



Photo by Werner Slocum, NREL 64396

Data and Tools for Energy Planning and Analysis

The National Renewable Energy Laboratory (NREL) creates widely used data and tools to facilitate energy system planning and analysis. These software tools have been developed for complex research problems and perfected over real-world applications and laboratory validations. Some tools are web-based data explorers, others are open source software, and all are rigorously designed to empower decision-makers with accurate and accessible information. This software selection shows how NREL resources can help stakeholders achieve a clean, just, and resilient energy transformation.

Web Tools for Energy Planning and Analysis

These interactive tools help users visualize and understand energy system analysis in a variety of applications. They are all free and accessible at www.nrel.gov.

The **Customer Damage Function (CDF) Calculator** is used to estimate costs resulting from grid outages at a facility. It is the first step for facility owners to determine the value of resilience investments and enhanced energy security.

NREL's **Standard Scenarios** capture a range of possible futures for the U.S. power sector to support and inform energy analysis. NREL's **Scenario Viewer** presents the results of these scenarios, as well as detailed emissions, costs, and operational metrics for select scenarios modeled with **Cambium**. The technology cost and performance input data are available online through NREL's **Annual Technology Baseline**.

REopt® (Renewable Energy Integration & Optimization) identifies the optimal sizing and dispatch of on-site energy technologies for users to meet cost-savings, resilience, and emissions reductions goals. The tool is used to evaluate the economic viability of distributed energy and storage, compare system designs, and estimate outage survivability.

ResStock™ and ComStock™ model energy use in the residential and commercial building stock. These tools can represent when, where, and how energy is being used. They can be used to estimate the impacts of energy efficiency and electrification and identify demand-side opportunities in the building stock.

The **State and Local Planning for Energy (SLOPE)** Platform is an online platform to support data-driven state and local energy and decarbonization planning. SLOPE includes a Scenario Planner that compares scenarios for the future of energy, costs, and emissions, as well as a Data Viewer that explores city, county, and state data on renewables, efficiency, and transportation.





Photo by Josh Bauer, NREL 54938

Software Applications for Energy Planning and Analysis

dGen™ (Distributed Generation Market Demand Model) simulates customer adoption of distributed energy resources through 2050. It has been used by dozens of cities, utilities, and energy system planners to predict growth in distributed energy with high spatial detail.

The **EVI-X Modeling Suite of Electric Vehicle Charging Infrastructure** allows users to identify ideal charging station sites and optimize charging with the electric grid. The suite includes tools to optimize infrastructure for equity investments, ride-hailing services, fleet electrification, and more.

DISCO (Distribution Integration Solution Cost Options) conducts static and dynamic hosting capacity analysis using automated distribution system upgrades and non-wires alternatives. DISCO's scalable and repeatable analyses help utilities understand the impacts of distributed energy resources and electrification on distribution systems.

The **SIIP (Scalable Integrated Infrastructure Planning)** platform provides open-source capabilities for large infrastructure systems modeling. In power systems, SIIP enables optimal unit commitment and dispatch, production cost modeling, load flow, and transient stability analysis.

ReEDS™ (Regional Energy Deployment System) simulates the evolution of the bulk power system through 2050 or beyond, producing cost-optimized scenarios for the capacity and operation of generation, transmission, and energy storage resources.

SAM (System Advisor Model) models financial and technological possibilities for renewable energy buildout. It allows project managers and policy analysts to determine least-cost deployments given economic and regulatory constraints.

PRECISE™ (PREconfiguring and Controlling Inverter SEt-points) automatically determines the optimal inverter settings for grid integration on any distribution system, saving utilities time and ensuring safe deployment of devices such as solar panels and batteries.

Learn the Latest About Energy System Tools and Research

Interested in using these tools and others for energy system planning and analysis? Visit www.nrel.gov/research/data-tools.html for more information on these tools, and get up-to-date information about the latest grid and systems integration research at www.nrel.gov/esif/esif-newsletter.html.