy Management Information Systems

EMIS (<https://betterbuildingssolutioncenter.energy.gov/toolkits/toolkit-implement-energy-management-information-systems-emis-your-building-portfolio>) is a broad family of technologies used to monitor energy use, identify efficiency opportunities, and set energy goals that can build resiliency. These technologies include, for example, interval meter analytics, visualization and reporting equipment-specific fault detection and diagnostics, benchmarking and utility bill tracking, and automated optimized control of building HVAC. They can enable site energy savings on the order of 5%–15%.



Red Hills Wind Farm Photo from NREL 16746



AES Lawai Solar Project- Kauai Photo by Dennis Schroeder / NREL 58020

SolarResilient™

The SolarResilient (<https://solarresilient.org/>) tool estimates the required rating and physical size of grid-connected photovoltaic (PV) and battery energy storage to provide power for extended periods during a large-scale grid power outage.

Technical Resilience Navigator (TRN)

The TRN (<https://trn.pnnl.gov/>) helps organizations manage the risk to critical missions from disruptions in energy and water services. It provides a systemic approach to identifying energy and water resiliency gaps and developing and prioritizing solutions that reduce that risk. The TRN enables organizations to be proactive in identifying and addressing vulnerabilities to their critical energy and water systems to reduce outage impacts and support continuous mission operation, which could result in cost and water reduction.

Lawrence Berkeley National Laboratory

Distributed Energy Resources Customer Adoption Model (DER-CAM)

DER-CAM (<https://gridintegration.lbl.gov/der-cam>) is a decision support tool for decentralized energy systems. The tool identifies the optimal portfolio, size, placement, and dispatch of a wide range of distributed energy resources (DERs) in buildings and microgrids. DER-CAM calculates investment options to minimize costs or CO₂ emissions. It helps facility managers assess how to best maintain power during grid outages through a variety of DERs.

Interruption Cost Estimate Calculator (ICE Calculator)

The ICE Calculator (<https://icecalculator.com/home>) is designed for electric reliability planners at utilities, government organizations, or other entities interested in estimating interruption costs and/or the benefits associated with reliability improvements.

National Renewable Energy Laboratory

Renewable Energy Integration and Optimization Model Subset (REopt Lite)

REopt Lite (<https://reopt.nrel.gov/tool>) helps commercial building managers evaluate the economic viability of grid-connected DERs, identify system sizes and battery dispatch strategies to minimize energy costs, and estimate how long a system can sustain critical load during a user-specified grid outage.

Sandia National Laboratories

Energy Storage Optimization Tool (QuEST)

QuEST (<https://www.sandia.gov/ess-ssl/tools/quest/>) is an open-source software application suite for energy storage valuation developed in Python. Current capabilities include estimating revenue potential for energy storage via value stacking in electricity markets, estimating cost savings for time-of-use customers using behind-the-meter energy storage, and obtaining publicly available data like electricity prices and utility rate structures.

Microgrid Design Tool (MDT)

The MDT (<https://www.energy.gov/oe/services/technology-development/smart-grid/role-microgrids-helping-advancement-s-energy-syst-0>) is a decision-support tool that aids microgrid planners and designers in quantitative analysis to meet objectives and constraints for efficiency, cost, reliability, and environmental emissions.

Environmental Protection Agency (EPA)

ENERGY STAR® Portfolio Manager

ENERGY STAR Portfolio Manager (<https://www.energystar.gov/buildings?testEnv=false>) is an online energy management tool that can be used to benchmark and track the energy and water use of any commercial building. When designing new buildings, users can also set an energy use target and see how estimated energy use stacks up against similar existing buildings nationwide. Buildings that use less energy and water require less power to maintain operations during an emergency.

Federal Emergency Management Agency (FEMA)

Benefit Cost Analysis (BCA)

The BCA (<https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis>) calculates the cost-effectiveness of a specified site or project through a benefit cost ratio, which compares hazard mitigation benefits and project costs. The BCA Toolkit consists of modules for a range of major natural hazards, such as floods and earthquakes, and project types, such as hurricane-safe rooms. FEMA requires that a BCA be conducted before it will award any type of FEMA hazard mitigation funding.



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Hazus

FEMA's Hazus Program (<https://www.fema.gov/flood-maps/tools-resources/flood-map-products/hazus#>) provides nationally applicable, standardized data and methods for estimating impacts from earthquakes, floods, hurricanes, and tsunamis. Hazus leverages multidisciplinary expertise in hazard measurement, structural engineering, and planning to generate actionable risk information that helps increase community resilience across the United States. Hazus risk modeling software is distributed as a GIS-based desktop application and has a growing collection of simplified open-source tools. Hazus relies on a detailed publicly available nationwide database of exposure information maintained for every state and U.S. territory.

Federal Transit Administration (FTA)

Hazard Mitigation Cost Effectiveness Tool

The Hazard Mitigation Cost Effectiveness Tool (<https://www.transit.dot.gov/funding/grant-programs/emergency-relief-program/hazard-mitigation-cost-effectiveness-hmce-tool>) provides transit agencies and planners a specific benefit-cost analysis for resilience projects designed to address vulnerabilities in public transportation systems due to emergencies or major disasters. ■

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U.S. DEPARTMENT OF
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& RENEWABLE ENERGY**

For more information, visit:

energy.gov/eere/slsc/resilience-public-sector

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