Energy to Communities (E2C)

Annual Highlights 2024

The Energy to Communities (E2C) program connects local governments, Tribes, electric utilities, and community-based organizations with national laboratory experts using customized, cutting-edge analysis to achieve energy systems that are reflective of local and regional priorities.

The program is funded by the U.S. Department of Energy (DOE), managed by the National Renewable Energy Laboratory (NREL) (nrel.gov), and delivered in collaboration with Argonne National Laboratory (ANL) (anl.gov), Lawrence Berkeley National Laboratory (LBNL) (lbl.gov), Oak Ridge National Laboratory (ORNL) (ornl.gov), and Pacific Northwest National Laboratory (PNNL) (pnnl.gov).

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Program Overview

E2C provides communities with expertise and tools to achieve their energy goals through three distinct program offerings: expert match, peer-learning cohorts, and in-depth partnerships.

Expert Match

Expert match provides community stakeholders who have decision-making power or influence in their community with access to short-term, no-cost technical assistance to answer pressing energy-related questions. In 2024, expert match supported 103 organizations.

Technical assistance spans ~3 months
103 participants in 2024

Peer-Learning Cohorts

Peer-learning cohorts convene up to 15 participants per cohort for approximately 6 months to regularly exchange strategies and best practices, learn in a collaborative environment, and workshop plans to overcome challenges around a common energy topic. In 2024, peer-learning cohorts supported 90 organizations.

Each cohort spans ~6 months
90 participants in 2024

In-Depth Partnerships

In-depth partnerships are multiyear efforts made up of teams (local government, community-based organizations, and electric utilities) that work alongside national lab staff to apply robust modeling and analysis tools and simulate hardware in real-world conditions to evaluate and validate potential scenarios and strategies before full technology deployment. In 2024, E2C continued six in-depth partnerships and started three new in-depth partnerships.

Technical assistance spans ~3 years
9 participants in 2024

Throughout each program offering, E2C provides innovative solutions to local energy challenges and opportunities, and to accelerate decision-making in other communities by amplifying lessons learned and distributing tools and resources.

In 2024, E2C provided customized technical assistance to more than 200 organizations across the country on topics within four categories: energy generation and grid, transportation, buildings, and reliability and recovery.

In 2024...

- E2C **created cross-sector modeling capabilities**, such as the integration of high-fidelity transportation and grid models from Argonne National Laboratory and Oak Ridge National Laboratory.
- E2C **leveraged in-depth partnership capabilities**, such as microgrid validation, to inform the development of a peer-learning cohort about microgrids and to support expert match communities.
- E2C **facilitated connections to other DOE technical assistance programs**, primarily programs supported by DOE's Building Technologies Office and the Energy Efficiency and Conservation Block Grant Program.

All of the projects supported by the E2C program provide **valuable data, new strategies, and lessons learned** that enable more informed decision-making to happen faster and in many more communities throughout the country.

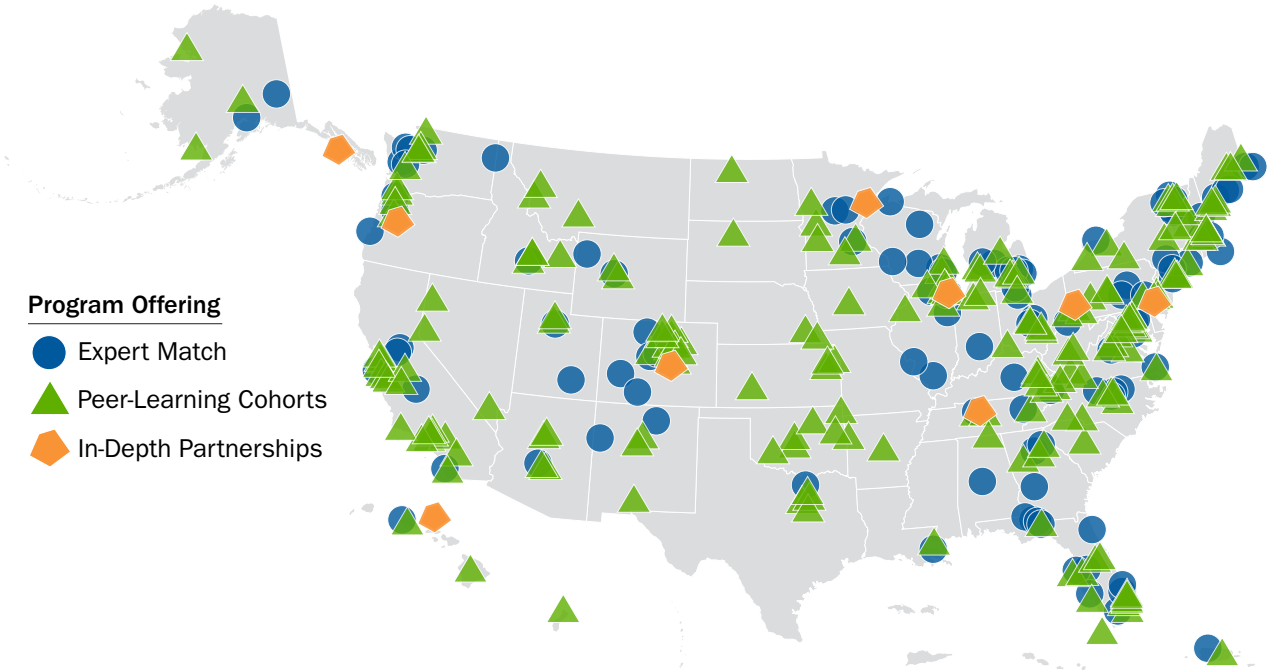


Figure 1. E2C's three program offerings supported more than 200 organizations in 2024.

Expert Match

Expert match provides short-term, no-cost technical assistance to answer near-term energy questions. In 2024, researchers at NREL, PNNL, ANL, ORNL, and LBNL responded to questions from 103 applicants representing communities from 38 states, 3 Tribes, and 1 territory. Applicants sought support with the following topics: buildings, power generation, reliability and recovery, jobs and economic development, and mobility.

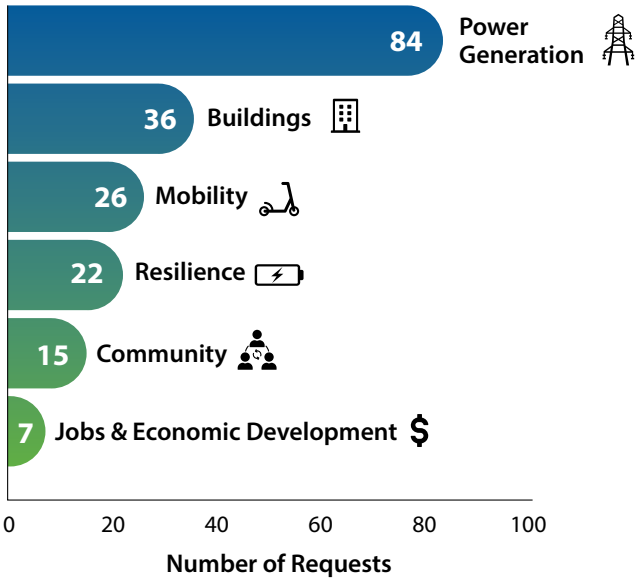
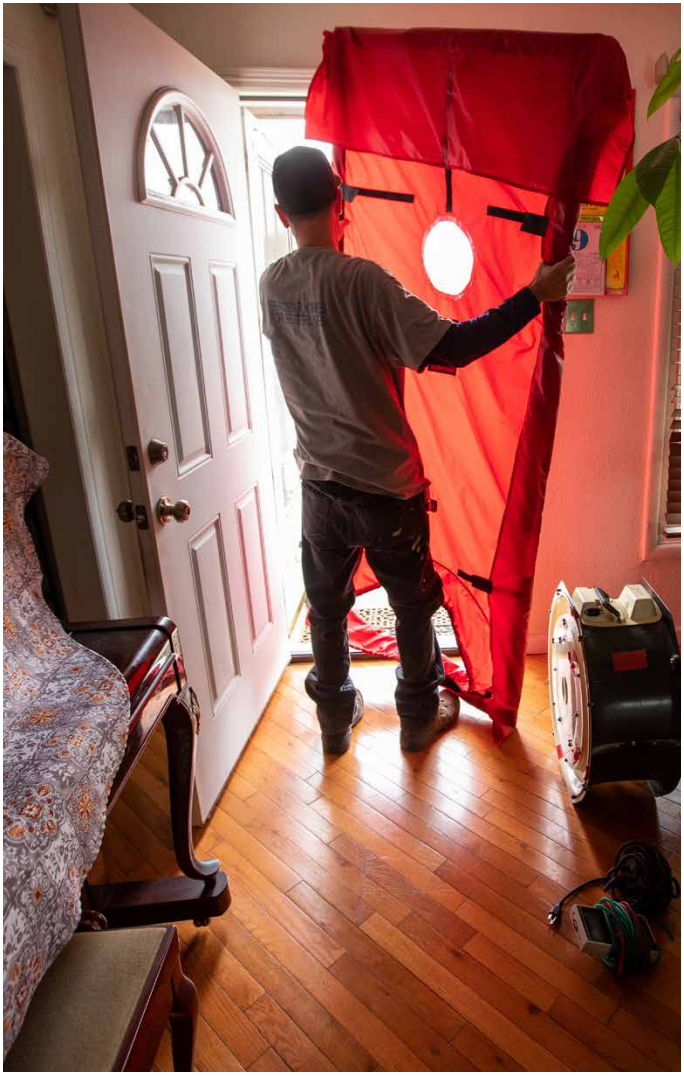


Figure 2. Power generation was the most requested topic among 103 expert match applicants in 2024.



A technician prepares a door frame for blower door testing to locate air leaks. *Photo by Werner Slocum, NREL 72254*

SUCCESS STORIES

Mobile Homes and Municipalities Find Heat Pumps to Fit Their Needs

Tranquility Estates, a mobile-home community in Raymond, New Hampshire, and Rockland, Maine, a popular tourist destination for its natural coastal beauty, each participated in expert match to explore heat pump system options for their buildings. DOE's Building Technologies Research and Integration Center at ORNL was used to conduct simulations and cost-benefit analyses, providing communities with information on the impacts of switching to geothermal energy.

The proposed air-source heat pump solution for the Flanagan Community Center in Rockland, Maine, has the potential to save 42% in energy cost. *Photo from Jenny Carter, City of Rockland*

Two Communities Find Electric Vehicle Options That Meet Local Goals

When the Board of Commissioners for Washtenaw County, Michigan, approved a climate action plan in 2022, the county was uncertain what implementation steps it needed to take—and how to pay for all of it. Expert match researchers at Argonne National Laboratory analyzed various options for Washtenaw to meet its goals by incorporating electric vehicles into the county's fleet. The researchers used TechScape, a techno-economic tool developed by Argonne, to quantify the benefits of available electric, hybrid, and plug-in hybrid vehicles in terms of total cost of ownership, emissions, and energy savings—with and without available Inflation Reduction Act tax incentives.

City of New Haven employees learn more about electric mobility options. *Photo from Paul Wessel, Clean Transportation Communities of Southern CT*

NEW DECISION-MAKING RESOURCES

Agrivoltaics 101 Resources Provide a Guide Toward Implementation

Among the 192 applicants served by expert match since the program started in 2023, 23 asked for support exploring and understanding opportunities related to agrivoltaics. Agrivoltaics allow for the dual use of land through the deployment of on-farm solar while maintaining land underneath and/or in between solar panels for agricultural production.

The practice can integrate crop production and livestock grazing, among other activities. Based on lessons learned from those projects, NREL researchers prepared a series of five "Agrivoltaics 101" fact sheets to help communities plan for agrivoltaic projects.

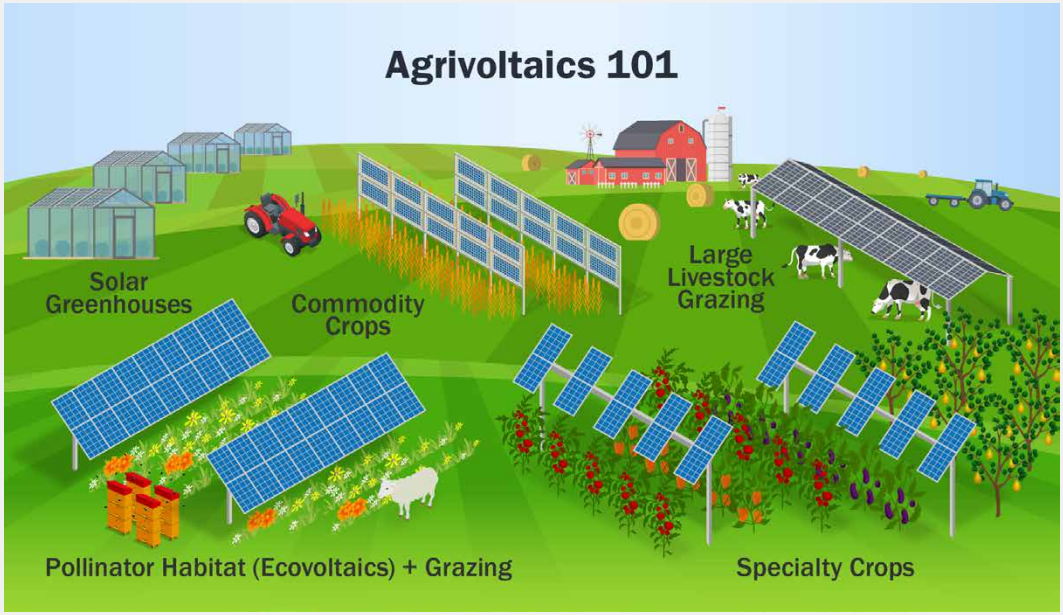


Figure 3. An excerpt from the "Agrivoltaics Basics" fact sheet. *Illustration by Tom Hickey and Al Hicks, NREL*

Find more resources from E2C expert match at **nrel.gov/E2C/expertmatch**.

Peer-Learning Cohorts

Peer-learning cohorts are multi-community engagements that convene up to fifteen participants regularly for approximately 6 months to exchange strategies and best practices, learn in a collaborative environment, and workshop plans and strategies to overcome challenges around a common energy topic.

In 2024, E2C ran six peer-learning cohorts, supporting a total of 90 participants from 36 states and territories. E2C's peer-learning cohort topics range from introductory content for communities that are just exploring energy options, to more focused content that may explore financing, procurement, or community engagement.

Peer-learning cohorts connect representatives from organizations across the country to exchange lessons learned and best practices for addressing shared energy challenges. *Photo by Joe DelNero, NREL 85705*

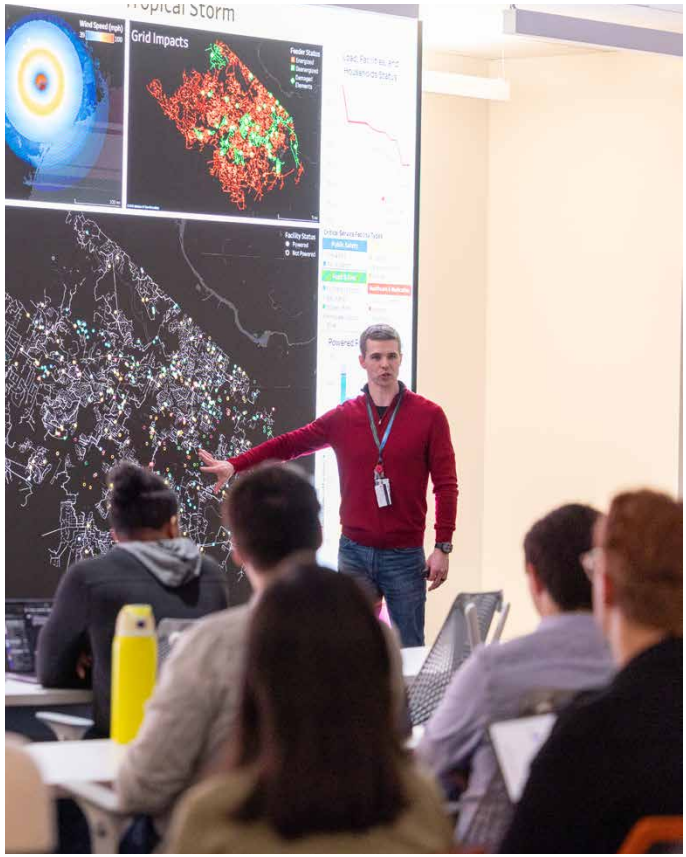
Implementation Partners

World Resources Institute

World Resources Institute (WRI) is a thought partner on E2C peer-learning cohorts and provides implementation support that enables the program to reach more communities more effectively. WRI collaborates with the E2C team to shape energy content that is reflective of regional and local priorities and incorporates NREL expertise and tools while remaining nimble and responsive as participant needs evolve. Learn more about WRI at WRI.org.

Clean Cities and Communities

The Clean Cities and Communities coalitions support E2C's peer-learning cohorts that focus on transportation topics by providing local context, relationships, and additional technical support. For example, staff from Milwaukee County, Wisconsin, applied to participate in a **E2C peer-learning cohort** (nrel.gov/state-local-tribal/e2c-peer-learning-cohorts) to develop an electric vehicle infrastructure plan, and their local Clean Cities and Communities coalition, Wisconsin Clean Cities, later helped facilitate connections between county offices, align transportation goals, and break down silos to accelerate transportation deployment. Learn more about the Milwaukee County partnership at the Clean Cities and Communities program at **cleancities.energy.gov/news/28630**.



Experts in a range of energy topics provide cohort participants with case studies, analysis and modeling tools, and training materials to accelerate energy progress. *Photo by Gregory Cooper, NREL 97276*

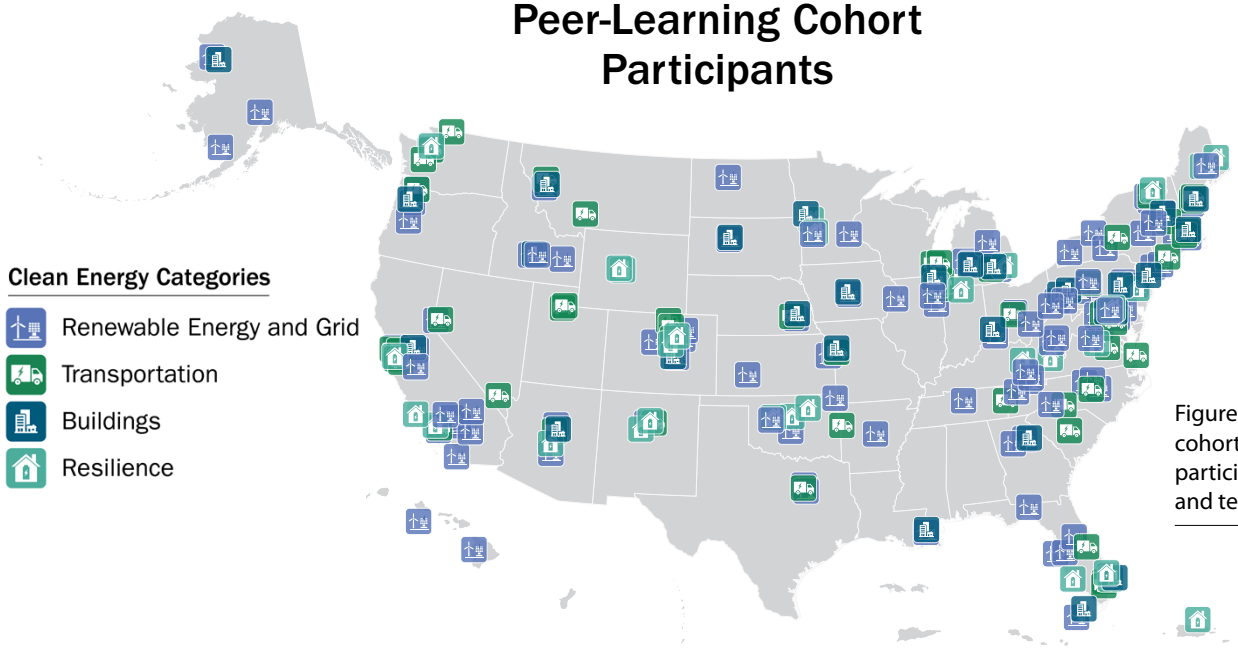


Figure 4. Peer-learning cohorts supported 90 participants from 36 states and territories in 2024.

Cohort timelines and topics

January-June 2024

- Integrating Community Priorities into Electric Vehicle Plans and Projects
- Evaluating and Prioritizing Municipal Buildings for Energy Efficiency and Decarbonization Investment
- Enhancing Resilience at Critical Municipal Facilities Through Solar, Storage, and Microgrids

July-December 2024

- Implementing an Agrivoltaics Project
- Charting a Path to Municipal Fleet Electrification
- Designing and Enhancing Energy Efficiency Programs for Residential Buildings

Announced in December 2024

- Expanding Capacity for Distributed Wind in Rural and Agricultural Communities
- Planning for Microgrids to Increase Energy Resilience
- Renewable Energy and Energy Efficiency Technologies in Appalachia

SUCCESS STORIES

Peer Learning Helps San Diego Center Community Voices in Clean Energy Plans

Many community organizations and local governments cannot afford to pay a consultant for tailored insights on their energy projects. But E2C's peer-learning cohorts offer access to valuable input from peers and researchers. Over the course of 6 months, Samaya Elder, a regional planner for the San Diego Association of Governments, met regularly with fellow planners from across the country in a collaborative, virtual environment. Everyone faced a challenge related to community engagement in energy planning and development—but they also had concrete examples of best practices and lessons learned to share. When the cohort concluded, Elder walked away with an outreach and engagement strategy informed by real-world experiences and researcher data. "The cohort opened doors to new ways of community engagement for us," said Elder.

Insights from peer-learning cohorts helped the San Diego Association of Governments (SANDAG) host workshops to draft their Priority Climate Action Plan. *Photos from SANDAG*

Reading, Pennsylvania, Finds Value of Energy Savings Performance Contracts

Reading, Pennsylvania, found guidance during a E2C peer-learning cohort that informed a strategy to leverage an energy savings performance contract (ESPC) to save hundreds of thousands of dollars annually on energy costs. The contract enabled Reading to begin construction on a 1.78-megawatt rooftop and parking lot solar installation, marking a significant step toward its goal of achieving 100% renewable energy. Reading's Sustainability Manager Bethany Ayers-Fisher said, "At the beginning of the cohort, the ESPC felt like a pipe dream. And now we see, yes, we can do this."

Shown at the Reading Public Works building are (left to right) Bethany Ayers-Fisher (sustainability manager, City of Reading), Matthew Wardecker (account executive, Schneider Electric), Dan Verna (project development manager, Schneider Electric), and English Bradley (Mayor Eddie Morán's chief of staff, City of Reading). *Photo from the City of Reading*

Find more resources from E2C peer-learning cohorts at **nrel.gov/E2C/cohorts**.

In-Depth Partnerships

In-depth partnerships are multiyear partnerships made up of teams (local government, community-based organizations, and electric utilities) that work alongside national lab staff to apply robust modeling and analysis tools and validate hardware in real-world conditions to evaluate potential scenarios and strategies before full technology deployment.

Managed by NREL, with support from ANL, LBNL, ORNL, and PNNL, teams evaluate potential energy scenarios by applying robust modeling, analysis, and validation to reduce implementation risks.

In 2024, E2C continued six in-depth partnerships from Round 1, and started three new in-depth partnerships for Round 2.

In-person summit

In August 2024, E2C held its first in-person summit, inviting representatives from each Round 1 in-depth partnership to visit NREL in Golden, Colorado, to share progress updates and learn from laboratory experts and each other.

Attendees of the E2C in-depth partnerships summit pose in front of a wind turbine blade at NREL's Flatirons Campus. *Photo by Joe DelNero, NREL 92674*

Ongoing In-Depth Partnerships

Chicago, Illinois

The Chicago Metropolitan Agency for Planning, Commonwealth Edison, and Respiratory Health Association are leveraging technical expertise from ANL and ORNL to evaluate regional transportation design pathways. Laboratory tools factor in electricity demands and forecast demand for transportation-related needs that will be evaluated using stakeholder-defined evaluation criteria. These improved tools will help the region better understand opportunities and challenges from implementing evolving transportation technologies—including passenger and freight travel electrification and energy-efficient mobility options—while also assessing cross-sectoral interactions with the grid. Preliminary scenarios on full electrification and mileage-based tolling have been presented to the stakeholders both as a demonstration of capabilities, as well as a foundation for the upcoming scenario run in 2025.

Colorado Springs, Colorado

Colorado Springs Utilities, the City of Colorado Springs, Energy Resource Center, the Housing & Building Association of Colorado Springs, Careers in Construction Colorado, and the University of Colorado-Colorado Springs seek to validate concepts that aggregate power across complex energy systems. This project will include planning, design, and operational validation of an advanced grid controls system for the MESA-Tollefson water treatment site in Colorado Springs. The project will leverage the combined capabilities between NREL's Advanced Research on Integrated Energy Systems (ARIES) and LBNL's Facility for Low Energy Experiment in Buildings (FLEXLAB®) platforms to validate operational scenarios. These laboratory platforms can evaluate real-world situations for the MESA-Tollefson site that will allow Colorado Springs Utilities to decide and demonstrate proposed strategies to garner stakeholder support. Further, ARIES and FLEXLAB will be linked together to evaluate solutions in real time. The ARIES emulation and validation capabilities cover a broad range of energy generation technologies and grid modernization scenarios. FLEXLAB can be used to evaluate reliability and recovery when building systems are responding to grid conditions under advanced grid controls. In 2024, the project team held working sessions at the NREL campus to refine the scope of this engagement that led to a kickoff in Colorado Springs with over 50 participants and community organizations.

Delaware Valley, Pennsylvania

The Delaware Valley Regional Planning Commission is leading a community team made up of members of local governments (Bucks County, Chester County, Delaware County, and Montgomery County), community-based organizations (the Smart Energy Initiative of Southeastern Pennsylvania, Community Action Agency of Delaware County, Community Action Development Commission of Montgomery County, Bucks County Opportunity Council, and the Energy Coordinating Agency), the primary investor-owned utility serving this

geographic area (Philadelphia Energy Company). The project team is developing a program model that improves coordination and efficiency of regional energy projects using a hub for shared administrative, project management, and technical coordination, thus replicating a shared community manager program at scale. The project will provide innovative solutions in the areas of program administration, supply chain, governance, and administrative hurdles currently limiting regional decarbonization. The hub concept aims to reduce household electricity costs and increase reliability by coordinating and properly accounting for the benefits of retrofitting single-family residential buildings, and adding solar photovoltaics, electric vehicle charging, and battery energy storage. This will provide many of the same services that the Philadelphia Energy Authority provides for Philadelphia and apply those lessons to the 238 municipalities in the surrounding region. The laboratory team of NREL, ORNL, and LBNL have created new multilab capabilities to identify panel upgrade requirements for homes undergoing deep electrification. Additionally, several new ResStock™ innovations are being developed. Specifically, the labs are improving residential building modeling to ensure they accommodate custom utility rates for individuals, handle localized costs, improve the scalability and automation of the model, and factor in additional expert input.

Moloka'i, Hawaii

Shake Energy Collaborative, Moloka'i Clean Energy Hui, Ho'āhu Energy Cooperative, the Hawai'i State Energy Office, and Hawaiian Electric have conducted assessments of community-defined energy system configurations to validate a portfolio of renewable energy generation projects that meet Moloka'i's electricity needs while supporting community values. Using ARIES capabilities, NREL ran over 300 grid configuration scenarios, identifying and communicating potential project risks and costs to the community partners to help them narrow down a set of projects that are both technically feasible and best aligned with community priorities.

Pittsburgh, Pennsylvania

Green Building Alliance, the City of Pittsburgh, Pittsburgh's Department of City Planning, and Duquesne Light Company plan to develop and evaluate integrated distribution planning processes to help build an affordable electricity system that aligns with evolving customer needs. The community partners held a kickoff meeting and subsequently convene on a regular basis to focus the scope of this project, coordinate their efforts, and obtain support from the partner laboratories. In addition, Green Building Alliance has hired and begun working with a subcontractor to support ongoing community outreach with informational interviews that will be both qualitative and quantitative to inform the selection of a candidate neighborhood and understand community goals. The laboratories selected communities by implementing a data-driven approach that collects and analyzes data across multiple domains (e.g., building, grid, environmental, socioeconomic, etc.) to strategically prioritize neighborhoods based on

the project needs. The laboratories have completed an agreement with Duquesne Light Company to access data and have begun working on grid distribution model analysis which will factor into upcoming buildings models. Through 2026, the project team will engage with select neighborhoods in Pittsburgh, identify metrics that guide planning, evaluate existing building stocks, characterize and model the distribution system, develop load forecasting capabilities, and explore distribution investment strategies. This will culminate with the laboratory team of NREL, ORNL, LBNL completing an assessment of assets, including both traditional solutions and non-traditional grid solutions, such as appliances, buildings, heat pumps, energy storage, electric vehicle chargers, and other distributed energy resources that can work together to meet both grid and community needs throughout the city and surrounding areas.

Sitka, Alaska

The City and Borough of Sitka, City and Borough of Sitka Electric Department, Sitka Conversation Society, and the Sitka Sound Science Center are working to optimize their existing hydropower generation based on flow, snowpack, meteorological data, and electricity demand. The team will also use best-in-class laboratory capabilities at PNNL and NREL to improve grid resiliency by assessing hazards, investigating current loads on a vulnerable branch, and evaluating workforce capacity for current and future required projects and upkeep. In 2024, the labs completed kickoff meetings with the city and utility members and prepared memos on

Figure 5. E2C continued six in-depth partnerships and started three new in-depth partnerships in 2024.

the options and opportunities for hydropower optimization and microgrid assessment to help refine the scope of work for this engagement. Once agreements were in place, PNNL began Hazard and Vulnerability Assessments, hydropower modeling of existing data sets, an economic analysis of similar cruise ports, and drafting an upcoming workforce survey. NREL is using the utility data to complete a microgrid assessment to evaluate how the utility can best power cruise ships while they are at port.

Round 2 In-Depth Partnerships

In October 2024, DOE announced three new in-depth partnerships.

Northeastern Minnesota

Minnesota is the nation's largest producer of iron ore used for steel production. Iron Range and Duluth-based entities including Ecolibrium3, Midwest Industrial Transformation Initiative, and Itasca Economic Development Corporation, with support from the local utilities, will work with experts at DOE labs to assess the feasibility of revitalizing Minnesota's iron range to support an advanced iron and steel industry and supply chain. This analysis will include economic and technical feasibility of advancing the iron and steel industry, focusing on expanded regional workforce needs, the identification of potentially needed infrastructure, preservation of natural resources. Additional activities will take place to engage local communities, including Tribes, on relevant industrial research opportunities.

Lane County, Oregon

In recent years, Lane County, Oregon, has experienced wildfires, heat waves, and severe storms that strain the electric grid and have caused extended customer power outages. Lane County, the Springfield Utility Board, Emerald People's Utility District, and The Center for Rural Livelihoods will work with DOE lab experts to investigate and evaluate distributed energy resources and adopt upgrades to grid technologies and strategies to improve the reliability and recovery of electricity services.

Nashville, Tennessee

Nashville is among the fastest growing metropolitan areas in the nation, putting strain on its aging energy infrastructure. Nashville Electric Service, the Metropolitan Government of Nashville & Davidson County, Middle-West Tennessee Clean Fuels, and Urban League of Middle Tennessee will receive support to develop an integrated transportation and energy roadmap to achieve metro-wide energy goals and Tennessee Valley Authority's commitment to deliver affordable and reliable power.

Learn more about E2C in-depth partnerships at **nrel.gov/E2C/indepth**.

Moving Forward

In 2024, DOE and the five supporting national laboratories made significant progress expanding E2C technical assistance to more than 300 communities throughout the country.

Gap Region Outreach Project

E2C identified geographic gaps in its technical assistance participants through the Gap Region Outreach Project. This effort revealed barriers to community participation and opportunities for future engagement in four regions: the Gulf South, Appalachia, the Midwest, and the Northern Plains.

NREL engaged 143 individuals from 115 unique organizations (60 community-based organizations and 55 government agencies) in the four priority regions. These participants were evenly distributed across the four regions. All were new to E2C and 40% had never applied for a federal energy grant, prize, or technical assistance program. ORNL collaborated with NREL on the Gulf South and Appalachia efforts.

The greatest identified barrier to engagement with federal opportunities like E2C was capacity. The specific capacity limitations detailed by Gap Region Outreach Project participants were wide-ranging and were systematized into six categories: lack of staff, insufficient funding, limited time, misaligned mission, cumbersome application requirements, and lack of topical skills and knowledge.

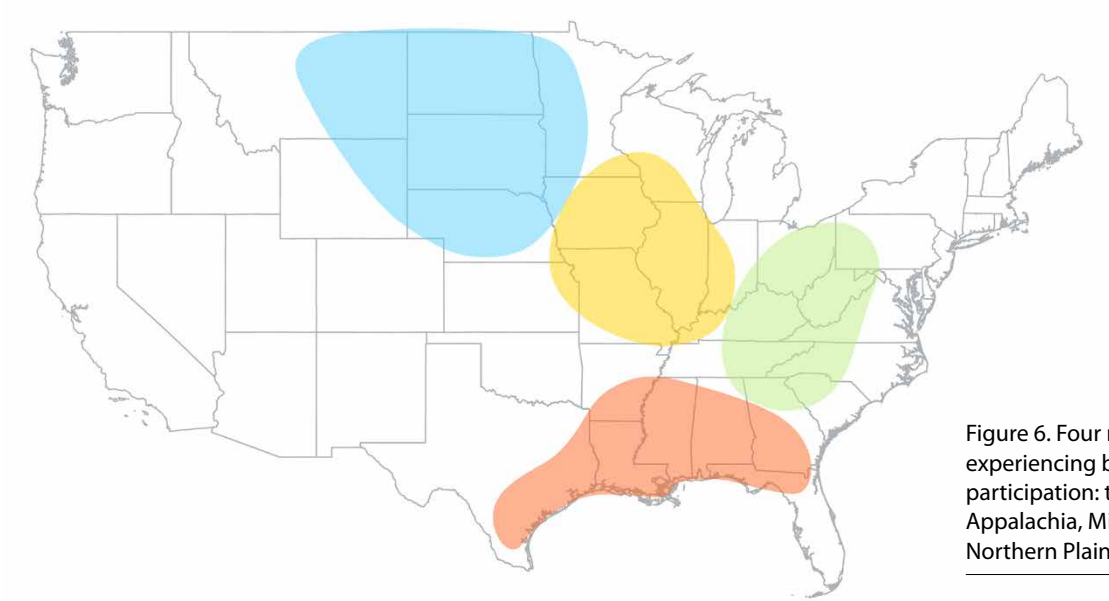


Figure 6. Four regions are experiencing barriers to E2C participation: the Gulf South, Appalachia, Midwest, and Northern Plains.

NREL recommended four strategies to make E2C more accessible and relevant to participants from the gap regions.

1. Build and maintain bidirectional relationships with regional partners to improve and evolve program offerings and leverage existing networks for outreach.
2. Refine new and existing web content and outreach language to reduce jargon and simplify language.
3. Refine public-facing program language to be apply to communities with different energy priorities.
4. Provide broad educational resources as well as tangible next steps to ensure technical assistance is accessible and actionable.

The E2C team is identifying opportunities to implement these four strategies across all three E2C offerings. Additionally, the team has started to address these gaps by piloting a region-specific peer-learning cohort, launched in January 2025, which will focus on renewable energy and energy efficiency in Appalachia.

The Gap Region Outreach Project demonstrated the great impact that small-group, tailored outreach can have in raising awareness and empowering participation. For instance, 30% of the organizations contacted during this effort applied for technical assistance through the E2C program, contributing to 17% of new expert match requests and 13% of peer-learning cohort applications during the project period.

Through 2025, E2C will continue exploring options to deliver technical assistance to share lessons learned and provide direct technical assistance to more communities representing all regions of the country.

Cover photo by Werner Slocum, NREL 67851

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