



Working Toward an Equitable Energy Future

For decades, the National Renewable Energy Laboratory (NREL) has been a leader in applied clean energy research. Having worked with thousands of communities and organizations—in the United States and around the world—NREL knows equitable energy systems are defined and driven by the people who live and work within them.

Uninterrupted access to energy is, for many people, an issue of life or death. For most, it is essential to quality of life. Because NREL’s vision is a clean energy future for the world, we focus on developing and delivering solutions that enable all people to participate in and benefit from the transition to sustainable energy.

We accelerate the clean energy transition broadly, prioritizing equitable distribution of social, economic, and health benefits and burdens across all segments of society. NREL places energy equity at the center of our mission-driven work by:

- Integrating diversity and equity throughout the innovation process to develop technologies and tools that make community-driven energy transitions possible
- Working with historically marginalized communities and other partners to address energy challenges and identify, evaluate, and implement solutions
- Analyzing the benefits and burdens of various energy transition pathways and the extent to which they accrue broadly and equitably
- Validating community-prioritized energy solutions in at-scale simulations to demonstrate impacts before implementation.

In-Depth Engagement Yields Codeveloped Solutions

Community access and participation are foundational to a just energy transition. NREL begins with engagement, incorporates feedback throughout the process, and responds to communities’ needs as conditions and priorities change over time. Our interdisciplinary approach combines behavioral science with analysis, engineering, and technical assistance to extend the reach and impact of investments and benefits at the individual, community, and societal levels. Examples include:

Columbus, Ohio: The city conferred with NREL to find mobility options that would spur economic growth, improve quality of life, and decrease the city’s carbon footprint. NREL identified a range of solutions, with a focus on underserved populations. The availability of on-demand transportation services increased the consistency of preventive healthcare visits, and enabled the delivery of more than 130,000 meals by self-driving shuttles, as well as the opening of access to 20,000 more jobs in the city via new transit hubs.

Los Angeles, California: In support of the city’s target of reliable, 100% renewable energy by 2035, NREL provided rigorous, integrated engineering-economic analysis to inform decisions on the path to economic growth, energy security, and clean electricity resources. The ensuing LA100 Equity Strategies project focuses on distributing the benefits and burdens of the energy transition equitably through procedural, distributional, and recognition justice.

Puerto Rico: Following Hurricanes Irma and Maria, NREL was called to help restore the region’s devastated infrastructure

and grid. NREL's approach—first engaging stakeholders to discuss varied and sometimes competing priorities—connected what was physically possible to what was practically acceptable and accessible to people on the ground.

Rural Transportation: In smaller communities and rural areas, cars are often the only transportation option to access healthcare, employment, education, or food services—which can be especially challenging for low-income, aging, or disabled individuals. By analyzing regional travel patterns and priorities, NREL is creating new transportation options with Bastrop, Texas; Greene County, Pennsylvania; Hood River, Oregon; the Appalachian region of Ohio; and California's Kern and Tulare counties.

Unalakleet, Alaska: Many homes in this remote Arctic village are drafty and mold-infested, but building new ones is prohibitively expensive. Housing shortages, overcrowding, upper respiratory disease, and energy costs nearly four times the national average force elders and young families to move away, fraying the fabric of this primarily indigenous community. Through in-depth engagement, NREL codeveloped an affordable, healthy, energy-efficient semimodular home that meets villagers' needs while reflecting Inupiaq culture and environment.

Equity-Focused Resources

Accurate, detailed data lead to more inclusive, better-informed decision-making about energy policy and projects. Many of NREL's tools are free, publicly accessible, and complemented by user guides. Examples include:

Distributed Generation Market Demand (dGen™): This model uses a unique bottom-up, agent-based approach to simulate customer decisions about adopting and using solar, wind, and storage technologies for residential and commercial entities in the United States through 2050. dGen helped identify why [underserved California communities](#) have lower rates of solar energy deployment.

Student Training in Applied Research (STAR): Intent on building a diverse clean energy workforce, NREL offers engineering and applied science students at historically Black colleges and universities, Hispanic serving institutions, and American Indian and Alaska Native serving institutions the opportunity to join a fully funded NREL internship called STAR. Interns will work alongside NREL researchers during the summer and continue with a faculty mentor the following academic year. Graduates can apply for a full-time, paid internship at NREL.

Global Toolkits: NREL partners with the U.S. Agency for International Development to help countries with energy policy, planning, and deployment support. Free toolkits address common and critical challenges countries face when scaling up energy systems, like equitable distribution, resilience, safety, and economic impacts.

Low-Income Energy Affordability Data (LEAD): This tool compares geographic concentrations of household energy burden—the percentage of household income spent on energy. Using the LEAD tool, [Rochester, New York](#), discovered low-income households were in renter-occupied, older (and likely less-efficient) homes, pointing planners to energy-saving measures for poverty alleviation.

Mobility Energy Productivity (MEP): This tool can be used to quantify how easily individuals can use different modes of transportation to access goods, services, employment opportunities, and other activities while accounting for time, cost, and energy. Such an innovative approach to characterize and inform the movement of people—as well as identify mobility inequality among sociodemographic groups—has the potential to create more livable communities with affordable and accessible transportation choices that create economic opportunities. [Read more and view visual mapping](#) of MEP scores in the Columbus, Chicago, and San Francisco areas.

State and Local Planning for Energy (SLOPE): The SLOPE platform illuminated options in [Milwaukee, Wisconsin](#), focused on reducing greenhouse gases and mitigating racial and economic inequity through “green” jobs. City officials noted the value of SLOPE's data for areas that had previously been represented by assumptions or estimates.

Tribal Energy Atlas: This first-of-its-kind interactive geospatial application allows [tribal energy project](#) planners, technicians, and investors to conduct analyses of installed energy projects and resource potential on tribal lands.

Transforming Energy for All

Diverse communities benefit from NREL's understanding of how the complex dynamics of energy transition planning and implementation impact energy equity.

To learn more, visit <https://www.nrel.gov/about/energy-justice.html> and contact:

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