C2C: Clean Energy *to* Communities
U.S. DEPARTMENT OF ENERGY

Annual Highlights 2023

Clean Energy to Communities (C2C) connects local governments, tribes, electric utilities, and community-based organizations with national laboratory experts using customized, cutting-edge analysis to achieve clean energy systems that are reflective of local and regional priorities.

The program is funded by the U.S. Department of Energy, managed by the National Renewable Energy Laboratory (NREL), and delivered in collaboration with Argonne National Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory.

"Every American deserves to enjoy the public health and cost-saving benefits of our nation's historic transition to a clean energy future – no matter where they live. DOE's Clean Energy to Communities program is helping communities across the country develop locally tailored energy solutions so that American families and consumers in every pocket of the nation can access cleaner, cheaper, and more reliable energy."

—U.S. Secretary of Energy Jennifer M. Granholm

"To ensure that our national energy transition includes and benefits all Americans, every community across the U.S. needs access to affordable, resilient, and reliable clean energy options. Through the C2C program, national experts with a broad view of workable solutions are empowering communities of all sizes with tools and guidance to customize local plans that achieve clean energy goals."

—Principal Deputy Assistant Secretary in the Office of Energy Efficiency and Renewable Energy Jeff Marootian

Messages from Lab Leadership

"As the lead laboratory for C2C, NREL maximizes the impact of research across the national laboratory system by working directly with communities to achieve their clean energy goals. The C2C program is a natural progression of our work and builds on the success of the LA100 study, which we are expanding to incorporate validation capabilities, including the Advanced Research on Integrated Energy Systems (ARIES) platform—a key feature of C2C."

—NREL Director Martin Keller

"Argonne National Laboratory (ANL) is excited to provide the scientific expertise for C2C, which holds great potential to empower a more sustainable Chicago region. Together, we're opening new frontiers for America's clean energy future."

—ANL Director Paul Kearns

"Lawrence Berkeley National Laboratory (LBNL) is excited to help communities like Colorado Springs and Fresno identify their pathways towards decarbonization and climate resilience. Through C2C, Berkeley Lab will engage these communities and provide expertise in microgrids, electric vehicles, and building energy efficiency to help them achieve their clean energy goals."

—LBNL Director Michael Witherell

"While delivering national-level impact, Oak Ridge National Laboratory (ORNL) also focuses on engagement with communities across the southeast United States as a way to maximize the benefits of our clean energy research. Understanding the unique needs, challenges, and opportunities of this region has allowed us to work with these communities in a new and impactful manner that is helping provide greater access to energy innovation in our area."

—ORNL Director Stephen Streiffer

"Pacific Northwest National Laboratory (PNNL) is proud to help communities like Sitka, Alaska, shape their energy future and meet their decarbonization goals. Through C2C, PNNL will gather community input and share its expertise in grid optimization and clean energy integration to help them make better-informed decisions."

—PNNL Director Steven Ashby

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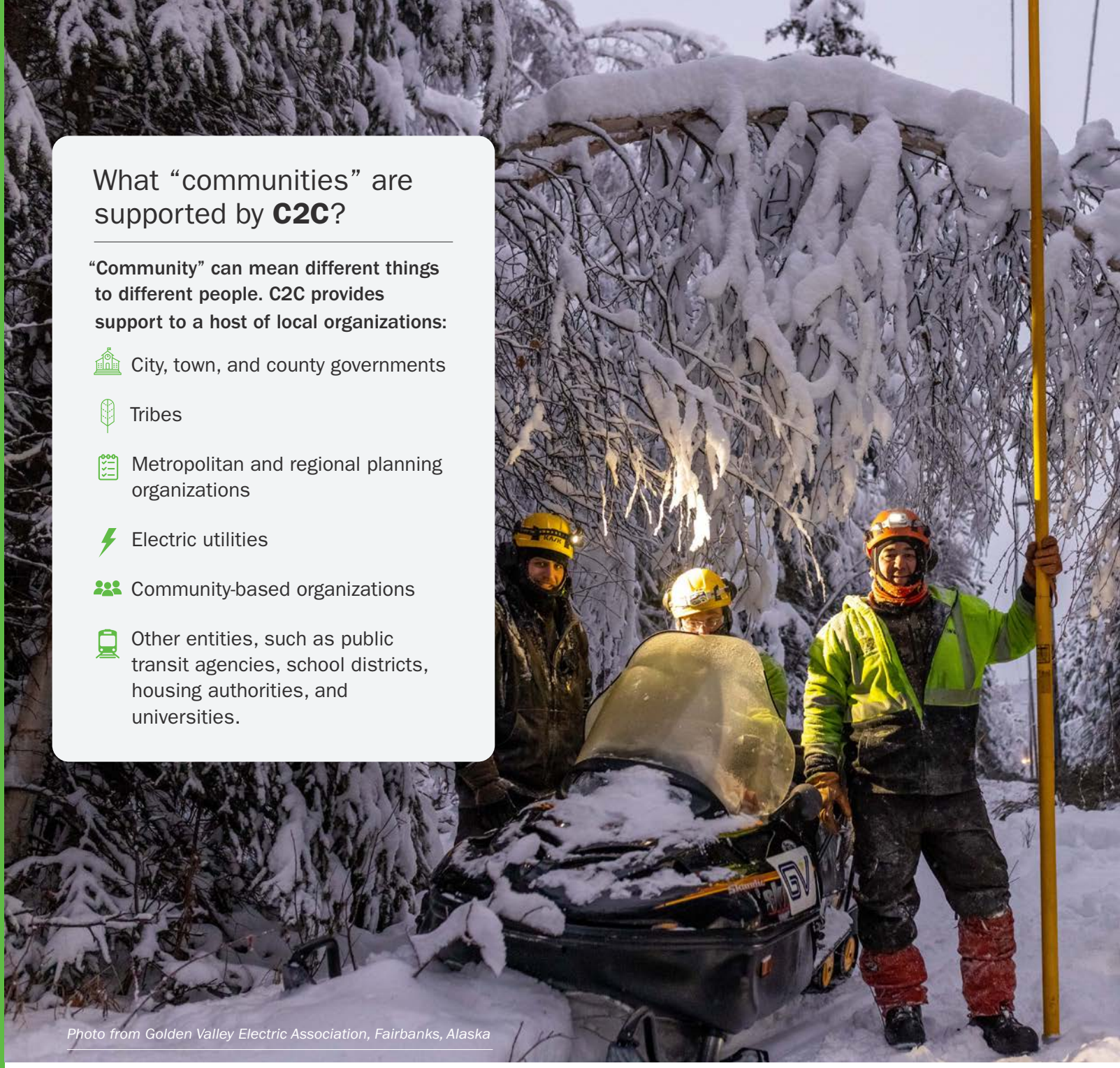
Communities' shared energy goals are undeniable: affordable energy, resiliency against disruptions, and energy that prioritizes health and safety of citizens. Many communities are just beginning to understand what clean energy options are out there. Others may have an idea or a plan and need help making the next move. Some need a little help along the way, others need more.

The U.S. Department of Energy (DOE) launched C2C in January 2023 after conducting extensive stakeholder interviews and pilot projects the year prior. Based on feedback from stakeholder engagement, the C2C program was created to provide support to communities throughout the multiple stages of energy transition—from foundational guidance and support through clean energy technology demonstration and deployment.

C2C provides support to communities at any stage of their clean energy transition. The program also connects with other community-facing DOE-funded programs. For example, C2C has supported communities that previously participated in the Communities LEAP program. C2C can also provide a pipeline of communities prepared to participate in future DOE programs that address clean energy technologies, such as Connected Communities, Communities LEAP, or the Energy Transitions Initiative Partnership Project (ETIPP) technical assistance program.

Photo iStock 1372334808



What “communities” are supported by **C2C**?

“Community” can mean different things to different people. C2C provides support to a host of local organizations:

- City, town, and county governments
- Tribes
- Metropolitan and regional planning organizations
- Electric utilities
- Community-based organizations
- Other entities, such as public transit agencies, school districts, housing authorities, and universities.

Photo from Golden Valley Electric Association, Fairbanks, Alaska

Overview

By bringing together innovative technology, state-of-the-art modeling, and unique research, development, and demonstration (RD&D) abilities to evaluate and test clean energy solutions before installing them in the field, C2C can help close the gap between clean energy ambitions and real-world deployment and performance. C2C solves cross-sector challenges—across clean power, mobility, grid, and buildings—to address local clean energy goals (Figure 1).

Communities lie at the heart of C2C, which recognizes that when it comes to clean energy, each community has different institutional contexts, resources, challenges, opportunities, and ambitions. C2C fosters community-led innovation with tailored support, from goal-setting and project development to technology deployment.

With that in mind, the C2C program offers a portfolio approach with three points of entry, ranging from short-term direct technical assistance (expert match) to peer-learning cohorts and multiyear in-depth partnerships (Figure 2).

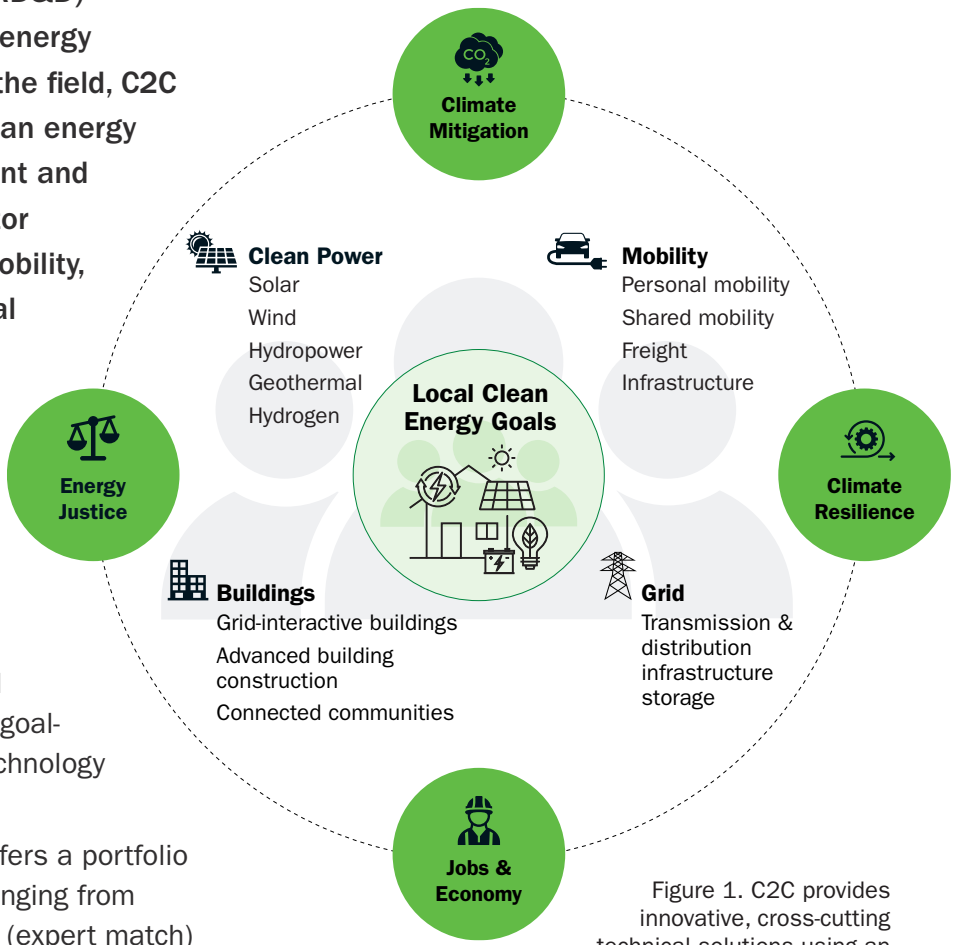


Figure 1. C2C provides innovative, cross-cutting technical solutions using an integrated approach.

Expert Match

Short-term, no-cost technical assistance for communities seeking to answer a near-term clean energy question.

~3 months
~80 communities

Peer-Learning Cohorts

Multi-community engagements to exchange strategies and best practices, learn in a collaborative environment, and workshop strategies to overcome challenges around a common clean energy transition topic.

~6 months
~80 communities

In-Depth Partnerships

Multiyear partnership 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 conduct hardware-in-the-loop testing of solutions to evaluate and test potential scenarios and strategies before full technology deployment.

~3 years
6 communities

Figure 2. Communities engaged with C2C through the three program offerings and the principal sector addressed in each.

Expert Match

C2C expert match connects clean energy experts with local governments, electric utilities, community-based organizations, and nonprofits to provide short-term, no-cost technical support to communities seeking to answer a near-term clean energy question, with a focus on community-driven challenges or goals—from clean electricity, buildings, mobility, and grid to financing, environmental justice, and more. Throughout 2022 and 2023, C2C expert match has worked with more than 80 organizations. Each community ultimately receives 40–60 hours of technical assistance through the program.

One of the most exciting takeaways from this first year is that many communities are being introduced to DOE resources through the C2C expert match program. For many, this is the first time they are engaging with DOE and working with the national labs. The low barrier to entry is especially helpful to communities that have pressing questions but are too capacity constrained to participate in longer-term technical assistance efforts. One of the goals of expert match is to position more communities to benefit from DOE resources and federal funding opportunities.

NREL HELPS COHOES COMMUNITY WITH FLOATING SOLAR SYSTEM AND HISTORIC BUILDING RETROFITS

A C2C expert match pilot helped the city of Cohoes, New York, explore and plan for historic building clean energy retrofits and a first-in-the nation municipality-owned and -operated floating solar project, which received $3 million in federal funding toward its construction.

Retrofitting a historic library to be more energy efficient with help from C2C expert match is one way the city of Cohoes is following its motto: Honor the past, Explore the present, Inspire the future. *Photo from city of Cohoes*

NREL PARTNERS WITH BLACK FARMERS' COLLABORATIVE TO PLAN SOLAR PANELS FOR FLORIDA FARMS AND CHURCHES

Members of the Black Farmers' Collaborative are taking the next steps toward installing solar panels on farms and houses of worship following a partnership with C2C. Through C2C expert match, the community received design guidance on:

- Agrivoltaics—solar paired with farming—for community-supported agricultural projects, to understand the balance between installation costs, energy output, and crop production.
- Rooftop solar projects on houses of worship, which led to the creation of a roadmap for installing solar panels on commercial-scale buildings in Florida.

Members of the Black Farmers' Collaborative visited Jack's Solar Garden in Colorado with NREL researchers to learn about agrivoltaics. *Photo by Dana-Marie Thomas, NREL*

"It was a game-changer when we really started looking at how incorporating agrivoltaics into farming could play into families. The project has helped me develop that conversation and come up with a real plan of implementation that can be duplicated."

-Cetta Barnhart, member of the Black Farmers' Collaborative and founder of Seed Time Harvest Farms

Cetta Barnhart owns Seed Time Harvest Farms, a community-supported agriculture business in Florida. *Photo from Seed Time Harvest Farms*

ARGONNE NATIONAL LABORATORY ANALYZES TRADE-OFFS IN COUNTY-WIDE ELECTRIC VEHICLE FLEET TRANSITION

With limited data and funding, Michigan's Washtenaw County was uncertain how it could transition to an electric vehicle fleet to meet its own mandated net-zero operations by 2030. Expert match researchers at Argonne National Laboratory helped the county understand the trade-offs between electric, hybrid, and plug-in hybrid vehicles by quantifying the total cost of ownership, energy savings, estimated electric range, fuel economy, and emissions. The Michigan Clean Cities and Communities coalition is helping Washtenaw find funding opportunities for the selections it makes.

Downtown Ann Arbor, Michigan. *Photo from Getty Images 511667056*

Implementation Partners

C2C expert match partnered with eight **Clean Cities and Communities** coalitions to deliver technical assistance to communities. Communities received transportation-related technical assistance from both the national labs and various local Clean Cities and Communities coalitions. The coalitions provide important local context and, in some cases, allow for in-person engagement with communities to provide the most helpful assistance. This program also served as an opportunity to introduce many more communities to Clean Cities and Communities and connect decision makers to their expertise and resources.

Photo by Erik Nelsen, NREL 64279

Peer-Learning Cohorts

C2C peer-learning cohorts offer multicommunity engagements that convene regularly to exchange strategies and best practices, learn in a collaborative environment, and workshop plans and strategies to overcome challenges around a common clean energy transition topic. In each cohort of up to 15 local and regional governments, tribes, planning organizations, utilities, and community-based organizations, participants receive support in a variety of ways from a diverse set of perspectives.

Lab experts provide education, training, analysis and modeling tools, and cutting-edge insights; practitioners and peers share case studies, strategies, and lessons learned that could help others approach similar efforts; and facilitators and external experts provide templates, additional resources, facilitated collaboration, and supplementary activities to enable accelerated clean energy progress.

Three new cohorts on clean energy topics begin twice a year, in January and July, and last approximately 6 months. C2C supported more than 80 organizations through peer-learning cohorts in 2023.

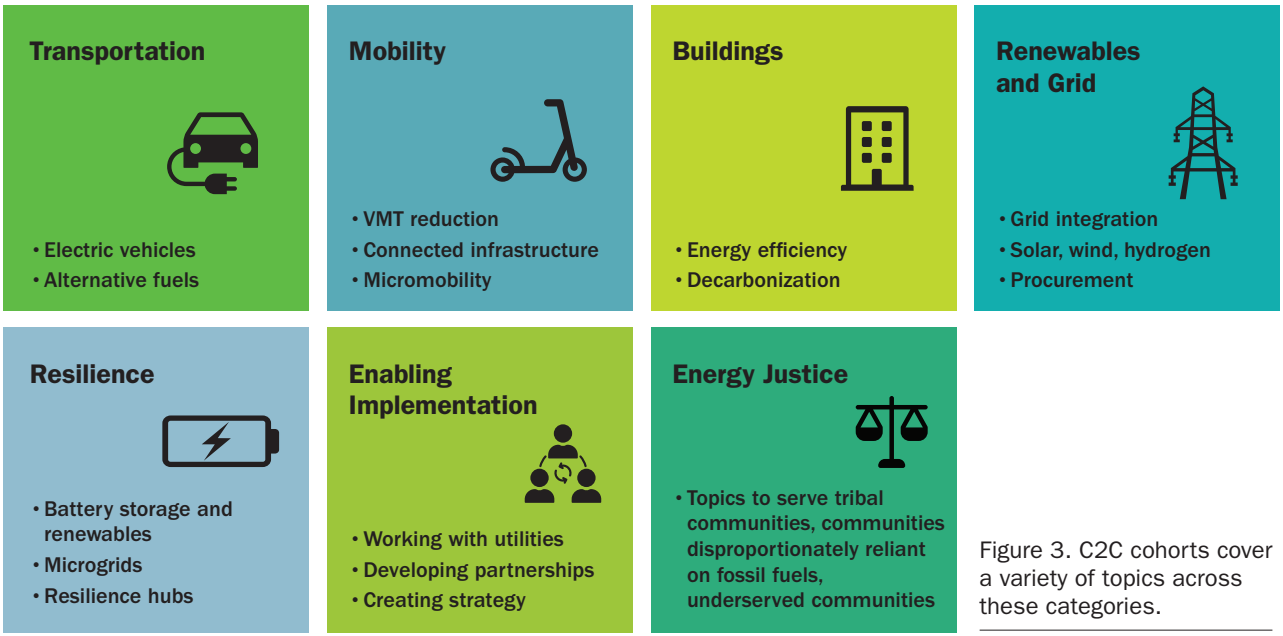


Figure 3. C2C cohorts cover a variety of topics across these categories.

COOK COUNTY DEVELOPS ELECTRIC VEHICLE CHARGING STRATEGY

Cook County, Illinois—home to the city of Chicago—is working to expand public access to electric vehicle (EV) charging stations, especially in underserved communities. Participating in the peer-learning cohort "Planning and Funding for Electric Vehicle Charging Infrastructure Deployment" gave their team the insights and data-rich resources they needed to make immediate progress on:

Chicago, Illinois. *Photo from Getty Images 1185728490*

- Assessing local EV charging needs based on demand.
- Engaging with communities for informed deployment.
- Writing and releasing a Request for Quotation to construct charging stations.

LITTLE ROCK TAKES STEPS TO 100% CLEAN ENERGY

After pledging to achieve 100% clean energy for its municipal operations by 2030, the city of Little Rock, Arkansas, needed to find actionable first steps toward that goal. Its participation in the peer-learning cohort "Moving from Idea to Implementation: Starting on the Path to 100% Clean Energy" helped them understand the impacts of Arkansas' new solar legislation, learn how to use NREL's State and Local Planning for Energy tool for scenario comparisons, release a Request for Proposal for energy savings performance contracting, and pivot their project quickly when their priorities changed.

Little Rock, Arkansas, has pledged to make its municipal operations 100% clean by 2030. *Photo from Getty Images 1428757649*

"This cohort was extremely well organized with great speakers, reliable follow up, clear expectations, and very effective, visual communication. The size of this cohort was one of its greatest strengths. During the sessions, we didn't feel invisible in the 'virtual room' and the facilitators made sure everyone stayed engaged. In almost every session, tools and resources were provided that the Little Rock Sustainability Office will be using for years to come."

-Brittany Nichols, Sustainability Educator, Little Rock, Arkansas

Photo from Brittany Nichols

Implementation Partners

World Resources Institute is a thought partner on C2C peer-learning cohorts and provides implementation support that enables the program to reach more communities more effectively. It collaborates with the C2C team to shape clean 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.

Photo from Getty Images 1836636181

The **Clean Cities and Communities** coalitions increase the impact of C2C transportation peer-learning cohorts by providing local context, relationships, and additional technical support to participants of transportation-related cohorts. Clean Cities and Communities coalitions work alongside a cohort participant from their region, joining cohort sessions, enhancing peer discussions, and adding to the shared body of knowledge. Between cohort sessions, they support their partnered participant by conducting activities that complement the cohort learnings and translate them into local circumstances, preparing cohort participants for future implementation.

Electric refuse truck fleet from Ocala, Florida Public Works.
Photo by Austin Sipiora, Tampa Bay Clean Cities and Communities Coalition

In-Depth Partnerships

C2C in-depth partnerships are multiyear, multi-million-dollar engagements made up of teams that comprise at least one local government, community-based organization, and electric utility. The community team is provided funding to work alongside national lab staff to apply robust modeling and analysis tools and conduct hardware-in-the-loop validation of solutions to evaluate and test potential clean energy scenarios and strategies before full technology deployment.

Six in-depth partnerships were announced in 2023, and two of these partnerships include an Energyshed focus (Figure 4).[1]

Aerial view of the hydrogen infrastructure and grid integration research pads at National Renewable Energy Laboratory's (NREL's) Flatirons Campus. These capabilities are part of the ARIES research platform. *Photo by Josh Bauer/Bryan Bechtold, NREL 82063*

[1] The concept of an Energyshed is loosely analogous to that of a watershed. Energyshed considers energy loads, sources of generation, and transmission and distribution networks within a broader footprint. Similar to a watershed, an Energyshed includes multiple connected geographic areas, communities, utilities, coordinating bodies, and/or jurisdictions.

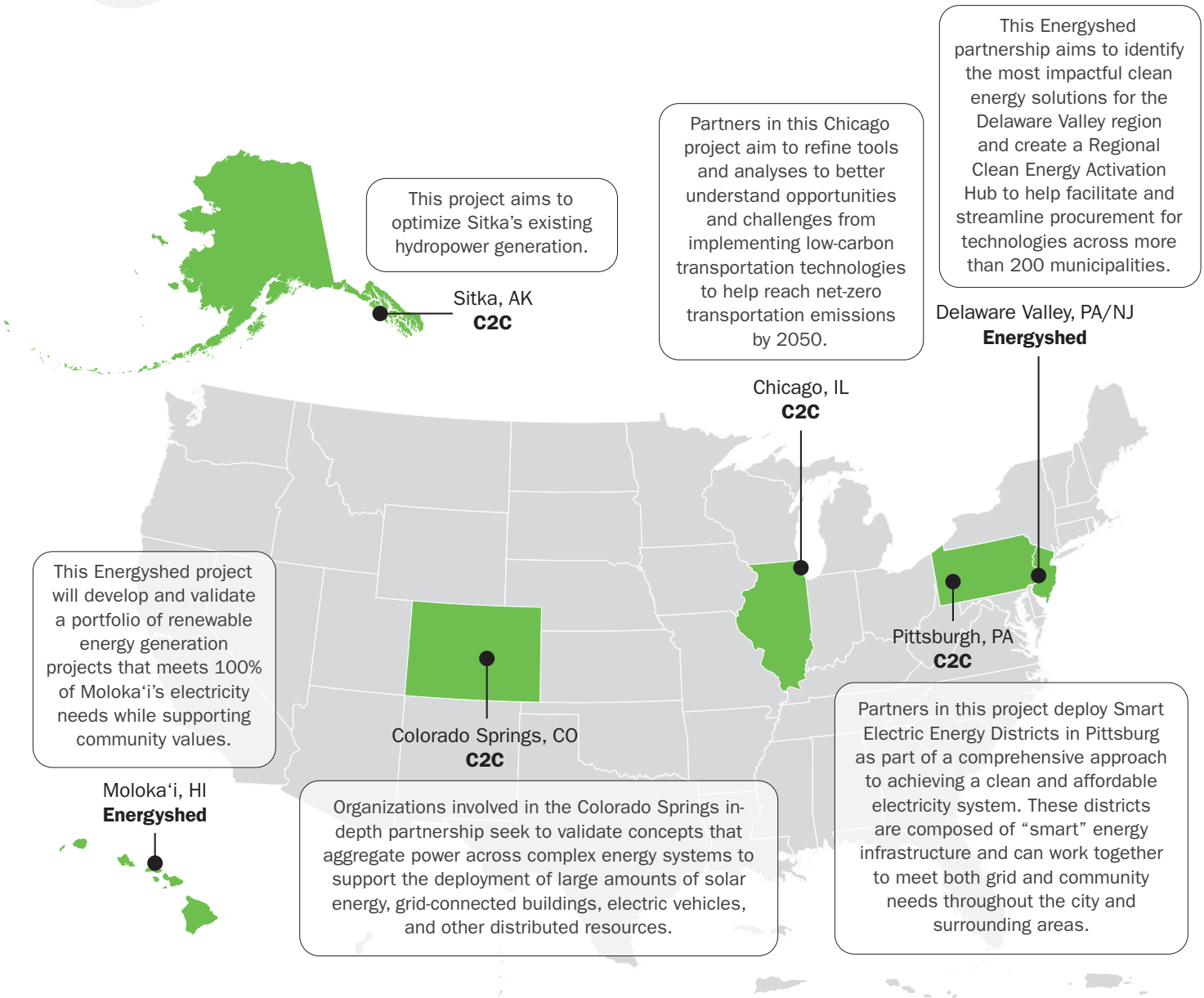


Figure 4. Six in-depth partnerships were announced in 2023.

NREL SUPPORTS ALASKA UTILITY'S TRANSITION FROM COAL TO CLEAN ENERGY

The Golden Valley Electric Association (GVEA), which participated in a C2C pilot in-depth partnership, serves Fairbanks and other Interior Alaska communities. With support from DOE's Office of Energy Efficiency and Renewable Energy (EERE), NREL developed the **award-winning Simulation and Emulation for Advanced Systems (SEAS) software**, part of the ARIES platform, and used it with the GVEA to plan and implement the transmission and distribution of clean energy technologies. In a pilot project, C2C worked with GVEA to evaluate and de-risk its transition to clean energy options in a partnership that helped shape the current in-depth partnership offering.

SEAS is the only software that simulates and validates energy transmission and distribution solutions across the buildings, transportation, and renewables sectors and the grid. SEAS allows communities to test "what if" scenarios to de-risk their options and help them confidently move from planning to implementation.

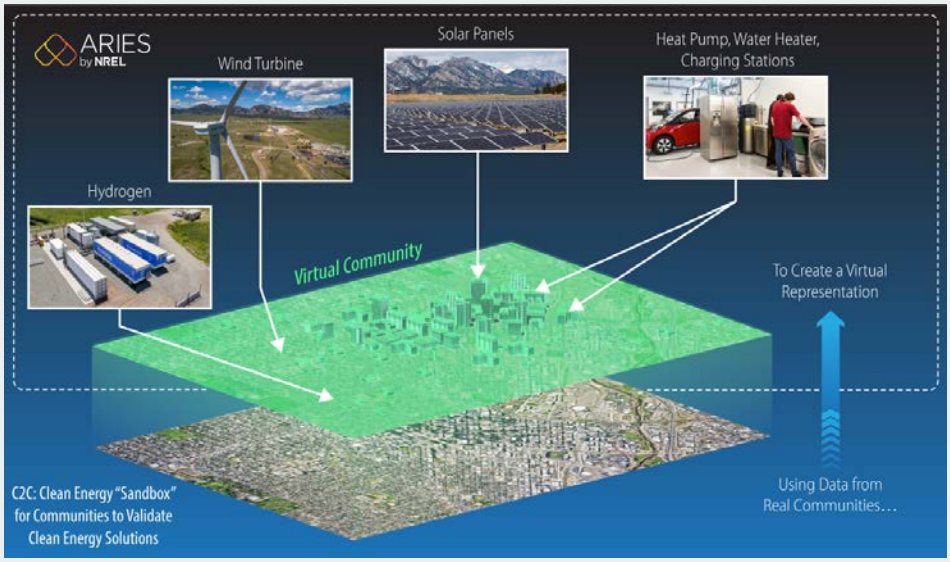


Figure 5. SEAS lets communities simulate and validate energy transmission and distribution across their grid and building, transportation, and renewables sectors.
Illustration by Besiki Kazaishvili

Conclusion

Using expertise from five DOE national laboratories, C2C has made tremendous progress, supporting more than 150 communities through December 2023 on a diverse range of clean energy topics. The scale of the clean energy transition requires innovative solutions that allow communities to test-drive technologies before they purchase and install them.

Looking into the future, C2C will increase its impact by:

- **Keep it Simple.** By making C2C's application process even easier, conducting strategic outreach to new communities, and ensuring that the support provided is targeted to local priorities, C2C's impact will continue to expand.
- **Share Lessons Learned.** C2C has learned a tremendous amount from its first year of implementation. Creating best practices and sharing lessons learned expand C2C's impact beyond the communities engaged in the program.
- **Leverage Deep Expertise at DOE National Labs.** C2C's ability to leverage national laboratory expertise—including validating cross-sector clean energy solutions before they are implemented—will be essential to scaling impact.
- **Increasing local staff capacity.** By training and working alongside staff at local governments, utilities, and community-based organizations, C2C will prepare those individuals and their organizations to accelerate their clean energy transition with confidence. Organizations may move within the C2C program offerings (for example, from expert match assistance to an in-depth partnership), to other DOE programs, or to execute next steps on their own.
- **Connecting with other DOE community-based programs.** As DOE's community-level work scales, C2C will increasingly coordinate with other programs—from those that focus on specific audiences, such as rural and remote communities, to those that focus on individual technology types.

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