Communities Advancing the U.S. Energy Transition

BY VINCENT MUSCO AND CAROLYN BERRY

Abstract

As policy makers increasingly recognize the value of community-driven energy investments, we highlight three examples of U.S. states where community-driven projects are an active part of the transitioning energy sector. Each demonstrates the importance of legislatures, regulators, utilities, third-party developers, non-profits, and individual community members in driving energy communities and community driven projects. These examples show that energy community programs use different business models, involve different levels of utility involvement, seek electricity products in addition to energy, and incorporate other policy goals. We draw out aspects of the programs that appear to be working well.

Increasingly, policymakers are recognizing a role for community-driven energy investments in decarbonizing the electricity sector. The European Union, for example, introduced the concept of energy communities in 2019 through legislation that overhauled its energy policy framework.[3] In the U.S., state legislatures and regulators have passed laws and rules that allow for and encourage participation by community-driven energy investments and projects, often included in efforts to allow for development of distributed energy resources.[4] Nevertheless, community-driven energy remains in its infancy. Of the approximately 1,300 GW of generation capacity in the U.S.,[5] just 5.27 GW (0.4 percent) is community solar generation,[6] which is by far the most prevalent form of community-driven energy investments to date.

Community-driven investments have historically faced substantial hurdles. Community-driven projects, averaging about 2 MW in size,[7] lack economies of scale resulting in a levelized cost of energy that is much higher than utility-scale solar projects.[8] Additionally, community-driven projects have been limited by legal restrictions, regulatory constraints, and interconnection challenges that prevent their development.

In the U.S., many states have taken steps to reduce or remove these hurdles and have designed programs that attract investment in community-driven projects. The programs create legal and regulatory structures that either pull together energy consumers to collectively finance in a project offered by a utility or third-party developer or allow those individual energy consumers to collectivize and invest as they see fit. At least 24 states have enacted community solar-enabling legislation,[9] and as we demonstrate below, the programs available in the U.S. can vary widely in their approaches to incorporating energy communities and community-driven projects.

No program allowing community participation is perfect. Each involves tradeoffs, competing policy goals, opportunity costs, and questions of rate design, cost allocation, and fairness. Not surprisingly, while some programs share similarities, no two are the same. Even the definition of "energy communities" can differ across jurisdictions. The definition in the U.S. Inflation Reduction Act (IRA) includes (1) brownfield sites, (2) census tracts, (3) "metropolitan statistical areas" and (4) "*non*-metropolitan statistical areas" that meet certain criteria,[10] whereas others, like Illinois, define community-owned projects as "owned collectively by members of the community to which an electric generating facility provides benefits" where "members of that community participate in decisions regarding the governance, operation, maintenance, and upgrades of and to that facility."[11]

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Below, we provide examples in three U.S. states where community-driven projects are an active part of the transitioning energy sector. Each demonstrates the importance of legislatures, regulators, utilities, third-party developers, non-profits, and individual community members in driving energy communities and community driven projects. The programs elicit participation by providing economic, environmental, educational, and even psychological benefits to energy community participation. These examples show that energy community programs use different business models, involve different levels of utility involvement, seek electricity products in addition to energy, and incorporate other policy goals. We draw out aspects of the programs that appear to be working well.

Illinois

Illinois offers a variety of opportunities to subscribe to community renewable projects. In 2017, the Illinois state legislature passed Public Act 099-0906 (the "Future Energy Jobs Act", or "FEJA").[12] FEJA created three key programs for community participation.

"Illinois Shines" is a program created to facilitate investment in new solar photovoltaic projects, including distributed systems (rooftop solar) and community projects. A stated purpose of the program is to attract capital that, absent the program, would not be invested in solar projects. The Illinois Shines program accepts applications from qualifying vendors to obtain a 15 to 20-year contract under which they would receive renewable energy credit (REC) payments associated with the output from new solar arrays serving homes and businesses including those unable to site solar panels on their properties. Vendors, in turn, sign up individual subscribers, who receive bill credits for solar output

on their electric bill. Community projects are required to have at least 50% of the project capacity subscribed by residential and small commercial customers with subscriptions no larger than 25 kW. REC payments are administratively determined using industry data and are designed to decrease as participation in the program ramped up (or increase if participation ebbs).[13]

To date, 116 community solar projects have been built and energized under the program, with another 1,099 projects under development.[14] In 2020, new legislation – the Climate and Equitable Jobs Act ("CEJA") – expanded the Illinois Shines program and adjusted the community project aspect. To better allocate limited program funds, an evaluation scoring metric was developed that prioritized projects placed on contaminated (or brownfield) lands or on existing structures, and that have other locational and environmental project attributes. The program changes introduced a new category – "community-driven" community projects – which, among other criteria, require projects to be at least 50 percent owned by community residents or non-profit organizations which directly serve the community where the project is located, and to provide community benefits, including bill savings, revenues from project ownership, tax credits, job creation, as well as indirect benefits (environmental, educational, cultural). Community-driven projects are required to comprise at least 5 percent of all projects procured under the program. To date, 110 community-driven projects are under development.[15]

The "Solar for All" program is similar to Illinois Shines but is designed to attract subscribers that lack sufficient means to participate in that program. It targets eligible homeowners and renters, non-profits, and public facilities serving eligible communities. To accomplish this, the REC prices for the Solar for All program are set higher than those in Illinois Shines.[16] Like the Illinois Shines program, vendors can receive upfront payment for all RECs upon energization of the project, which facilitates the financing of the project.[17]

The third FEJA program consisted of a series of competitive procurements in which jurisdictional utilities were required to solicit proposals from developers for non-solar community renewable and low-income community solar projects. Held in December 2019, the procurements had strict eligibility requirements. For example, community solar projects were required to partner with one community-based organization (for up to 40% of the project capacity) and demonstrate economic benefits to the community, such as local employment and revenue benefits. Unlike the Illinois Shines and Solar for All programs, qualified developers competed for 15-year contracts based on their bid prices, rather than on qualitative considerations. Two projects were selected in the low-income community solar category.[18] No bids were submitted in the "non-solar" community renewables procurement,[19] indicating that solar photovoltaics, at least for now, are the resource of choice for community projects.

The Illinois programs show the importance of legislation and regulation in fostering development of energy communities. FEJA and subsequent law revisions created mandates and funding sources for the programs. This allowed private capital to develop projects and seek interested community members to become subscribers and/or owners.

Some of the Illinois programs key aspects include:

- The programs result in *incremental* solar projects, i.e., invested capital that otherwise would not otherwise be allocated to solar projects.
- The programs seek to optimize land use by prioritizing investment in brownfield and environmentally hazardous areas or use of existing infrastructure.
- The programs use dedicated and specified funding set out in state law to pay for delivered RECs, which lowers investor risk associated with the programs.
- Illinois is using competitive procurements as tool to lower project costs.
- All programs use well-vetted contracts to govern the transactions. These contracts help protect counterparties from underperformance and other risks.
- State regulators, agencies, and legislators have shown flexibility in changing program designs to respond to the supply and demand observed for the programs. For example, when the Illinois Shines program was adjusted by law to expand funding and create additional categories of projects that better target specific state policy goals, such as subscriber-owned projects and projects that demonstrate greater levels of community benefits when it became clear that those kinds of projects were not being built.

Minnesota

Minnesota offers an example of a state with a lengthy history of community-driven projects that has adapted through time and spawned a unique business model that allows community members to participate in and own new projects. Minnesota's program, also known as Solar Community Gardens, was enacted through state legislation in 2013.[20] It defined a community solar garden as a solar facility, of up to one megawatt, that sells energy to subscribers who purchase a given portion of its output. It required all energy generated by the facility be purchased by the public utility at a "value of solar" rate. The "value of solar" rate incorporated savings from avoided costs such as the construction of new generation or transmission and line losses among other items.[21] The program initially adopted had no limits on the number of projects that could be built. The program was opened to residential and commercial subscribers, schools, government entities, and other organizations.

Electric cooperatives and some utilities in Minnesota own and operate community solar projects as a way to provide access to solar energy to their customers. Subscribers typically sign a 20 or 25-year contract to essentially lease individual solar panels in a project array giving them the rights to the energy produced. The "lease" payment can be made up front for the entire

contract duration or monthly under a "pay-as-you-go" plan. The ownership of RECs associated with the solar energy production is negotiated with the developer. Payment is made through the public utility in the form of an energy credit on customer utility bills at the value of solar rate.[22]

Like those in Illinois, the Minnesota Solar Community Gardens program design has evolved. Over time, it became clear that more projects were being developed for companies and government entities than for residential customers, particularly low and moderate income (LMI) customers. This occurred as a consequence of the lower cost of serving fewer customers with bigger projects, and the higher level of customer expertise and creditworthiness for these projects. New legislation passed in 2023 increased the project size to a maximum of 5 MW and put in place a requirement that 55 percent of a project's capacity be given to LMI households, public interest groups (such as municipal or Tribal subscribers, non-profit organizations, schools, houses of worship, and libraries) and affordable housing residents. Limits on annual growth rates were established through 2032 which total to over 800 MW in the first eight years. The value of solar rate was also replaced with tiered rates based on customer class and defined subscriber types, capped at the customer's average retail rate.[23,24]

Minnesota's example provides three additional key aspects worth highlighting.

Because there is no requirement for projects to be built by the utility or a "qualified vendor" (as in Illinois), it is possible for grassroots development of energy community projects. One grassroots success story in Minnesota is Cooperative Energy Futures ("CEF"). Founded by a group of college students based on a vision of creating wealth locally through energy efficiency and clean energy, the cooperative[25] was an early adopter of the community solar model as a way to provide to all its customers access to clean energy. CEF secures project funding and constructs and operates the solar facilities which are owned by the cooperative members across the State.[26] It has eight community solar gardens in place and has plans to add seven more. As part of its strategy, CEF seeks to provide education, engagement, and neighborhood coordination, as well as innovative business models that allow community members to own projects and benefit from energy market participation.[27]

- The program's success in the service territory of the largest jurisdictional utility in Minnesota – Xcel Energy – has been hindered by interconnection delays. In 2021, the Minnesota Public Utilities Commission fined Xcel related to roughly 120 complaints regarding interconnection timelines.[28]
- The program has been particularly successful with electric cooperatives.[29] This may be because electric cooperatives already include a degree of organization that makes forming an "energy community" less burdensome.

Hawaii

Hawaii offers an example of a state at the cutting edge of distributed and community resources to provide not just energy, but key grid services. Given its geography – about 2,400 miles from the U.S. mainland – no U.S. state faces more difficult challenges in transforming its energy sector than Hawaii. Aside from supply chain challenges and costs, Hawaii's electric utilities have no power markets or neighboring control areas to fall back on for reliability or economic electricity purchases. The islands themselves are not interconnected and thus must self-supply all electricity. Not surprisingly, Hawaii has the highest average retail electricity rates in the U.S. (39.72 cents/kWh – 78 percent higher than second-place California)[30] and, due to its legacy thermal generating units, has some of the highest emissions-per-MWh of any state in the country.[31]

Against this backdrop, Hawaii has adopted the most aggressive renewable portfolio standard in the U.S., pledging 100% renewable energy by 2045. In pursuing this goal, Hawaii has engaged a multitude of programs and initiatives, many innovative, to increase renewable penetration and to do so reliably. One example is Hawaiian Electric's procurement of a recently-energized 185 MW/565 MWh battery project on Oahu developed by Plus Power (the "Kapolei Energy Storage" facility) to replace a 180 MW coal-fired power plant.[32] The history of these programs – which includes a community-based renewable energy program[33] – is extensive and noteworthy.

One innovative approach taken by the Hawaii Public Utilities Commission ("the Commission") and Hawaiian Electric[34] that is a form of an energy community development was to pursue competitive procurement of grid services from aggregations of customer-sited distributed energy resources. Interested developers were invited to submit bids that aggregated individual customer loads, with each individual contracting with the developers. Winning developers would then sign 5- to 10-year contracts to provide grid services to the utility. This type of energy community is dispersed but highly interconnected.

While the aggregator model itself is not necessarily new, Hawaii's use of it to provide grid services, including a "fast" frequency response,[35] is new. Traditional generation portfolios rely upon mechanical inertia from large rotating generators to provide frequency response; as these generators are replaced by inverter-based generation with no such mechanical inertia, grid operators and planners have needed new approaches to procuring frequency response to keep the grid reliable. By use of grid-forming inverters, renewable resources and battery storage systems can contribute frequency response. Hawaiian Electric's procurement allowed developers to aggregate their desired mix of customer loads, energy storage devices, and renewable generation to meet the utility's strict definition of the grid services being procured.

The Hawaii legislature, the regulator, the utility, the developer community, and utility customers all played a role in the formation of energy communities

in Hawaii. The legislature's enactment of the 100% by 2045 RPS requirement, plus the allowance for net metering, created a mandate and removed hurdles to the development of community energy projects. The Commission has promulgated regulations requiring a "portfolio" approach to addressing the state's electricity needs (that includes innovative approaches, such as aggregated grid services), and along with the utility, has employed competitive procurement to manage the cost and risk of new resources.

Hawaii, like Illinois, is using competitive procurement and supplier contracts that protect customers. Additionally, Hawaii uses innovative approaches to solve modern grid needs, allowing new technologies, business models, and contracting methods to compete to fulfill the utility's needs. Hawaii is able to tap into the public groundswell to participate in energy communities by offering multiple options, including traditional community-based renewable energy projects or, as is the case here, in customer aggregations.

Footnotes

[3] *European Commission*, "Energy communities": https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en.

[4] *United States Environmental Protection Agency*, "Shared Renewables": https://www.epa.gov/green-power-markets/shared-renewables.

[5] *American Public Power Association*, "America's Electricity Generating Capacity," February 2023: https://www.publicpower.org/resource/americas-electricity-generating-capacity.

[6] *Wood Mackenzie*, "US community solar growth slowed 16% in 2022; national market expected to double by 2027," February 15, 2023: https: https://www.woodmac.com/press-releases/us-community-solar-growth-slowed-16-in-2022-national-market-expected-to-double-by-2027/.

[7] Heeter, Jenny, et al., "Sharing the Sun: Community Solar Deployment, Subscription Savings, and Energy Burden Reduction," *NREL*, July 2021, slide 5: https://www.nrel.gov/docs/fy21osti/80246.pdf.

[8] *Lazard*, "Lazard's Levelized Cost of Energy Analysis—Version 16.0," April 2023, slide 37: https://www.lazard.com/media/2ozoovyg/lazards-lcoeplus-april-2023.pdf.

[9] *United States Environmental Protection Agency*, "Shared Renewables": https://www.epa.gov/green-power-markets/shared-renewables.

[10] "Inflation Reduction Act of 2022": https://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf (emphasis added).

[11] "Public Act 102-0662": https://www.ilga.gov/legislation/publicacts/102/PDF/102-0662.pdf.

[12] "Public Act 099-0906," https://www.ilga.gov/legislation/publicacts/99/PDF/099-0906.pdf.

[13] Current REC prices for community solar projects range from $39.27/REC to $95.12/REC, depending on the size and type of community solar project. See: https://ipa.illinois.gov/content/dam/soi/en/web/ipa/documents/42023/rec-prices-for-illinois-shines-and-illinois-solar-for-all-41923.pdf.

[14] Illinois Shines, "Project Map": https://illinoisshines.com/project-map/.

[15] Illinois Shines, "Project Map": https://illinoisshines.com/project-map/.

[16] Current REC prices for community solar projects range from $78.01/REC to $110.76/REC, depending on the size and type of community solar project. See: https://www.illinoissfa.com/renewable-energy-credit-prices/

[17] *Illinois Power Agency,* "2024 Long-Term Renewable Resources Procurement Plan," October 20, 2023, pp. 37: https://ipa.illinois.gov/content/dam/soi/en/web/ipa/documents/2024-long-term-plan-20-oct-2023-.pdf.

[18] The winning projects had an average winning REC price of $72.02/REC. *Illinois Power Agency,* "19 December 2019 Low-Income Community Solar Pilot RFP Results": https://ipa-energyrfp.com/wp-content/uploads/2019/12/Low%E2%80%90Income-Community-Solar-Pilot-RFP-Results_December-19-2019.pdf.

[19] *Illinois Power Agency,* "Fall 2019 Procurement Events Non-Solar Community Renewables RFP Results": https://ipa-energyrfp.com/wp-content/uploads/2019/12/Non-Solar-Community-Renewables-RFP-Results_19-December-2019-1.pdf.

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[22] Minnesota Department of Commerce, Division of Energy and Utilities, "Tips About Community Solar": https://mn.gov/commerce/energy/solar-wind/community-solar/.

[23] Minnesota Commerce Department, "Community Solar Gardens," Key Program Details, Additional Key Features: https://mn.gov/commerce/energy/consumer/energy-programs/community-solar-gardens.jsp.

[24] Minnesota Legislature, 2023 Minnesota Statutes, 216B.1641 Community Solar Garden: https://www.revisor.mn.gov/statutes/cite/216B.1641.

25 Cooperatives are established under Chapter 308A of the Minnesota Statutes, See Minnesota Legislature, Office of the Revisor of Statutes: https://www.revisor.mn.gov/statutes/cite/308A/full.

26 Cooperative Energy Futures, "Projects Completed/Under Construction": https://www.cooperativeenergyfutures.com/projects-complete-dunder-construction-1.

27 Cooperative Energy Futures, "Our History": https://www.cooperativeenergyfutures.com/our-history-1.

28 Hughlett, Mike, "State regulators fine Xcel Energy $1M over dispute with solar developers," Star Tribune, January 21, 2021: https://www.startribune.com/state-regulators-fine-xcel-energy-1m-over-dispute-with-solar-developers/600013483/.

29 Most community solar projects in Minnesota are owned and operated by electric cooperative utilities, See Minnesota Commerce Department, Community Solar: https://mn.gov/commerce/energy/solar-wind/community-solar/.

30 U.S. Energy Information Administration, "US Electricity Profile 2022": https://www.eia.gov/electricity/state/.

31 For example, Hawaii has the highest sulfur dioxide rate (lbs/MWh) in the U.S. U.S. Energy Information Administration, "Hawaii Electricity Profile 2022": https://www.eia.gov/electricity/state/hawaii/.

32 Cuthrell, Shannon, "Hawaii Installs Tesla Battery Storage for Critical Grid Support," EE Power, January 29, 2024: https://eepower.com/news/hawaii-installs-tesla-battery-storage-for-critical-grid-support/.

33 Hawaii State Energy Office, "Community-Based Renewable Energy": https://energy.hawaii.gov/get-engaged/community-based-renewable-energy/.

34 Hawaiian Electric is the investor-owned utility that serves load on Oahu, Hawaii, Maui, Molokai, and Lanai.

35 Fast frequency response is product that requires resources to responds within 200 milliseconds or less.