



THE UNIVERSITY OF CHICAGO
THE LAW SCHOOL
Abrams Environmental
Law Clinic

November 13, 2025

Via E-Filing

Ms. Lisa Felice
Executive Secretary
Michigan Public Service Commission
7109 West Saginaw Highway
Lansing, MI 48917

RE: MPSC Case No. U-21870

Dear Ms. Felice:

Please find enclosed the Official Exhibits of Sergio Cira-Reyes on Behalf of Urban Core Collective, UCC-52 to UCC-74 (Part 5 of 6), along with proof of service, for electronic filing in the above-referenced matter.

Please do not hesitate to contact my office with any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark N. Templeton".

Mark N. Templeton, *pro hac vice*
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Chicago, IL 60637
Phone: (773) 702-9611
Email: templeton@uchicago.edu

xc: Parties to Case No. U-21870

Disconnect Data Evaluation with Payment Segmentation and LMI data

Evaluation Report

Prepared by: Caleb Forner

Current Primary Contacts: Caleb Forner, Ryan Keilen

Date: June 27th 2025

OVERVIEW

This report examines the relationship between electric residential customer disconnect rates, dunning history, customer payment segmentation, and Low to Moderate Income (LMI) data points.

KEY MESSAGES

- The dataset combines the customer data features at the year, month, service type, and geographic location level aggregated down to the census tract.
- The timeframe covered is from January 2024 to May 2025 with a script developed to load additional data as needed.
- The primary geographic location level evaluated is the census tract
- Only electric residential customers are included in this evaluation
- Only census tracts with >100 customers are included for this evaluation to reduce influence from low density areas
- While the data is collected over time, this analysis treats each time point as an independent observation to investigate cross-sectional relationships between features
- Feature comparisons are done with the proportionality of feature counts relative to total customers in a particular geographic location. This normalization mitigates the correlation between features that scale with population size and avoids multicollinearity
- Given the non-normalized distribution of the data, monotonic relationships between variables were evaluated using Spearman's rank correlation. P-values < 0.05 were considered statistically significant, indicating that the observed associations were unlikely to have occurred by chance.

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RESOURCES

Data sources were formatted to be able to compare the various data at the same grain for geographic location across the Consumers Energy service territory. Initial analysis was conducted using Python.

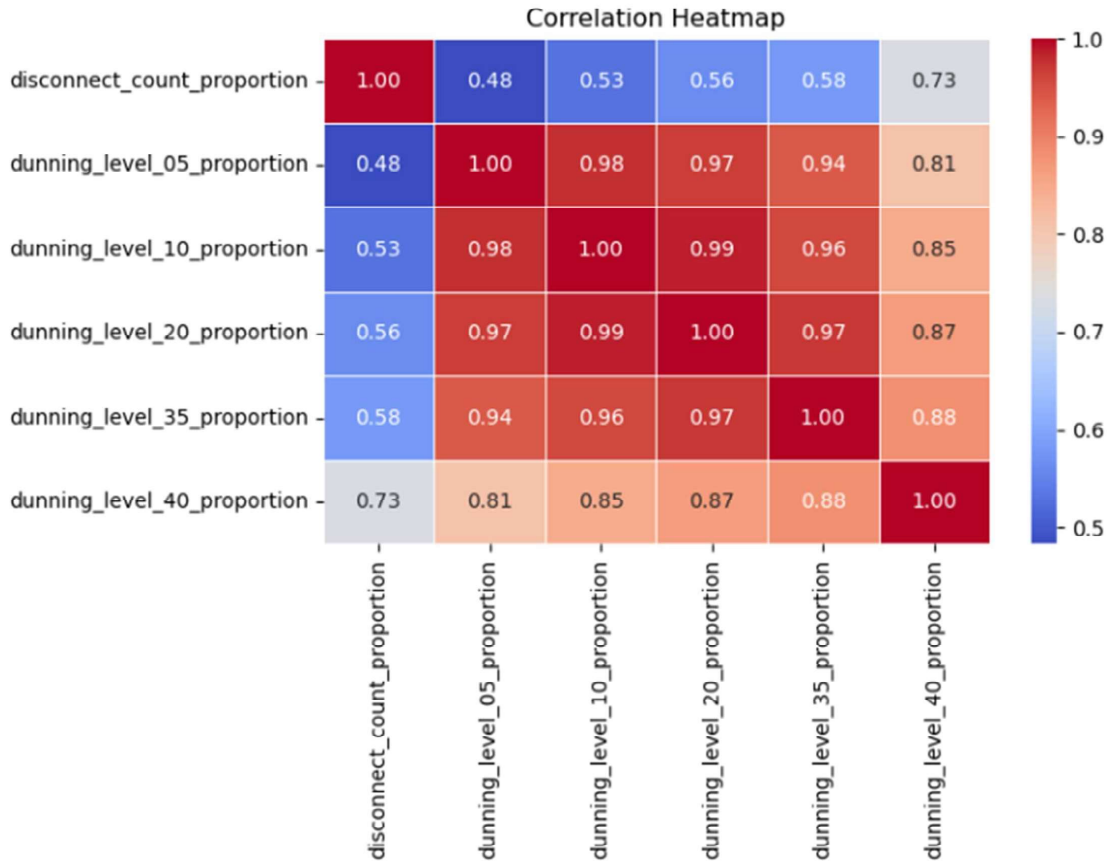
Source	Purpose
current_customer_detail.sql - Repos	Get active customer geo location and account data for a specific time frame
combined_detail.sql - Repos	Capture customer LMI data and estimated ALICE/Poverty counts for a specific time frame
disc_eval_disconnects.sql - Repos	Capture dunning related disconnections for a specific time frame at the customer level
disc_eval_dunning.sql - Repos	Capture dunning history for a specific time frame at the course level
disc_eval_segmentation.sql - Repos	Capture customer payment segmentation data for a specific time frame
lmi_functions.py - Repos	Data processing scripts
disc_eval_data_load.ipynb - Repos	Load and structure the data for analytics as well as extract key data insights
	PowerBI for data exploration

RESULTS

DUNNING IMPACT

For dunning evaluation, we selected dunning levels 05, 10, 20, 35, and 40 to compare against the proportion of disconnects (disconnect_count_proportion) as a baseline and sanity check. Given the procedural nature of the dunning process, we expected these proportions to be highly correlated among the dunning values. In regards to the disconnects, **dunning level 40** (dunning_level_40_proportion) showed the **strongest positive correlation** with disconnects, with a **correlation coefficient of 0.73**, indicating a strong linear relationship. This correlation is statistically significant, as confirmed by the associated P-value.

Visual 1.1.1 – Dunning Correlation Heatmap



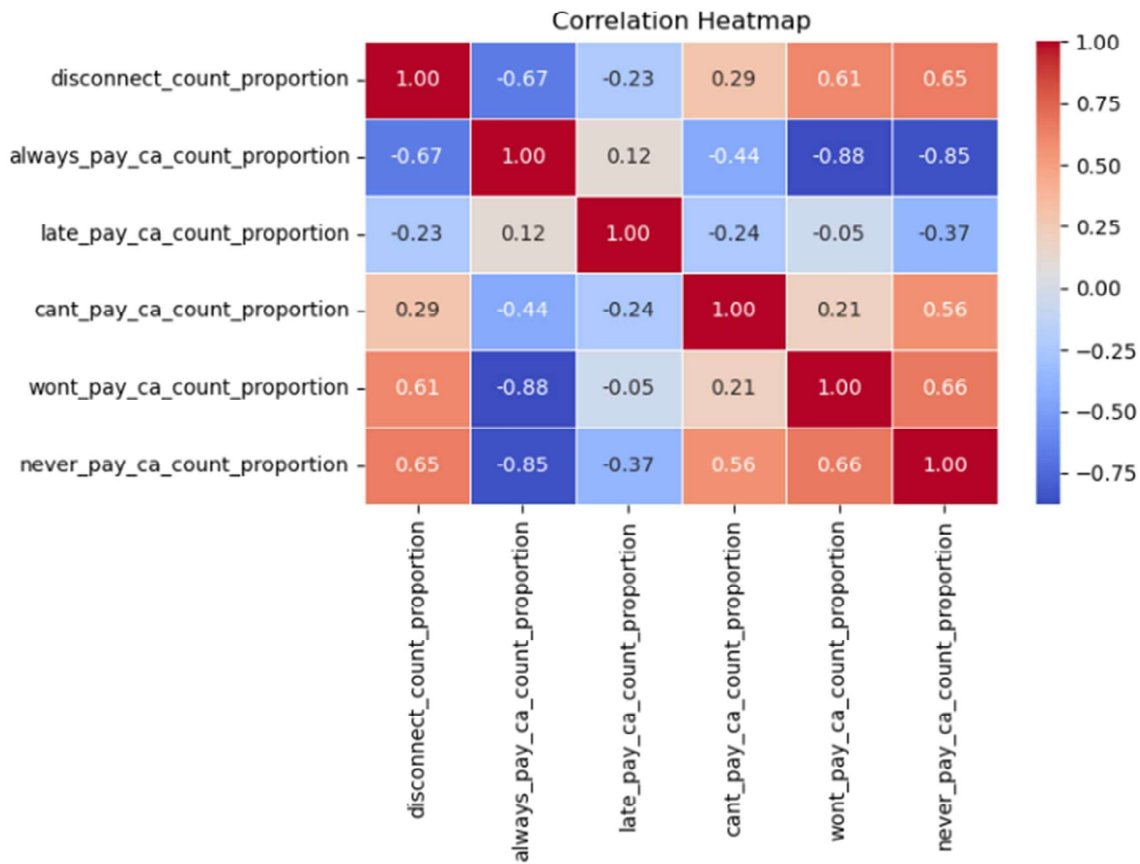
CUSTOMER PAYMENT SEGMENTATION IMPACT

For customer payment segmentation we selected the customer payment segmentation proportions to compare with the disconnect proportions based on census tracts. The customer payment segmentation data lends itself to this monthly format nicely as the segment counts in a particular month would reflect their payment history for the prior 12 months. We would expect locations with a higher proportion of Always Pay customers to have lower disconnect proportions while those locations with higher proportion of Won't Pay and Never Pay customers to have higher disconnect proportions.

The data supports these expectations. The strongest and statistically significant relationships were observed with the **Always Pay**, **Won't Pay**, and **Never Pay** segments:

- **Always Pay:** Strong **negative correlation** with disconnects ($r = -0.67$), indicating that higher proportions of reliable payers are associated with fewer disconnections.
- **Late Pay:** Also negatively correlated ($r = -0.23$), though the relationship is more moderate.
- **Won't Pay** and **Never Pay:** Show **strong positive correlations** ($r = 0.61$ and $r = 0.65$, respectively), suggesting that higher proportions of these segments are associated with increased disconnections.
- **Can't Pay:** Displays a **weaker but still positive correlation** ($r = 0.29$), indicating a modest association with disconnection rates.

Visual 2.1.1 – Customer Payment Segmentation Correlation Heatmap

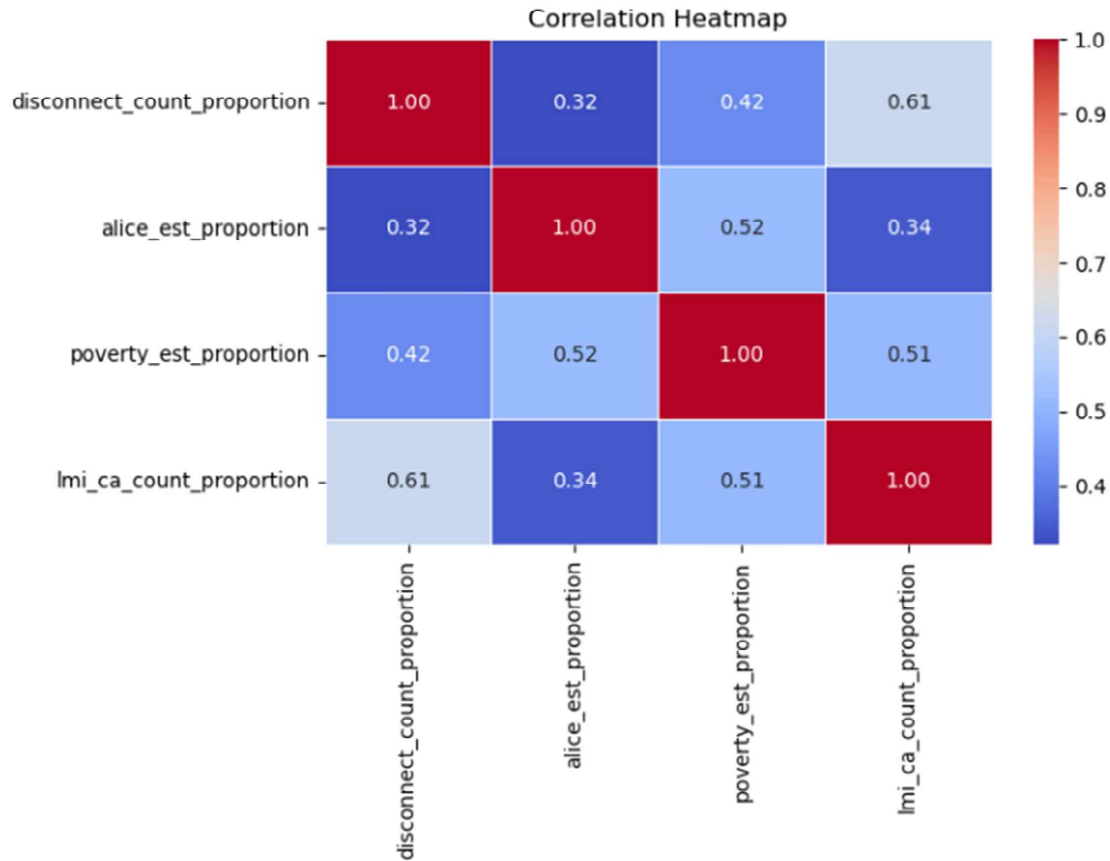


LMI IMPACT

For LMI comparisons we are calculating the estimated number of LMI customers which could fall into the ALICE (Asset Limited, Income Constrained, Employed) or Poverty categories based on our dataset using the ALICE project data. We are not approaching this data with expectations, just exploring the relationship between the LMI datapoints and disconnections.

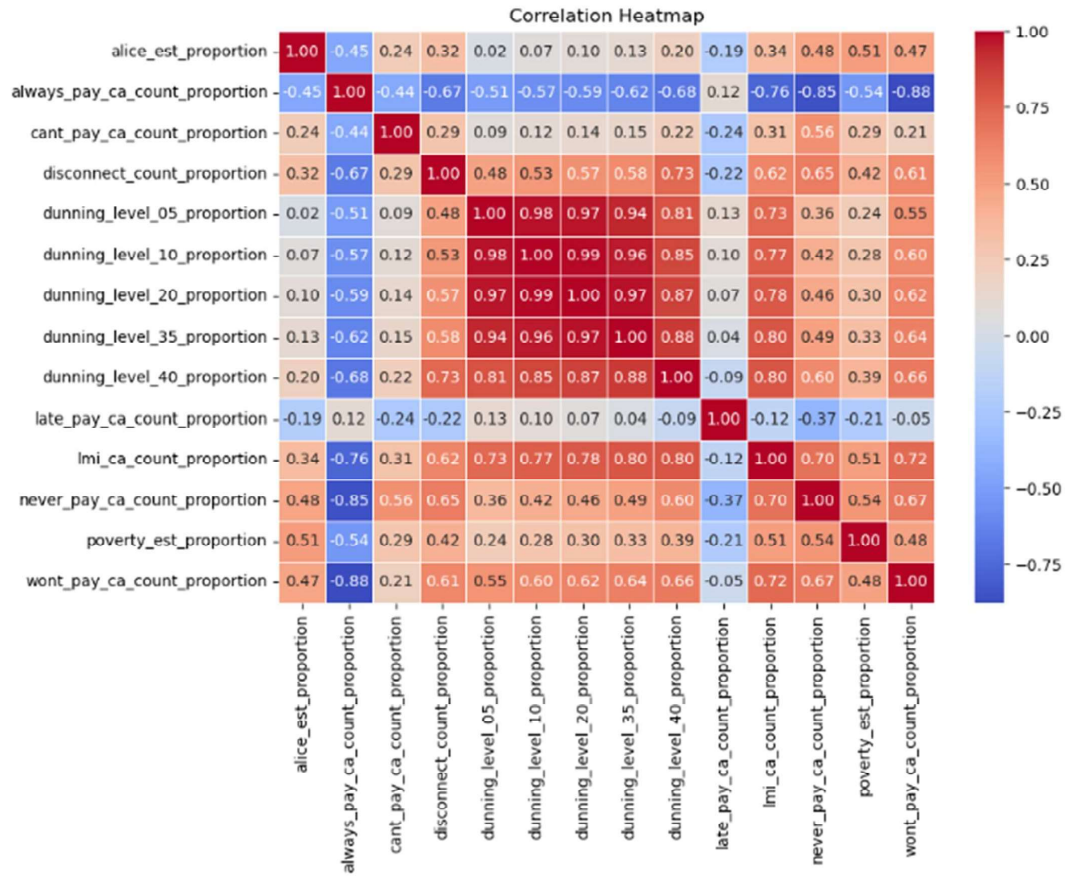
The strongest and statistically significant relationships were observed with the LMI customer proportions while a moderate relationship exists with the poverty customer proportions, and a weaker relationship exists with the ALICE customer proportions. All relationships are positively correlated.

Visual 3.1.1 – LMI Correlation Heatmap



OVERALL RESULTS

Overall correlation results provided for reference.

Visual 4.1.1 – Overall Correlation Heatmap

OBSERVATIONS

- Higher rates of Dunning Level 40 occurrences are associated with increased disconnection rates.
- Higher proportions of "Always Pay" and "Late Pay" customers are associated with lower disconnection rates.
- Higher proportions of "Won't Pay" and "Never Pay" customers are associated with higher disconnection rates.
- Higher proportions of ALICE (Asset Limited, Income Constrained, Employed) and Poverty-designated customers correlate with increased disconnection rates.
- Higher proportions of customers receiving LMI (Low-to-Moderate Income) benefits are also associated with higher disconnection rates; however, this may reflect the composition of the program or raw customer counts in specific geographic areas.
- The strongest positive and statistically significant correlations to disconnect rates are:
 - Dunning Level 40
 - Never Pay
 - Won't Pay
- The strongest negative and statistically significant correlation to disconnect rates is:
 - Always Pay
 - Late Pay

Customer Payment Segmentation

From Complexity to Clarity

Caleb Forner/Ryan Keilen
May 14th, 2024



Introduction



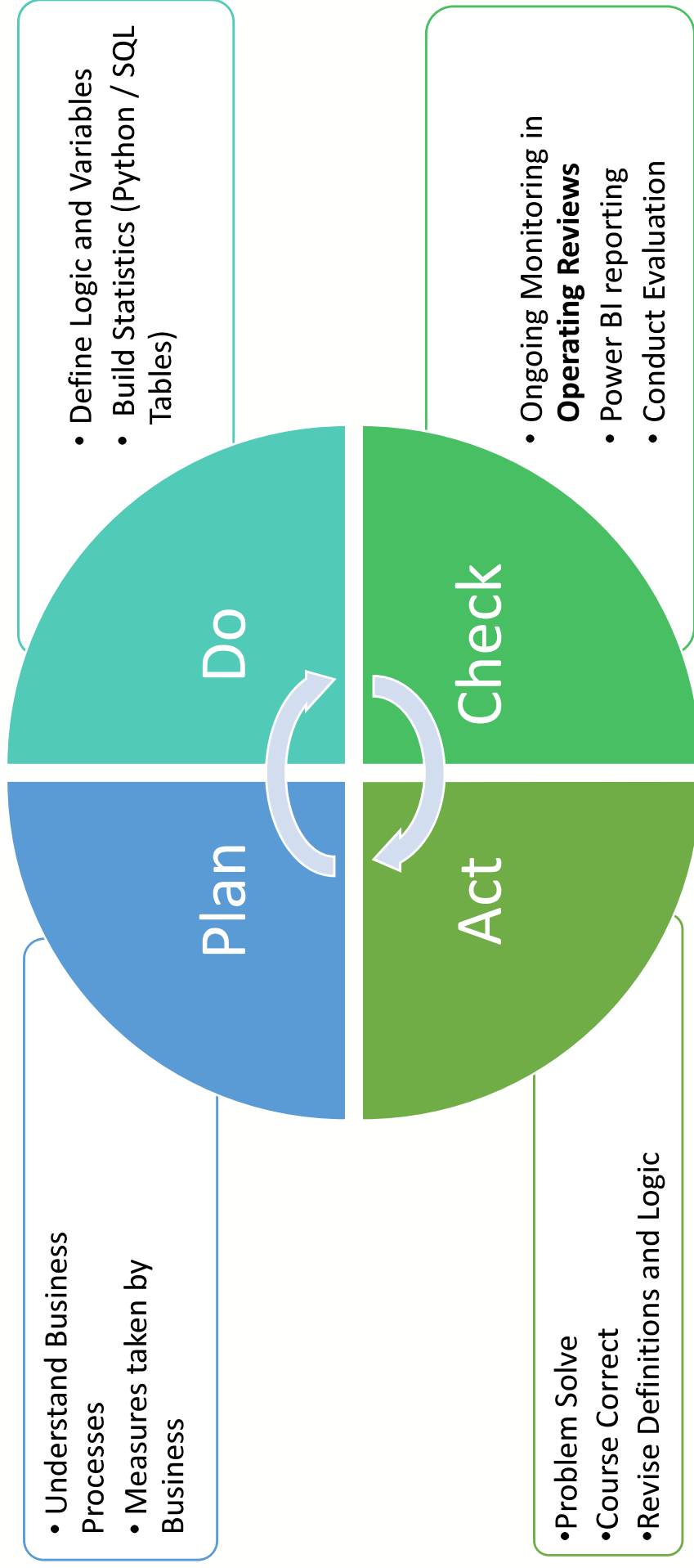
WHY BUILD A PAYMENT SEGMENTATION MODEL?

- Increasing uncollectible expense (UCX)
- Improve customer experience through automated processes
- Provide high-level visibility into payment behavior for ANY customer related metric.

The Journey



CMS Collaboration Model



Segment Philosophy



Always Pay

- Almost always pays in full and on time
- Not expected to reach collections
- Proven track record



Late Pay

- Does not consistently pay on time
- Usually pays in full
- Not expected to reach collections



Won't Pay

- Does not usually pay on time
- Often needs reminder or collection notices
- Usually pays when pressed



Can't Pay

- Usually pays when can
- Financial limitations on paying
- Ideal candidates for assistance



Never Pay

- Unable or unwilling to pay

Design Philosophy

- Behavioral Model
- Logical Segmentation
- Utilize Existing Resources
- Customer Point of View
- 3 Main Principles
 - Scalable
 - Flexible
 - Maintainable

Starting Features

Phase 1				Phase 2		
Payment Behavior	Pay Plan	Dunning	BP ID Types	Account Details	Customer Comms	
On-Time Payments	SPP/W/PP Plans	Dunning level	Low Income Indicator	Number of Move In/Out	Calls	
Full/Partial Payments	Installment Plans	Disconnections	Theft/Fraud	Account Duration	Website Interactions	
Enrolled in AutoPay	SPP/W/PP Defaults		Bankruptcy	Owner/Renter		Complaints
Returned Payments	IP Defaults		Numerous Bad Debt	Premise Write Off	Call/Web post Dunn.	
Average Bill Amount	Holds/Dunning Locks		No Checks Accepted	Program Participation		
Outstanding Balance	Flex Pay		Write Off History	Owner/Renter/Landlord		
Number of Bills Past Due	Budget Plan			Commodity		
Avg. # of days to Pay				Account Class (Res/Com/Ind)		
**Bill Size vs Avg						
Bill as % of Income						
Type of Payment						

Won't Pay
 Can't Pay
 Never Pay

Selected Features

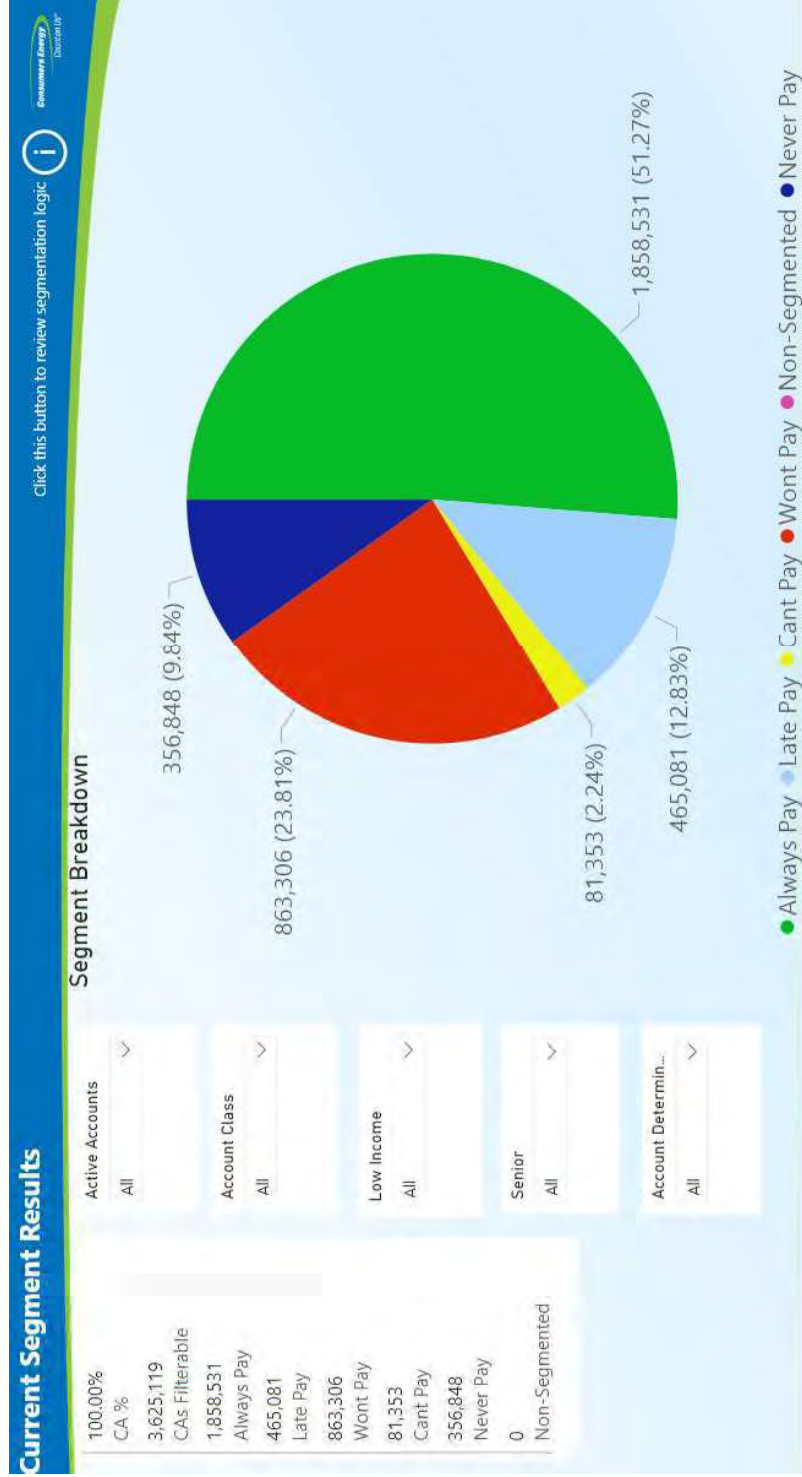
PRIMARY

- On Time Payment %
- Total Payment %
- Maximum Number of Days Paid Late
- Count of Invoices Past Due
- Count of Invoices Paid Late

SECONDARY

- Customer Attributes
- Dunning Locks
- Average Days Paid Late
- Average Bill Amount
- Dunning Disconnects
- Low Income
- Payment Channel Details

The Result



Translating the Results

- Segmentation Flow
- Sub-Segments
- Evaluating Secondary Features

VI: One Missed Payment for Always Pay (Long Term)

SCENARIO: Susan has been a CE customer for the past 11 months. On her 12th month with us she went to Vegas for a couple days and unplugged. Good for you Susan! Unfortunately for her, she forgot to pay her energy bill which was due on Monday while she was rolling smoke eyes at Caesar's Palace. She came home Thursday to a missed email and call indicating she was 3 days past due. Let's see what happens...

Next Run:

- ▶ **Payment Before Next Run:**
 - ▶ If Susan had been paying 100% of her bills on time and in full, no worries! As long as she pays within 3 days of the bill due date would remain in **Always Pay**. If she pays after 3 days, she would move to **Late Pay**.
 - ▶ If Susan pays outside of the 3 day window (provided this is her **ONLY** late payment), she would be pushed to **Late Pay**. If she had previously paid late, even within the 13 day window, she would be pushed to **Won't Pay**.
- ▶ **Non-Payment Before Next Run (+1):**
 - ▶ If she does not pay with still only 1 open doc, Susan's payment percentage will remain at 92% with an on time payment percentage of 92%. She will remain in **Always Pay** until she receives another bill or until she pays the current open bill.
- ▶ **Non-Payment Before Next Run (+2):**
 - ▶ If she does not pay with now 2 open docs, Susan's payment percentage will drop to 83%. This will move her to **Can't Pay**.



5/8/23

THE FORGOTTEN ONES (Non-Segmented customers to account for where SPP/WPP/IP = 0 not fall under Always or Late Pay)

'Always Pay (Slipped)' **RESOLVED**

- Define: Those with a pay_pct = 100% and on_time_pay_pct >= 91% that had max_days_late between
- Count: (~61,000)
- These can be accounted for in Late Pay by removing the on_time_pay_pct from Late Pay

'Always Pay (One Slip)' **MOVED TO WON'T PAY**

- Define: Those with a pay_pct = 100% and on_time_pay_pct >= 91% that had a max_days_late > 9
- Count: (~82,000)
- Initial inclination is that these should go into late pay - due to them not really meeting the definition of 'Won't Pay'

'CHRONIC LATE (CALEB'S FAVORITE FOR WON'T PAY)

- Define: Those with a pay_pct >= 91% and max_days_late > 9
- Count: (~537,850) - (WITH WPP/SPP/IP ~618,000)
- It seems like these would be an easy grab for 'Won't Pay'
- Can add restriction of late_count > 1 (~495,000)
- Can add restriction of on_time_pay_pct between 0% and 50% (~24
- Can't pay pay_pct 50% - 90.99%
 - Partial Docs Cleared > 0?
- Never Pay pay_pct 0% - 49.99%

Feature Evaluation: Locks

0.16%	5,971	171	172	3,753
CA %	CAs Filterable	Always Pay	Late Pay	Won't Pay
148	1,727	0		
Can't Pay	Never Pay	Non-Segmented		

USE CASE EXAMPLES

- Allocating assistance dollars
- Marketing
- Other Segmentation Projects
- Business Process Improvement
 - Payment Locks
 - Communication
- KPI Tracking
 - Large shift in payment buckets
 - Evaluate Business Countermeasure effect

CHALLENGES

- “Analysis Paralysis”
- Clean Data (CRM system vs analytics data sources)
- Feature Selection
- Keeping the end-state in mind (behavioral vs predictive)
- Focusing on the 99%

Questions



email: caleb.fornier@cmsenergy.com

U21870-UCC-CE-0368

Page 1 of 1

Question:

4. Refer to the Company's Response to UCC's First Discovery Request, U21870-UCC-CE-0233, on page 3 where Witness Jessica R. Byrom attests that the Company will complete its internal problem-solving process by Sep. 24, 2025. On Sep. 24, 2025, or whenever available, please provide any and all reports resulting from the internal problem-solving process. Please consider this to be a continuing and ongoing discovery request.

Response:

The internal problem-solving process has been extended to December 31, 2025. The Company will continue to provide any resulting reports as they become available.

Witness: Jessica R. Byrom

Date: September 10, 2025

RESEARCH ARTICLE

Environmental justice and power plant emissions in the Regional Greenhouse Gas Initiative states

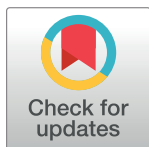
Juan Declet-Barreto¹*, Andrew A. Rosenberg²

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OPEN ACCESS

Citation: Declet-Barreto J, Rosenberg AA (2022) Environmental justice and power plant emissions in the Regional Greenhouse Gas Initiative states. PLoS ONE 17(7): e0271026. <https://doi.org/10.1371/journal.pone.0271026>

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Data Availability Statement: <https://osf.io/tu2hj/>.

Funding: Juan Declet-Barreto's contribution came from work completed while a Kendall Science Fellow at the Union of Concerned Scientists (UCS),

Abstract

Policies to reduce greenhouse gases associated with electricity generation have been a major focus of public policy in the United States, but their implications for achieving environmental justice among historically overburdened communities inappropriately remains a marginal issue. In this study we address research gaps in historical and current ambient air emissions burdens in environmental justice communities from power plants participating in the Regional Greenhouse Gases Initiative (RGGI), the country's first market-based power sector emissions reduction program. We find that in RGGI states the percentage of people of color that live within 0–6.2 miles from power plants is up to 23.5 percent higher than the percent of the white population that lives within those same distance bands, and the percentage of people living in poverty that live within 0–5 miles from power plants is up to 15.3 percent higher than the percent of the population not living in poverty within those same distance bands. More importantly, the transition from coal to natural gas underway before RGGI formally started resulted in large increases in both the number of electric-generating units burning natural gas and total net generation from natural gas in environmental justice communities hosting electric-generating units, compared to other communities. Our findings indicate that power sector carbon mitigation policies' focusing on aggregate emissions reductions have largely benefitted non-environmental justice communities and have not redressed the fundamental problem of disparities in pollutant burdens between EJ and non-EJ communities. These must be directly addressed in climate change and carbon emissions mitigation policy.

Introduction

The electricity sector accounts for 29 percent of total U.S. greenhouse gas (GHG) emissions and about 32% of total U.S. energy-related carbon dioxide (CO₂) emissions [1, 2]. Almost all of the U.S. electricity sector's CO₂ emissions (98%) come from the burning of coal and natural

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Competing interests: The authors have declared that no competing interests exist.

gas. Thus, reducing GHGs associated with electricity generation has been a major focus of public policy to address climate change at federal, regional and state levels across the US.

The fossil-fuel based energy sector remains a priority for climate change mitigation efforts. Historically, concern about the intersection of climate change mitigation and social equity has been a marginal issue in the domestic U.S. policy agenda [3]. The issue of equity has often focused on the question of potential unequal rate-payer cost burdens of various regulatory schemes [e.g., 4]. Nevertheless, there are other equity issues that concern environmental justice scholars and advocates. Prime among these is the problem of co-pollutant emissions [5].

In addition to emitting carbon dioxide—a globally-dispersed pollutant—the power sector is responsible for emissions of other locally or regionally-dispersed pollutants. Electricity generation constitutes 64 percent of SO₂ emissions, 14 percent of NO_x emissions, 3.4 percent of PM_{2.5} emissions, and 1.4 percent of PM₁₀ emissions in the U.S. [6]. Co-pollutants from electricity generation are responsible for significant health impacts on local communities, and contribute to the disproportionate health-impairing pollution burden that exists in many environmental justice communities [7–9].

This paper reports the results of an empirical investigation of CO₂ and two co-pollutant (NO_x, SO₂) emissions from electricity generation in states participating in the Regional Greenhouse Gas Initiative (RGGI). RGGI is the United States' first market-based emissions reduction program, established in 2009 with the intent of reducing carbon emissions from electric generation in those states [10, 11].

The purpose of this study is to address the research gaps in historical and current ambient air emissions burdens from power plants in environmental justice communities. We identified large differences in siting and operation of power plants between communities of color and low-income communities, versus other communities. As policies to mitigate climate change and pollution move forward they must directly address the heterogeneity of conditions in communities of color and low income versus other communities in order to be both just and effective.

Electricity sector emissions and environmental justice

The burden of mortality and morbidity due to exposure to co-pollutants associated with electricity generation (e.g., NO_x, SO₂, PM₁₀ and PM_{2.5}) is well established [12–16]. Reducing emissions of power plant co-pollutants can have many human health benefits, including decreases in all-cause [17] and PM_{2.5}-attributable mortality and morbidity; decreased hospitalizations due to myocardial infarctions and respiratory and cardiovascular disease [18–20], significant economic savings due to lost work days averted; and billions of dollars in health savings and other health benefits [21]. In the United States, a large percentage of both low-income populations and people of color live close to power plants [6, 22, 23], making equitable reductions in power sector emissions a critical public health and environmental justice issue.

Addressing the disproportionate burdens from ambient air emissions and other environmental risks in Black, Indigenous, communities of color and low-income communities is the focus of environmental justice scholars and advocates [24–26]. Achieving environmental justice is the goal of fairly and equitably addressing the fact that some communities, which are typically low-income communities of color, are overburdened with environmental and economic burdens [27].

While there is a substantial body of research linking air quality and health, studies examining the *distribution* of such benefits across communities are much less abundant. Are the benefits from GHG and co-pollutant reductions distributed equitably across communities? Or do some communities benefit more than others? The distribution question is at the center of

environmental justice and climate mitigation research. Environmental justice scholars and advocates contend that mitigation policies should address the attendant co-pollutant emissions associated with fossil fuel combustion in environmental justice communities, thereby also reducing disparities in existing environmental hazard burdens [e.g., 5]. Environmental justice advocates have largely not supported market-based solutions for emissions reductions because there is no explicit recognition nor requirement to address equity, arguing that climate change mitigation policy provides an opportunity to address historical and current pollution burdens—an opportunity that should not be forgone [5]. Environmental justice advocates maintain that in excluding race- and income-based equity considerations—the fundamental historical problem in environmental justice—efforts to reduce GHGs could fail to reduce emissions in environmental justice communities that already face substantial cumulative environmental hazards burdens [28, 29]. Others have found that energy sector decarbonization policies that explicitly incorporate both the realization of environmental justice and improved air quality result in substantial reductions in damages from co-pollutants [30]. Another concern is the possibility that emissions “hotspots” may emerge from local, large point sources like power plants, increasing co-pollutant exposures in overburdened communities. If, for example, the costs of emissions reductions in plants located in environmental justice communities are higher than in plants located elsewhere, market logic will lead to increases in carbon and co-pollutant emissions in those communities as utilities pursue lower-cost reductions elsewhere [3]. Carbon-trading programs, environmental justice scholars contend, are ill-suited to prevent local (i.e., at a specific particular power plant) emissions increases because these programs establish overall emissions reductions goals, and allow regulated entities to trade allowances with each other as a primary compliance mechanism [31]. Environmental justice advocates also reject that climate and air pollution should be handled separately, and warn against missing the opportunity to use climate change mitigation policy to achieve reductions in power plant co-pollutants that have not been realized under the Clean Air Act [5]. In addition, others have voiced more fundamental problems with carbon trading that do not center on emissions reductions, namely that carbon markets undermine efforts to decarbonize the global economy [32].

The analysis presented here investigates empirically carbon and co-pollutant emissions associated with electricity generating units (EGUs) in the ten states participating in RGGI: Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. New Jersey was an initial participant, withdrew in 2012, and in 2018 its newly-elected governor issued an executive order to rejoin. We selected these states because as subjects of the first regional climate mitigation initiative in the electricity sector in the United States, they offer an interesting starting point for assessing distributive outcomes of carbon and co-pollutant reductions between EJ and non-EJ communities.

This study is a longitudinal exploration of ambient air emissions originating from power plants located in environmental justice communities and communities not considered environmental justice communities. We developed the following guiding questions, in consultation with some leaders in the environmental justice movement, as an exploratory first step toward understanding electricity sector emissions in environmental justice communities:

1. To what extent are communities of color and low-income communities overrepresented in residential proximity to power plants in the RGGI states?
2. Are income and race an appropriate basis for a valid and reliable quantitative delineation of environmental justice (EJ) communities versus non-EJ communities, suitable for longitudinal analyses of power plant emissions?

3. What is the distribution of the polluting potential as measured by fuel type, total net generation, capacity factor, and of actual pollution from emissions of CO₂, SO₂, and NO_x from electric-generating units (EGUs) sited in environmental justice communities compared to EGUs sited in non-environmental justice communities?
4. What changes in the relationships between power plant characteristics and community types (EJ versus non-EJ) have occurred since 2009?

To answer these questions, we first develop empirical cumulative distribution functions (CDFs) of population groups indicative of environmental justice community status versus distance to power plants. We then group each census tract in our study area into one of two clusters of high vs low fractions of people of color and people living in poverty, which we label environmental justice communities (EJC) or non-environmental justice communities (non-EJCs). We then estimate six indicators of power plants' potential to pollute (siting frequency, electricity generation capacity, capacity factor, and emissions of CO₂, SO₂, and NO_x), stratifying all indicators by reported fuel type (oil, coal, biomass, or natural gas) separately for power plants sited in EJC vs. non-EJCs. We conclude with a discussion of the implications of our findings for the incorporation of environmental justice goals for overburdened communities in power sector carbon emissions reduction policy.

Data

Database of historical emissions from EGUs

An EGU is a fossil fuel-fired combustion unit that serves a generator that produces electricity for sale [33]. We selected EGUs as the unit of analysis because fuel type data are aggregated at the EGU level, a key component of our analysis. The U.S. Energy Information Administration (EIA) administers yearly surveys to electrical power producers. Survey form 860 provides information on all EGUs that are currently in operation or have retired since 2001, including data on the generator's latitude and longitude, first and last years of operation, and information on installed environmental controls. Form 923 provides data on electricity production and fuel consumption. Emissions data for CO₂, NO_x, and SO₂, generation, fuel inputs, and environmental controls were provided by the EPA's Air Markets Program [34]. Based on these publicly available data, we obtained a combined database of all EGUs in the United States, along with data describing historical electricity generation, capacity, emissions, and other attributes for the period 1995–2015 [34–37]. Due to gaps in EGU data reporting for the years 2001 and 2002, we did not use data from those years in our analyses. We focused on EGUs with rated (or nameplate) capacity of 25 Megawatts (MW) or higher located in RGGI states.

There were 333 EGUs with a rated capacity of 25 MW or higher in RGGI states. There were 261 individual facilities ("fencelines"), and some facilities host more than one EGU; 41 of these facilities co-hosted between two and three EGUs. We eliminated 23 EGUs without valid latitude/longitude coordinates. In our final selection we included 310 EGUs, or 93 percent of all eligible EGUs (Fig 1).

Race/ethnicity and poverty in classifying environmental justice communities

Socio-demographic data on poverty status and race/ethnicity by census tract was obtained for 2010 from the U.S. Census Bureau [38, 39]. Two indicators commonly used to identify EJCs were calculated: First, "Percent people of color" was defined as the percentage of the total population in a census tract that identifies as non-Hispanic African American, American Indian, Alaska Native, Asian, Pacific Islander, other non-White race, or of Hispanic/Latino/Latina

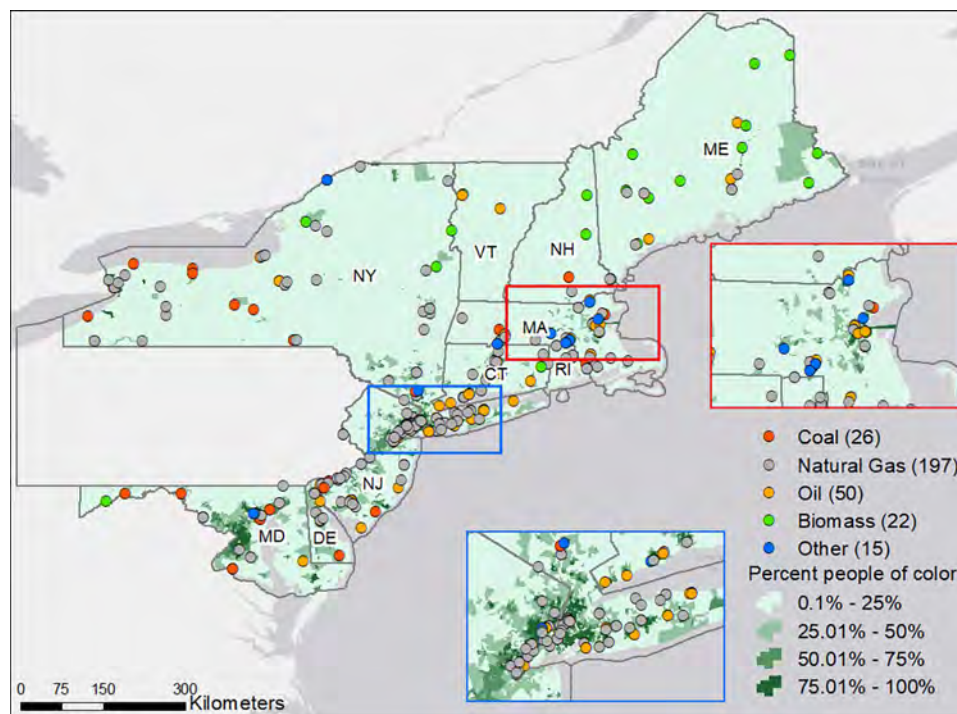


Fig 1. Electric Generating Units (EGUs) and people of color in RGGI states. Each EGU is symbolized according to its most-commonly used fuel in 2015.

<https://doi.org/10.1371/journal.pone.0271026.g001>

origin of any race or races. “Percent living in poverty” was defined as the percent of individuals with a ratio of income to poverty level below one, that is, individuals with incomes below the federal poverty threshold.

Analysis

Population proximity to power plants

We estimated disparities in the proximity of populations to EGUs by developing empirical cumulative distribution functions (CDFs) of population versus distance to EGUs. CDFs of population proximity to industrial point sources have been proposed as providing more meaningful representation of distance-based exposure than fixed-distance bands [40]. We first calculated the straight-line distance (in miles) of the nearest power plant to the geographical center of each census tract. Tracts were sorted in increasing order of distance, and the cumulative population at distance j was defined as the sum of the population in all census tracts at a distance less than or equal to distance j from power plants. Distance was then plotted, separately for each of four population subgroups against the percentage of each subpopulation out of the total population at that distance. The four population subgroups included were whites, people of color, the population below the poverty threshold, and the population at or above the poverty threshold. For the purposes of assessing population proximity to power plants, we deemed people of color and the population below the poverty threshold as environmental justice populations, and whites and the population at or above the poverty threshold as reference, non-environmental justice populations. We did not consider the intersection of low-income and white populations as environmental justice communities, instead focusing on mutually exclusive population subgroup pairs of whites/people of color; and persons living below, or at/above the poverty threshold.

Identification of environmental justice communities

While defining environmental justice communities has been a subject of research and documentation, there is no generally accepted standard research definition of an environmental justice community. Some studies utilize fine-scale census data on the racial/ethnic composition and poverty levels of populations to assess the environmental justice status of communities [26, 41–43]. Others incorporate social, economic, and environmental indicators such as economic inequality [44, 45]; vulnerability based on age [46], political enfranchisement and educational achievement [47, 48], level of civic engagement [26], linguistic isolation [49], sexual orientation and gender identity [50], and criteria air pollution [51].

There is some regulatory guidance on how to identify environmental justice communities [22, 52, 53]; however, the application of such guidance to systematically and quantitatively identify environmental justice communities does not exist. In our research, we address this gap by developing and applying a cluster analysis to identify Census tracts as EJs or non-EJs. In our research, EJs are defined solely by race, ethnicity, and poverty indicators. In our study, we deem race, ethnicity, and poverty indicators to be the best publicly and systematically-available proxies for identifying EJs across a large study area. Our quantitative definition of EJs may differ from other approaches to identifying specific communities as EJs or non-EJs. We adhered to EPA's guidance on identification of EJ communities using percent in poverty and percent people of color indicators (e.g., 22, 49, 50), and we did not explicitly separate low-income white communities from other low-communities in our analysis.

Following Collins et al. [50] we conducted a two-cluster *k*-means analysis for the 11,813 Census Tracts in RGGI states. The *k*-means technique is an algorithm used to classify observations in a dataset into *k*-number of clusters or categories, where each cluster has a mean that produces the smallest within-cluster sum of squares. Rather than inferring poverty or race/ethnicity composition thresholds, we used cluster analysis as a statistical method for grouping each census tract in our study area into one of two clusters of high vs low fractions of people of color and people living in poverty. Based on the *k*-means cluster analysis, we assigned census tracts with higher fractions of people of color and people living in poverty to the EJs category, and census tracts with lower fractions of the same variables to the non-EJs category. *k*-means algorithms are based on averages; as such, our method may not accurately group outliers of extreme values in race/ethnicity and poverty variables. Although our analysis of EGUs is focused only on Census Tracts hosting EGUs (and not all 11,813 Census Tracts in RGGI states), we conducted the cluster analysis on all Census Tracts in RGGI in order to obtain a classification of Census Tracts that is representative of the distribution of poverty and race/ethnicity across RGGI states. Thus, we selected the 219 Census Tracts with at least one EGU located within each tract in our study area, eliminating 8 that had incomplete Census data on race/ethnicity and poverty variables. For each tract of the selected 211 tracts, we calculated two indicators of EJ community status—percent people of color and percent living at or below the poverty threshold—and assigned one of two categories (EJ, non-EJ) to each tract based on the *k*-means cluster analysis.

Polluting potential of EGUs

We estimated six indicators of an EGU's potential to pollute, stratifying all indicators by reported fuel type (oil, coal, biomass, or natural gas) separately for EGUs sited in EJ vs. non-EJ communities. First, we calculated the total number of EGUs sited within tracts designated as EJs and tracts designated as non-EJs as an initial estimation of polluting burden. Second, we used data on annual electricity generation by fuel type in the EGU database to assign a majority fuel type to EGUs based on the largest fraction of generation in each reporting year

and calculate total net generation in both EJC and non-EJC. Third, we combined EGU-level nameplate capacity information (in Megawatts) with generation data to calculate each EGU's capacity factor, a number that represents the ratio of actual electricity produced to the maximum possible generation of the unit. For each year and fuel type, we calculated the mean capacity factor of EGUs that reported capacity and generation data. The final three indicators of RGGI EGUs' polluting potential are the average annual CO₂, SO₂, and NO_x stack emissions. We calculated all indicators for the years 1995–2015, with the exception of 2001 and 2002 as noted above.

Results

Population proximity to power plants

For short distances of residential proximity to power plants in RGGI, the cumulative percentage of EJ populations is markedly higher than the cumulative percentage of non-EJ populations (Fig 2). Between 0 and 6.2 miles, the percent difference between people of color and Whites increases to a maximum of 23.5% (Fig 2A). For distances ≥ 6.2 miles, the difference decreases gradually, amounting to $<1.0\%$ for distances ≥ 39.4 miles. The results for poverty are similar: between 0 and 4.9 miles, the cumulative percentage of people living in poverty is up to 15.3% higher than the cumulative percentage of people not living in poverty (Fig 2B). For distances ≥ 4.9 miles, the percent difference decreases gradually to $<1.0\%$ at a distance of 20.5 miles or more.

Identification of environmental justice communities

The cluster analysis cleanly split Census Tracts into two groups; 59 census tracts were classified as EJC and 152 tracts were classified as non-EJC. The EJC had, on average, 65.8 percent people of color and 19.0 percent living with low incomes. The 152 tracts classified as non-EJC averaged 15.9 percent people of color and 10.6 percent living with low incomes (Table 1). Of the 152 tracts classified as non-EJC, five tracts with percent people of color one standard deviation above the mean fell in the non-EJC category and are labeled as non-EJC outliers (Fig 3).

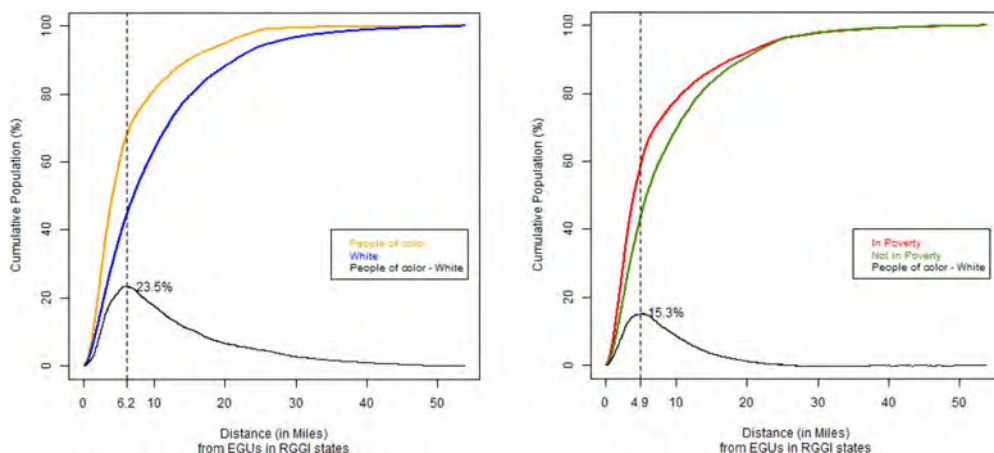


Fig 2. a. Cumulative distribution of people of color and White populations by distance to EGUs in RGGI. Black line indicates between the cumulative population curves. The maximum percent difference is labeled on the figure. Dotted vertical line indicates distance of maximum difference value. b. Cumulative distribution of people living in poverty and people not living in poverty by distance to EGUs in RGGI. Black line indicates difference between the cumulative population curves. The maximum percent difference is labeled on the figure. Dotted vertical line indicates distance of maximum difference value.

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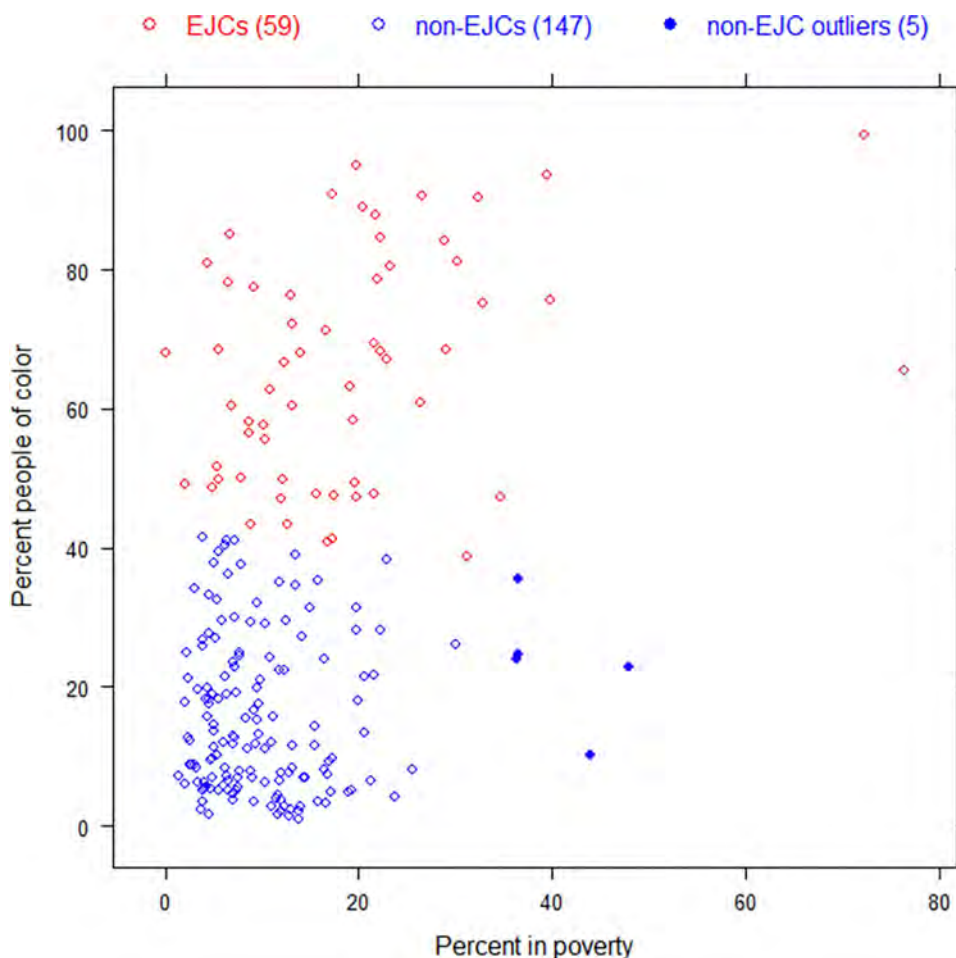
Table 1. Basic statistics of k-means cluster analysis of census tracts hosting EGUs in RGGL.

	Percent people of color		Percent in poverty	
	mean	Sd	mean	sd
EJCs (n = 59)	65.8	16.4	19.0	14.0
non-EJCs (n = 152)	15.9	11.2	10.6	7.9

<https://doi.org/10.1371/journal.pone.0271026.t001>

In Fig 3 we have shown only the Census Tracts hosting EGUs; see S1 Fig for the EJC/non-EJC classification of all Census Tracts in RGGL.

Of the 310 EGUs in our analysis, 73 (23.5%) were sited in Environmental Justice communities, and the remaining 237 (76.5%) were sited in non-Environmental Justice communities. When looking at the distribution of EGUs within communities, we find that EJ communities have a higher relative frequency of multiple EGUs sites when compared to non-EJ communities: among all EJ communities in our study area, 57.4% have exactly one EGU, versus the large majority of non-EJ communities, where 71.3% of all communities host exactly one EGU (Table 2). Consequently, 42.6% of EJ communities host between 2 and 5 EGUs, compared to only 28.7% in non-EJ communities.

**Fig 3. Percent people of color and percent in poverty statistics in k-means cluster analysis of census tracts hosting EGUs in RGGL.**

<https://doi.org/10.1371/journal.pone.0271026.g003>

Table 2. Number of census tracts with one and between 2–5 EGUs sited within EJs and non-EJs communities in RGGI.

Number of EGUs sited within	Number of Census Tracts	
	in EJ communities	in non-EJ communities
1	27 (57.4%)	122 (71.3%)
Between 2 and 5	20 (42.6%)	49 (28.7%)

<https://doi.org/10.1371/journal.pone.0271026.t002>

Polluting potential of EGUs

Number of EGUs. The longitudinal analysis of EGUs by fuel type shows that since 1995, natural gas increasingly became a larger percentage of EGUs in both EJs and non-EJs (Fig 4). However, since 2003, the number of natural gas EGUs as a percent of all EGUs was higher in EJ communities than in non-EJ communities. For every year in 1995–2015, the percent of coal-fired EGUs in EJ communities was consistently smaller than that of coal-fired EGUs in non-EJ communities. The number of EGUs in each type of community also grew during the time period: from 50 to 70 (a 40.0% increase) in EJ communities and from 193 to 225 (a 16.5% increase) in non-EJ communities, and both communities saw the sharpest increases in after 2003. Biomass-burning EGUs were located only in non-EJ communities. To assess the statistical significance of changes in the number of power plants, we conducted one-way ANOVA of the frequency of oil-, natural gas-, and coal-fired power plants. We excluded biomass-fired plants because no biomass plants regulated by RGGI were sited in EJ communities in our analysis; we also excluded plants that did not report fuel type. The p-values indicate that the number of power plants of each fuel type are different in statistically-significant ways in EJs compared to non-EJs (S1 Table).

Electricity generation. Total net electricity generation in EGUs sited in both EJ and non-EJ communities has been dominated by coal and natural gas-fired units (Fig 5), with a decrease in the share of coal generation in tandem with an increase in natural gas since 1995. In EGUs sited in EJ communities, since 1995 natural gas became a larger share of total generation than in non-EJ communities. For each year in the study period, the fraction of coal-based generation has been larger in non-EJ communities than in EJ communities. In units sited in non-EJ communities, total net generation increased from about 104,358 GWh in 1995—peaking in 2005 at 180,316 GWh and then decreasing to 132,988 GWh in 2015. In EJ communities, generation increased consistently from 25,091 GWh in 1995 to 52,529 GWh in 2015.

Capacity factor. During the study period, mean capacity factors of oil and natural gas EGUs were similar in both EJs and non-EJs (Fig 6). Coal-fired EGUs in EGUs sited in non-EJs have higher capacity factors than in those sited in EJs. As in Figs 4 and 5, biomass-fired EGUs have been present only in non-EJs.

Emissions of CO₂, SO₂, and NO_x. The longitudinal trajectory of average annual CO₂ emissions was generally similar for EGUs located in EJ communities and in non-EJ communities (Fig 7), but there are some important differences. First, between 1995–2005, CO₂ emissions in EJs were slightly higher. While EGUs in both types of communities saw sustained reductions in CO₂ emissions after 2005, those reductions were larger in EJs after 2009 (with the exception of an increase in 2010). After 2003, CO₂ emissions from natural gas are slightly larger than in non-EJs. Small amounts of biomass emissions appear only in EGUs located in non-EJs.

SO₂ emissions trajectories between EJs and non-EJs are similar, with two exceptions (Fig 8). First, in EJs, SO₂ emissions during 1997 and 1999 were higher in. Second, starting in 2003, SO₂ emissions decreased in EGUs in both types of communities but reductions were

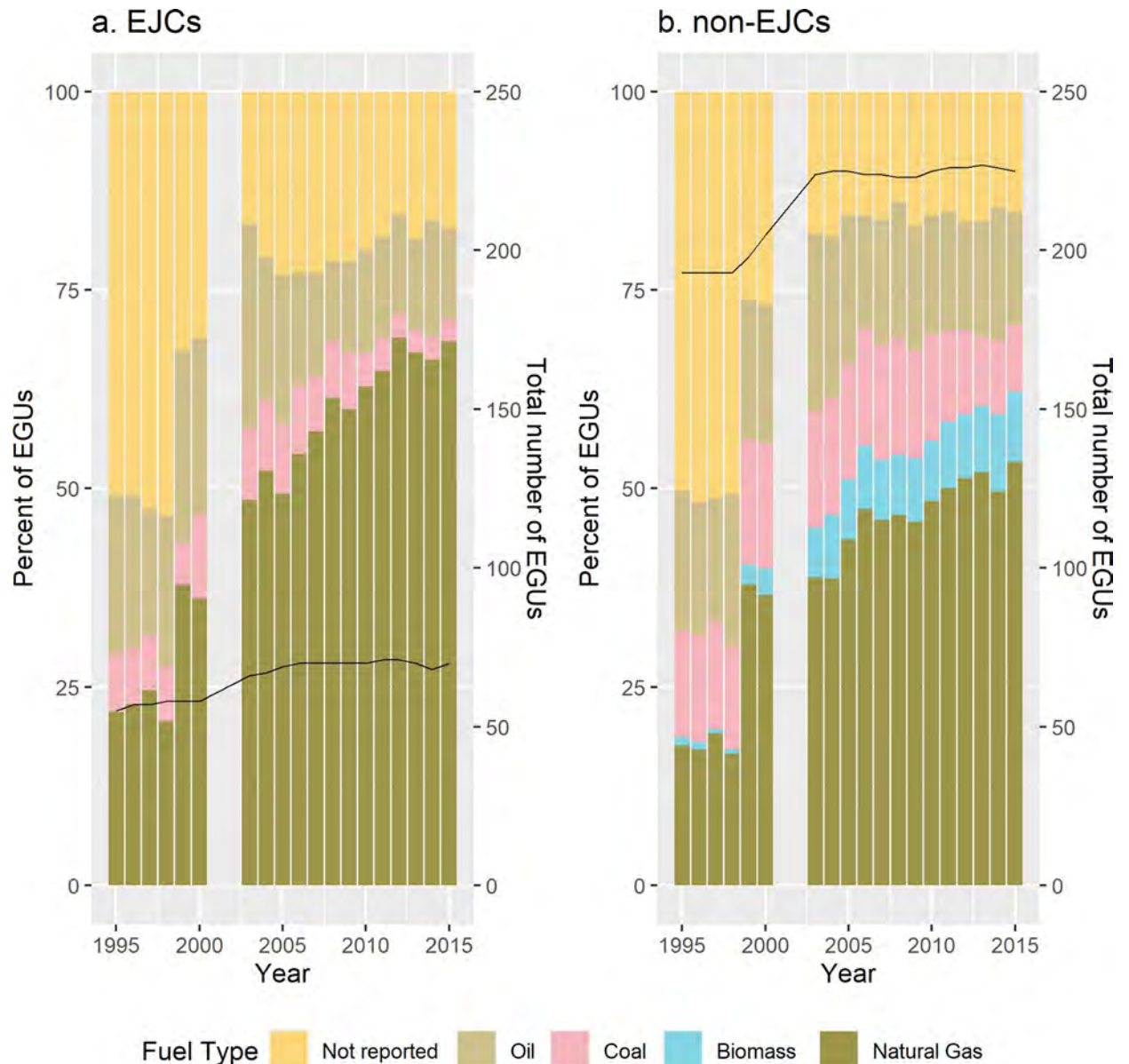


Fig 4. EGUs by fuel type in RGGI sited in (A) EJC and (B) non-EJC. Percent of total EGUs by fuel type is indicated in left y-axis. Black lines indicate the total number of EGUs and correspond to the right y-axis.

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larger in EJC especially after 2007. Since 1995, average SO_2 emissions have been mostly from oil and coal and decreased in both types of communities (but emissions dropped more in EJ communities after 2009).

NO_x emissions between EJ and non-EJ communities are similar, but larger on average in EJ communities during 1995–2005 (Fig 9). After 2005, differences are due to biomass NO_x emissions from EGUs in non-EJCs, as there are no biomass NO_x emissions in EJC. In both types of communities, the share of NO_x emissions from coal, oil, natural gas dropped markedly after 2000, and with the exception of years 1999 and 2000, NO_x emissions from biomass burning—only found in non-EJCs—remained a small fraction of average annual NO_x emissions.

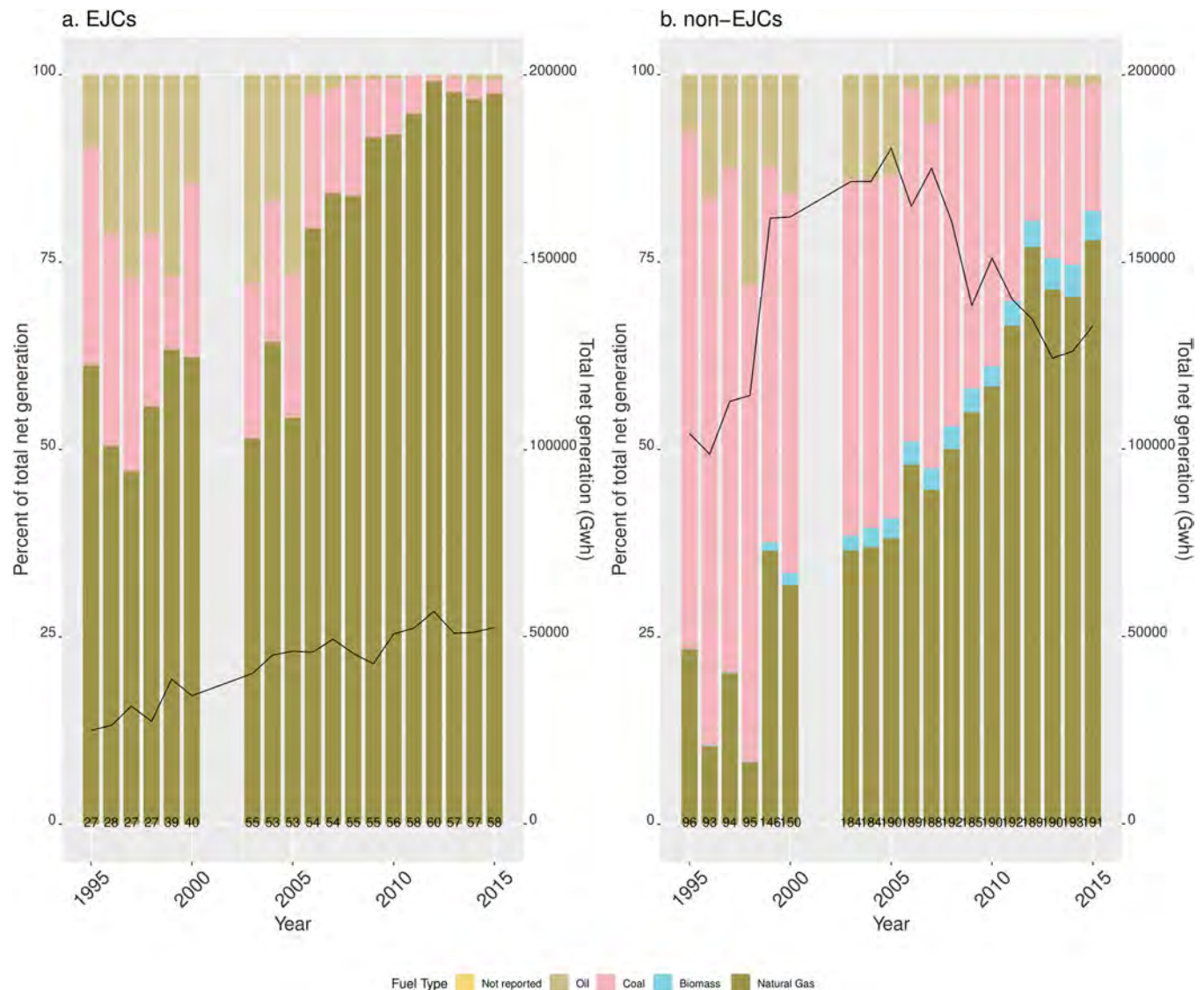


Fig 5. Total net generation by fuel type in EGUs in RGGI sited in (A) EJC and (B) non-EJC. Percent of total net generation by fuel type is indicated in left y-axis. Black lines indicate total generation and correspond to the right y-axis. EGUs that did not report fuel type also did not report generation and are thus omitted. The numbers at the bottom of the bars indicate the number of reporting units for each year.

<https://doi.org/10.1371/journal.pone.0271026.g005>

Discussion

Our analysis constitutes the first systematic and empirical attempt to assess disparities in pollutant potential from electricity production between EJ communities and non-EJ communities in RGGI states. There are a few key insights from our analysis. First, our proximity analysis shows that in states that participate in RGGI, a larger cumulative share of environmental justice populations live in proximity to electric power plants compared to non-EJ populations at similar distances. This is the case for distances of up to 39.4 miles from power plants in the comparison between Whites and people of color, and up to 20.5 miles for the poverty status comparison. However, the largest differences in population proximity occur between 0–6.2 miles based on race (up to 23.5% higher for people of color), and between 0–4.9 miles based

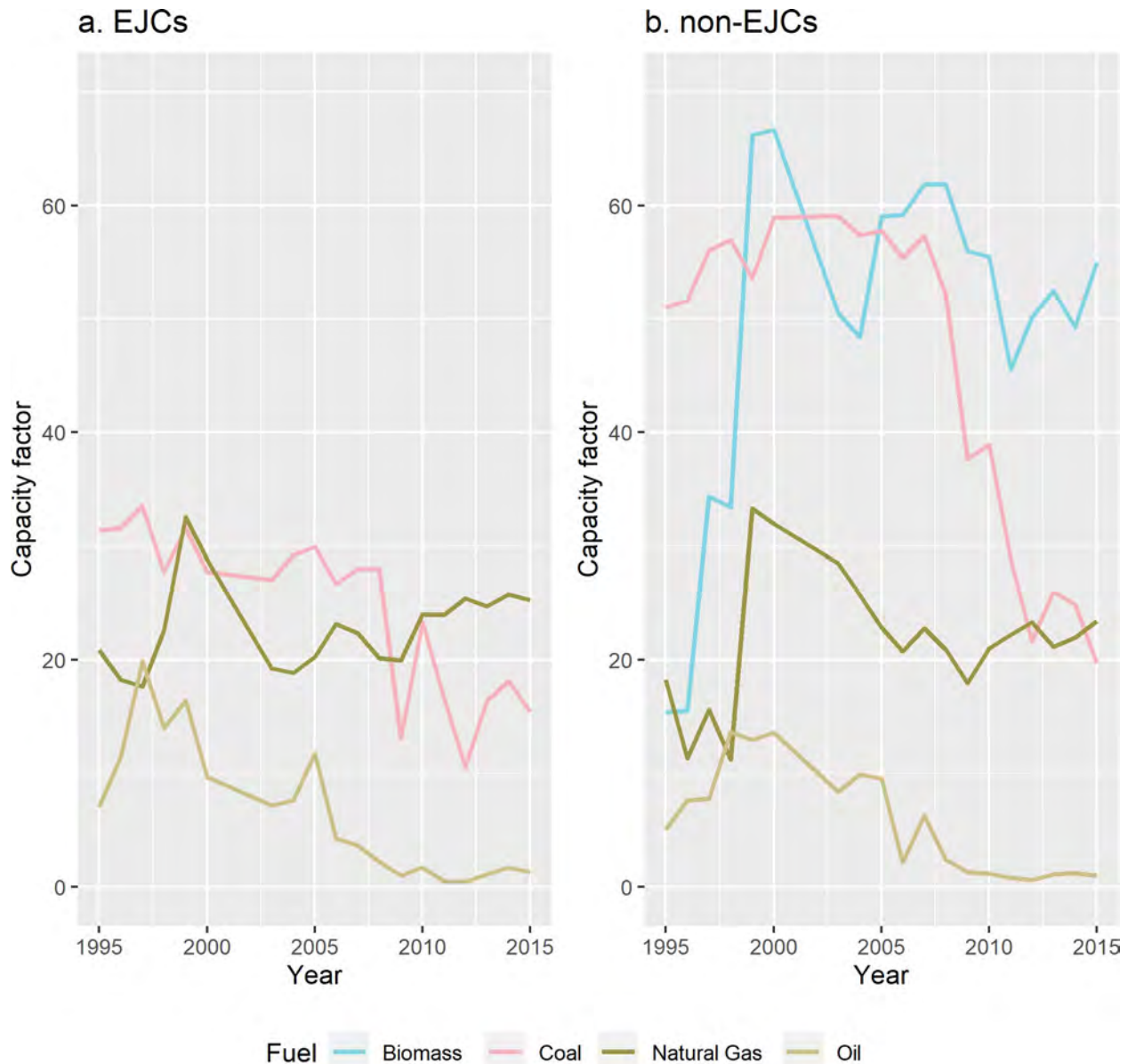


Fig 6. Mean capacity factor by fuel type in EGUs in RGGI sited in (A) EJCs and (B) non-EJCs. EGUs that did not report fuel type also did not report capacity factors and are thus omitted.

<https://doi.org/10.1371/journal.pone.0271026.g006>

on income (up to 15.3% higher for people living in poverty). Furthermore, our siting analysis also found that 42.6% of EJ communities host between 2 and 5 EGUs, but only 28% of non-EJ communities host the same frequency range of EGUs. These results should be considered in energy sector emissions reduction policies that also contribute to reducing human health impacts from power plants because living within short distances of power plants is correlated to greater adverse health outcomes than for those people living farther away. For example, adverse birth outcomes have been found to be highest for populations living within 5 km or less from power plants emitting fine particulates [54]. While proximity to power plants is not sufficient to fully assess disparities in health impacts due to emissions from fossil-fuel

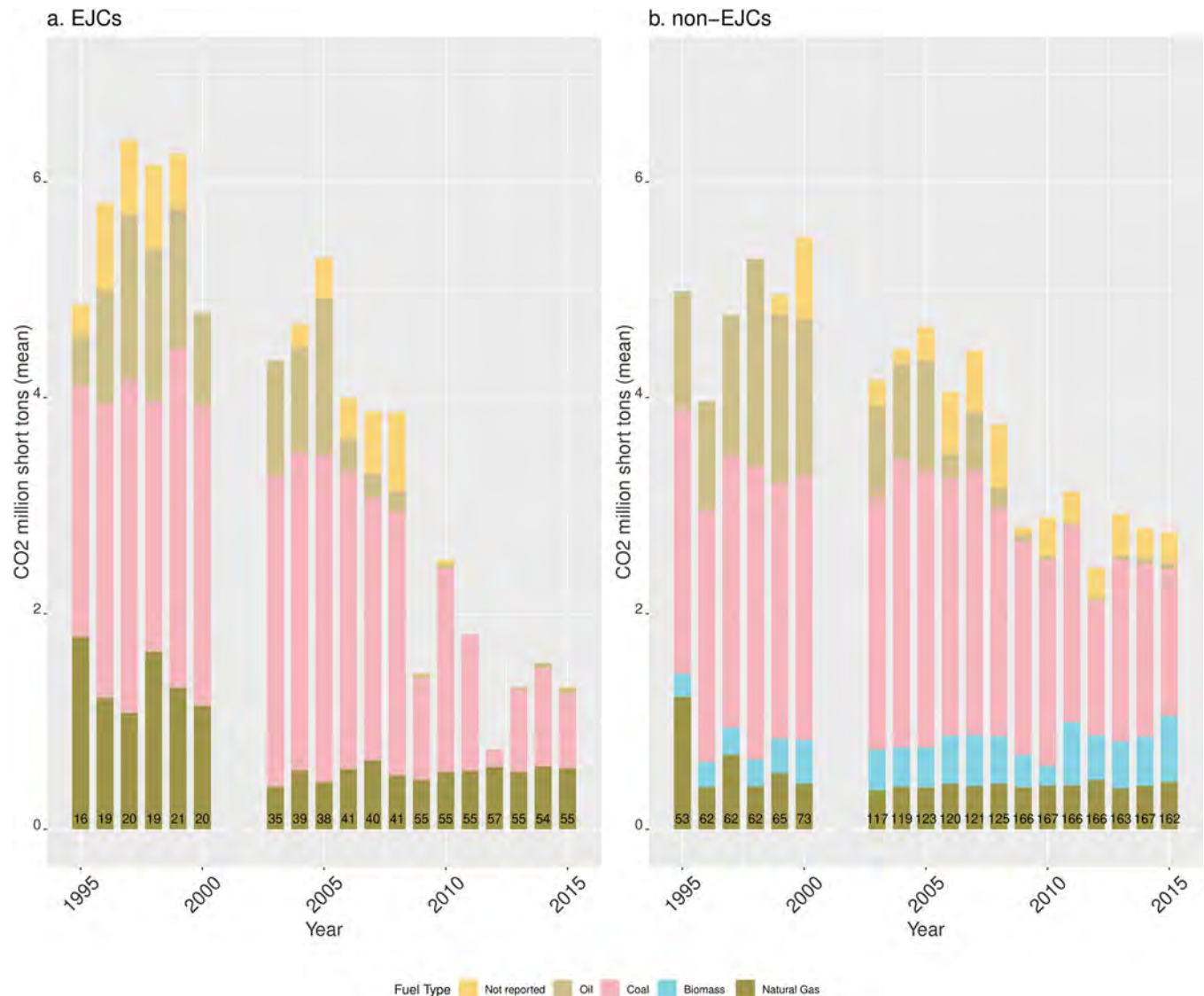


Fig 7. Mean annual CO₂ emissions by fuel type from EGUs in RGGI sited in (A) EJC and (B) non-EJC. The numbers at the bottom of the bars indicate the number of reporting units for each year.

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electricity production, our results further validate the inequity that people living with low incomes and people of color continue to live near pollution emitting facilities and with higher potential exposure burdens due to a higher frequency of multiple facilities many decades after the problem of siting disparities first came to light [27].

Second, the coal-to-natural gas transition was more marked in environmental justice communities. As coal-fired EGUs became a smaller share of all EGUs between 1995–2015, natural gas in EJ communities became an increasingly larger fraction of all EGUs (and of total net generation) with a consistent upwards trend in both indicators of polluting potential. However, the time period also coincides with a general downwards trend of average emissions of CO₂, SO₂, and NO_x across EGUs in both types of communities (our third main finding). Finally, our fourth main finding is that coal-fired EGUs in non-environmental justice communities consistently run at higher rates than in environmental justice communities.

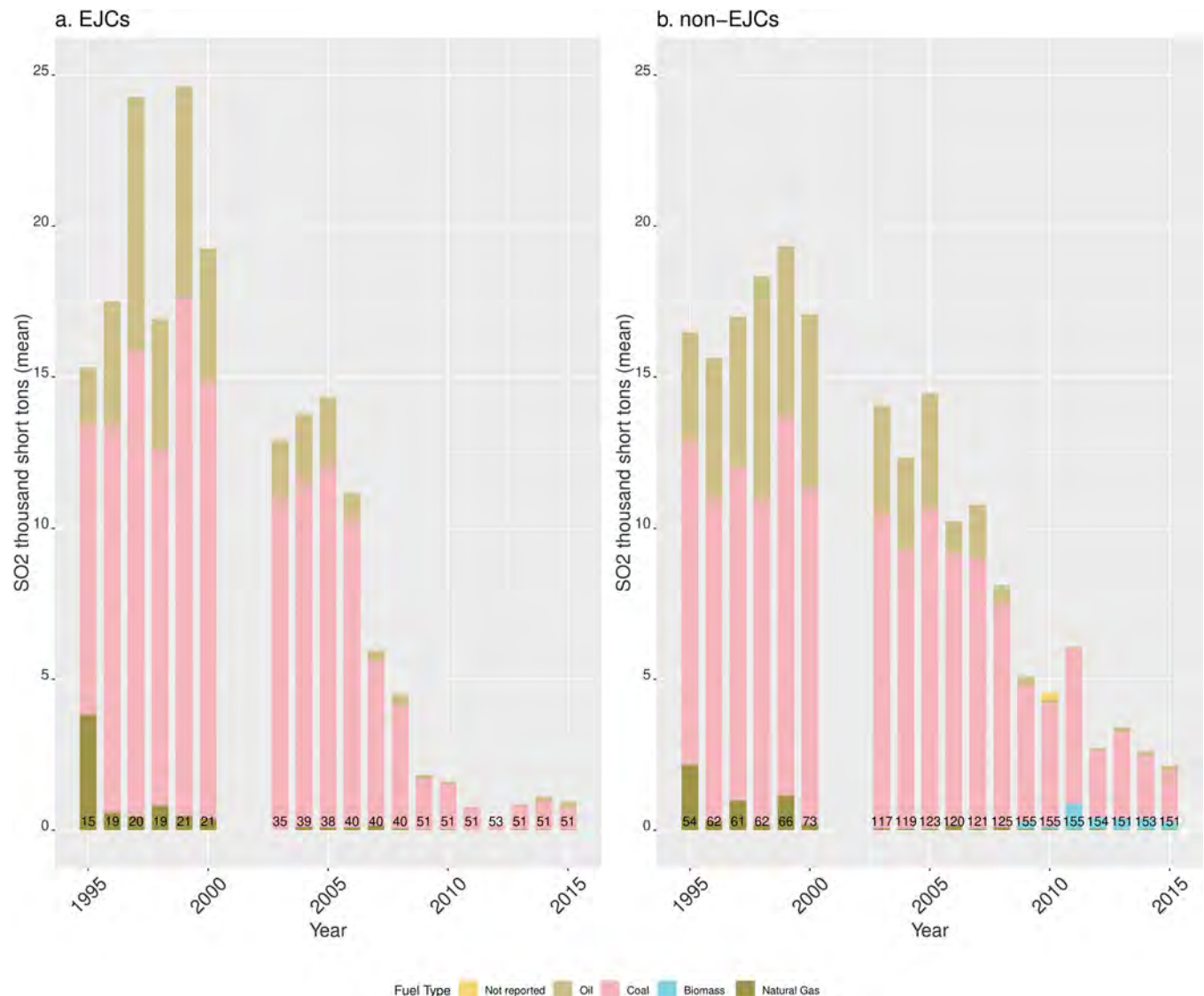


Fig 8. Mean SO₂ emissions by fuel type from EGUs in RGGI sited in (A) EJCs and (B) non-EJCs. The numbers at the bottom of the bars indicate the number of reporting units for each year.

<https://doi.org/10.1371/journal.pone.0271026.g008>

Comparison of our study to the EJ assessment of California's cap-and-trade program

Our study compares to and diverges from the only other empirical assessment, to our knowledge, of environmental justice burdens in a US regional GHG emissions market, focused on the first three years since California's cap-and-trade program began [55]. That study found that facilities regulated under the trading program are disproportionately located within environmental justice communities, that GHG emissions increased in more than half of regulated facilities since trading started, and that neighborhoods that saw GHG and co-pollutant emissions increases were largely low-income communities of color also with high rates of other socio-demographic markers associated with disadvantage. In comparison, two of our findings stand out. First, in RGGI states, environmental justice communities live closer than other populations to power plants. Second, the relative frequency of multiple EGUs in any one Census

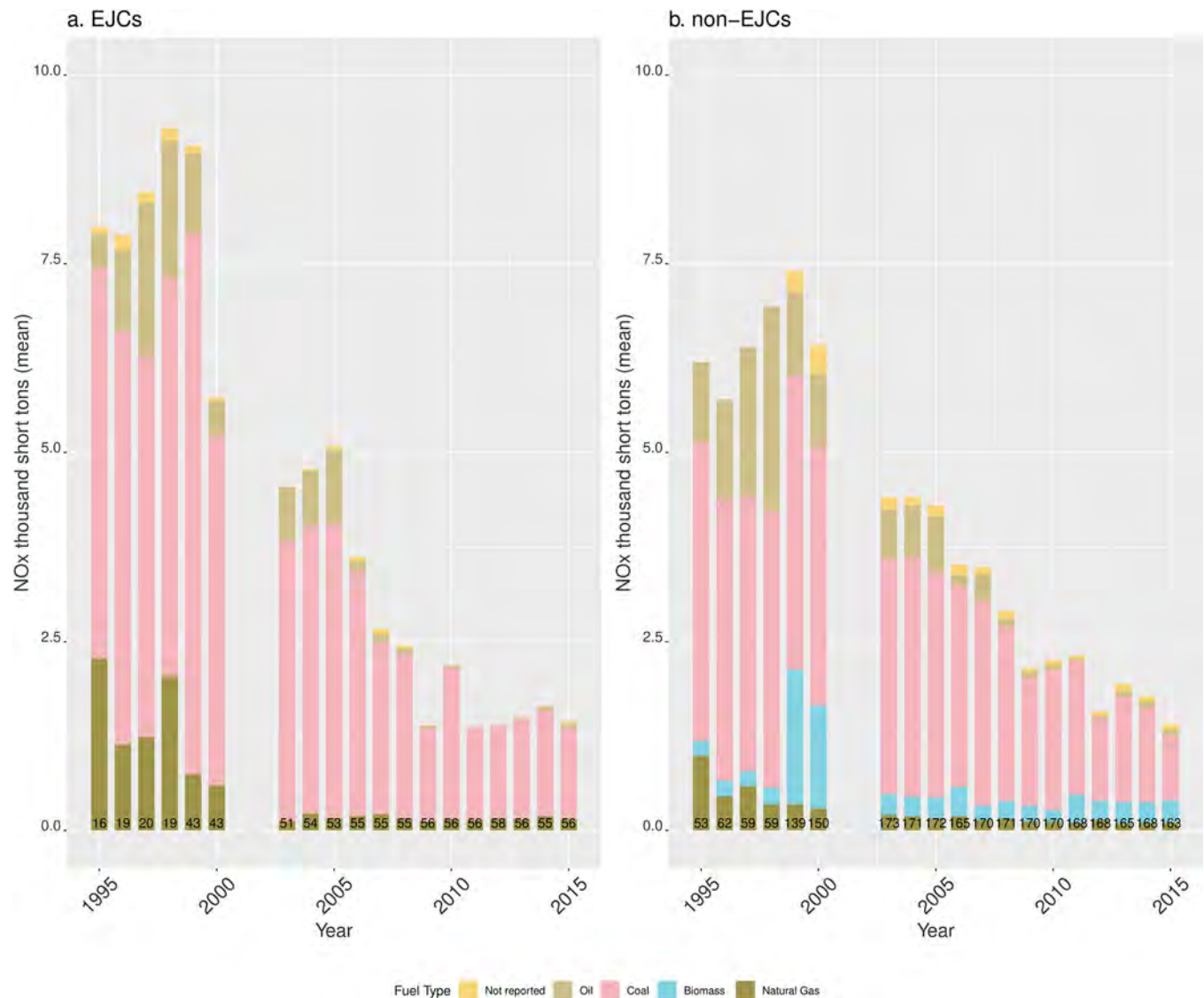


Fig 9. Mean NOx emissions by fuel type from EGUs in RGGI sited in (A) EJCs and (B) non-EJCs. The numbers at the bottom of the bars indicate the number of reporting units for each year.

<https://doi.org/10.1371/journal.pone.0271026.g009>

Tract is higher in environmental justice communities than in non-environmental justice communities. These findings suggest that, similar to California's cap-and-trade program, environmental justice communities in RGGI are more exposed to dangerous co-pollutants compared to other communities. Our study diverges from the California assessment because, due to data limitations, we did not assess emissions from PM_{2.5} or air toxics, both of which have important implications for human health. In addition, our study was restricted to power sector emissions regulated under RGGI, whereas California's program covers all industrial sectors except for agriculture. But we were also able to look at a longer trajectory of emissions from the mid-1990s to 2015, which arguably were influenced by market and regulatory factors underway since before the start of the program in 2009. In our inductive assessment, we did not find changing trends in trajectories of CO₂, NO_x, or SO₂ specifically tied to the pre- and post-2009 years. Instead, emissions trajectories in our study follow a generally downwards trend

detectable since 1995 that is likely due to the transition from coal to natural gas, and perhaps to other mitigation policies in the power sector.

Limitations of our research

As a first step in assessing disparities in power plant emissions exposure, our research has some limitations. First, our analysis does not consider dispersion of co-pollutants, as we focused on disparities in power plant characteristics in EGUs sited in EJ vs. non-EJ communities. Therefore, our analysis does not indicate exposure from the fate and transport to pollutants. The co-pollutant data used in our study (SO₂ and NO_x) represent stack emissions, and do not consider how physical and photo-chemical atmospheric interactions create or disperse pollutants dangerous to human health or how power plant operating conditions differ among environmental justice and other communities. These interactions should be resolved using atmospheric chemistry and dispersion models that also include the dispersion of methane and fine particulates, which are outside the scope of the present research. Furthermore, we have considered power plant emissions in isolation from the cumulative environmental and health threats with which environmental justice communities are often overburdened, including burdens from transportation emissions. Our analysis is focused on emissions, siting, generation, and capacity factors of power plants hosted in communities in RGGI states. It has been argued that not comparing host vs. non-host communities results in underestimating environmental inequities [56]. We recognize that our results are conservative in this regard, but have shown that communities hosting at least one RGGI power plant do not have significantly higher rates of poverty or of people of color than non-host communities. In addition, EJ communities often endure burdens from energy production infrastructure such as shale gas expansion, oil trains, gas pipelines, and liquid natural gas export stations, but these are outside the scope of our work. For these reasons, our analysis underestimates the true burden of power plant-related exposure between environmental justice communities and other communities, which remains a limitation of current environmental justice assessments and policy [57].

While we have shown the transition in RGGI from coal to natural gas—underway since before the formal start of the program in 2009—our analysis did not allow us to establish if the steeper increase in natural gas units in environmental justice communities occurred due to conversion of coal units to gas, or if it entailed the construction of new plants. In addition, it was not possible for us to assess differences in the coal-to-gas transition between urban areas in RGGI states (that tend to be predominantly populated by people of color) and rural areas (that tend to be whiter). These are a key areas for future research that would also need to take into account permitting process dynamics among regulators and utility operators to determine the degree of disparity in new EGU construction in environmental justice communities.

Our results potentially underestimate the extent of locational disparities. In our analysis we use the federal poverty threshold to identify people living in poverty. However, the federal poverty methodology was developed in the 1960s and is recognized as outdated with respect to present family income needs. For example, research suggests that on average, families require twice the federal poverty level to meet basic needs [58]. Furthermore, the utility of the federal poverty level is limited because it does not take into account differences in cost of living across geographies in the United States. Furthermore, U.S. Census data reporting limitations on the ratio of income to poverty levels did not allow us to separate those living *above* the poverty line from those living *at* the poverty line. In our research, it would have been preferable to combine the poverty level of people living under the poverty level together with those living at the poverty level as our indicator of poverty, but this was not possible.

Beyond fuel type and generating capacity, there may be other factors that affect emissions levels which were not explored in this paper. Small emitters (i.e. with capacity rating <25MW) fall outside the scope of RGGI, and often have lower stack heights that can potentially contribute to localized dispersion of pollutants. Do these emitters constitute un-quantified emissions burdens in environmental justice communities? This question, to our knowledge, has not been explored systematically. There are outstanding issues of procedural justice that need to be considered in future research as well. Research has found deficits in environmental enforcement actions under the Clean Air Act and other environmental regulations in US counties with low-income populations when compared to other counties [59]. To what extent has there been equity in enforcement and compliance of power sector-related environmental regulations in environmental justice communities in RGGI states? These are critical questions to answer to deepen our understanding of disparities in environmental hazards and outcomes in environmental justice communities.

Our definition of what constitutes an EJ community identifies the intersection of populations of color with those of low income, but with the exception of the proximity analysis, our research does not consider power plant co-pollutant burdens in white EJ communities nor in wealthier communities of color. Other functional definitions of EJ communities may be more appropriate in other geographical contexts or reveal additional insights, as suggested by the five communities with high rates of people of color or people living in poverty that we classified as non-EJ community outliers (Fig 3). A guiding principle of environmental justice community organizing is to “let people speak for themselves” [60], which could imply that our definition of EJ communities may exclude communities that self-identify as EJ communities. While we find our method to be useful to systematically assess power plant-related burdens across a large number of communities, we recognize its potential to overlook communities burdened with historical and current environmental injustices, and invite further dialog among EJ advocates, researchers, and environmental regulators to refine the methods, and qualitative and quantitative data useful to assess the EJ status of communities.

Conclusions

We have taken an inductive approach to answering questions from environmental justice advocates regarding power plant emissions burdens, focusing on the mid-1990s to 2015. During that period, multiple policies as well as increased availability of natural gas, among other reasons, have contributed to reshaping the landscape of fossil fuel burning for electricity production nationally in the US, but also in RGGI states. In our research, the clearest signal of change in emissions trajectories is that of CO₂, SO₂, and NO_x from coal, which coincides with the “dwindling role for coal” [61] transition in the U.S. energy sector towards natural gas. But that transition also clearly entailed a large increase in both the total number of natural gas-firing units and in total net generation from natural gas in environmental justice communities, indicating that RGGI’s focus on sector-wide, aggregate reductions has not explicitly considered potential impacts or inequitable burdens on environmental justice communities. This is especially salient because environmental justice advocates have warned that achieving equity and environmental justice goals requires explicit attention in carbon and climate mitigation policy, and should not be left up to chance in climate change mitigation policy [5]. In addition, concerns remain about the potential for carbon market forces to drive increases in carbon and co-pollutant emissions as utilities pursue lower-cost emissions reductions [3]. Some claim there is no evidence that emissions trading programs have exacerbated pollutant burdens in environmental justice communities [see 62–65]. But as Pastor et al. [29] have argued, these claims are largely theoretical and mostly lack empirical evidence [but see 66 for a notable

exception]. We note that others have suggested that factors other than RGGI market incentives have driven emissions reductions: lower natural gas prices have been found to be “the main driver of the RGGI system” [67], but teasing out the endogenous or exogenous reasons for aggregate emissions reductions in RGGI is outside of the scope of our research and remains an area for future research especially in regards to environmental justice burdens. The electric power sector in RGGI is a managed policy landscape, and moving forward, there need to be policies that bring benefits to overburdened communities. While we did not analyze RGGI’s specific policies, we have demonstrated that differences in siting, generation, capacity factors, and emissions between environmental justice and non-environmental justice communities hosting RGGI power plants are significant (even if, as we have noted above, our analysis underestimates the true burden of power plant pollutant exposure).

The coal to natural gas transition has occurred in the context of a largely successful effort from environmental, clean and renewable energy, and climate change mitigation advocacy groups to retire coal-burning power plants to reduce GHG emissions and enable the transition to renewable energy. In our analysis, the disaggregate benefits of that transition—as measured by inequities in number of natural gas-fired, units, and generation of electricity and CO₂ emissions from natural gas—appear to have gone to non-environmental justice communities. But we have also shown that in RGGI states, non-EJ communities contain larger fractions of coal-fired EGUs than EJ communities, that reductions in average CO₂ emissions between 1995–2005 in EJ communities were slightly larger, CO₂ reductions in EJ communities were larger than in non-EJ communities after 2009, and average NO_x emissions were larger in EJs from 1995–2005, but dropped markedly after 2000. These results suggest that environmental inequalities manifest in many different ways. However, for environmental justice concerns, the most salient feature of the coal-to-natural gas transition shown in our analysis has been that the percent of natural gas-fired EGUs in EJ communities was consistently higher than in non-EJ communities.

While there have been aggregate reductions in CO₂, SO₂, and NO_x from power plants, communities hosting power plants in RGGI states have divergent historical and current conditions of social and environmental disadvantage, and policies cannot operate as if race, ethnicity, and income do not matter because, as we have demonstrated, they clearly do. But which policy, market, or other forces can account for the faster ramp up of natural gas power plants in environmental justice communities? To what degree did the transition entail new natural gas facilities versus coal plant conversions? How did power plant pollution control technologies over time contribute to changes in emissions? To what extent have advocacy groups’ campaigns aligned more with non-EJ communities, and how can these efforts help explain the differential patterns we found? These are critical questions to answer in light of inequities in enforcement of environmental, civil rights, and public health laws and policies, as well as pervasive discriminatory zoning and land-use practices, flaws in industrial risk assessment, and exclusionary practices that limit meaningful participation of environmental justice communities in decision-making, all of which prompted the emergence of the environmental justice in the first place [68, 69].

Our analysis demonstrates that, in the absence of directed policy attention, there are real differences in siting and operation of facilities in communities of color and low-income communities, and the polluting potential for overburdened communities is higher. Therefore, policy efforts to address the energy generation sector’s emissions need to directly consider the equity implications of policy options, not just their impact on one or more pollutants. And, despite the fact that CO₂ may be globally impactful, local effects of energy production cannot be ignored, ethically or legally.

Supporting information

S1 Fig. Percent people of color and percent in poverty statistics in k-means cluster analysis of all census tracts in RGGI states.

(TIF)

S1 Table. Diagnostic statistics of difference of means of polluting potential indicators between EGUs in environmental justice communities and non-environmental justice communities in RGGI states.

(XLSX)

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Formal analysis: Juan Declet-Barreto.

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Validation: Andrew A. Rosenberg.

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Writing – original draft: Juan Declet-Barreto, Andrew A. Rosenberg.

Writing – review & editing: Juan Declet-Barreto, Andrew A. Rosenberg.

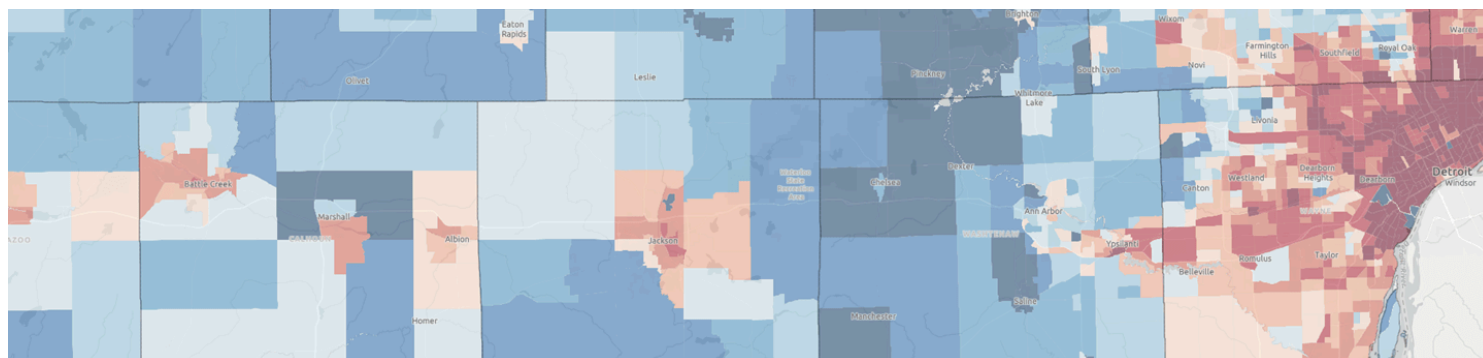
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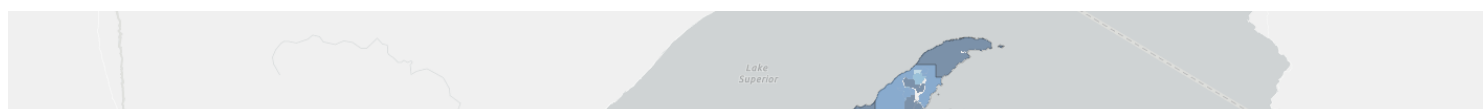
MiEJScreen: Environmental Justice Screening Tool (Version 1.0)

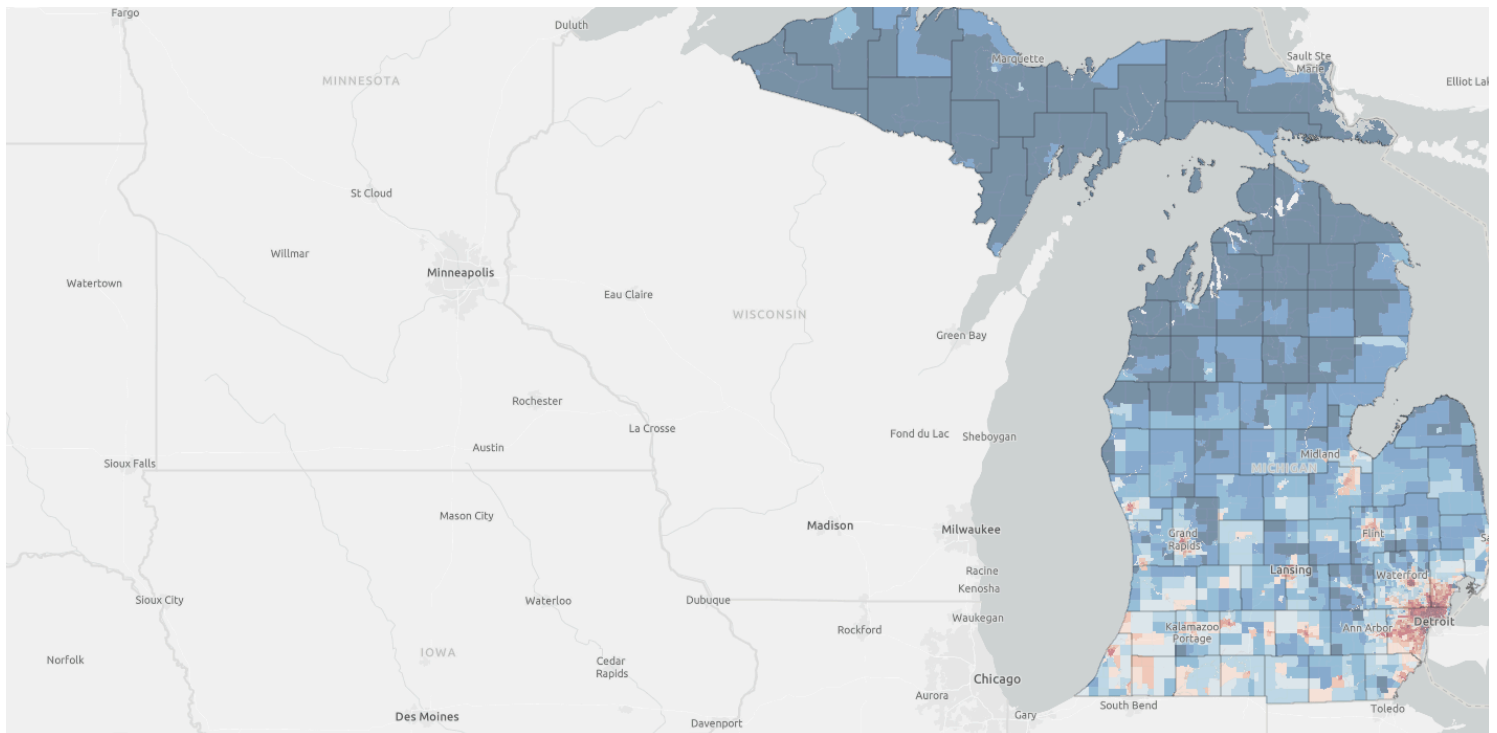
MiEJScreen is an interactive screening tool that identifies a variety of stressors and demographics within communities that may impact environmental conditions or the public health of residents.

The map allows users to explore the environmental, health, and socioeconomic conditions within a specific community, region, or across the state.

These data sets can be viewed individually or combined into a final MiEJScreen score that allows users to understand how communities experience Environmental Justice impacts relative to others. These results are depicted in the form of maps so that different communities can be compared to one another. Percentile scores for MiEJScreen indicators allow for comparisons across census tracts but are not absolute values.

A census tract with a high score is one that experiences a combination of various stressors and potential increased vulnerability than census tracts with low scores. MiEJScreen ranks census tracts based on data that is available from state and federal government sources.





MiEJScreen application (version 1.0)

This tool was developed in response to the dedicated advocacy of community members and the 2018 recommendations from the Michigan Environmental Justice Workgroup.

- Launch MiEJScreen** >
- Download the user guide** >
- Download the fact sheet** >
- View scoring matrix** >
- Read the technical report** >

Where can I learn more?

During the public comment period, EGLE offered several opportunities to learn about how to use the tool during informational sessions. Links to recordings of those sessions are below.

There were two **MiEJScreen Informational Webinar and Screening Tool Demonstrations** on **March 29, 2022**.

- [Recording of the 1:00 pm Demonstration Session](#)
- [Recording of the 6:00 pm Demonstration Session](#)

There were two **MiEJScreen Informational Webinar and Public Comment Sessions** on **April 27, 2022**.

- [Recording of the 1:00 pm Public Comment Session](#)
- [Recording of the 6:00 pm Public Comment Session](#)

Contact information

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About the model

Categories	Environmental Exposure	Environmental Effects	Sensitive Populations	Socioeconomic Factors
Indicators	NATA Air Toxics Cancer Risk NATA Respiratory Hazard Index NATA Diesel Particulate Matter Particulate Matter (PM _{2.5}) Ozone Traffic Density	Proximity to Cleanup Sites Proximity to Hazardous Waste Facilities Impaired Water Bodies Proximity to Solid waste Sites and Facilities Lead Paint Indicator Proximity to RMP Sites Wastewater Discharge Indicator	Asthma Cardiovascular Disease Low Birth Weight Infants Blood Lead Level Life Expectancy	Low Income Population Black, Indigenous, People of Color Population Educational Attainment Linguistic Isolation Population Under Age 5 Population Over Age 64 Unemployment Housing Burden
Sub Scores	Environmental Conditions (Average percentile of Environmental Exposure indicators + 0.5 x average percentile of Environmental Effects indicators) <u>1.5</u>		Population Characteristics (Average percentile of Sensitive Population indicators + average percentile of Socioeconomic Factor indicators) <u>2</u>	
Score	Final Composite Score = Environmental Conditions score x Population Characteristics score MiEJScreen Score			

Click or tap the image to expand

Michigan's Environmental Justice screening tool is based on California's CalEnviroScreen. CalEnviroScreen is a place-based model that provides information for the entire state on a geographic basis (census tract level). It includes multiple indicators as contributors to cumulative impacts representing environmental conditions and factors that affect people's vulnerability to environmental pollution.

The MIEJScreen overall score is made up of two sub scores (Environmental Conditions and Population Characteristics) which are further divided into four categories. There are two categories representing Environmental Conditions: Exposures and Environmental Effects, and two categories representing Population Characteristics: Sensitive Populations and Socioeconomic Factors. Each of the categories has a set of indicators that are scored for each census tract by its raw value, then assigned percentiles based on rank-order. Those percentile scores are averaged for each of the four categories (Exposures, Environmental Effects, Sensitive Populations, and Socioeconomic Factors). The formula below is used to combine the scores for each category to calculate the overall MiEJScreen Score:

About the indicators

Environmental exposure indicators



NATA air toxics cancer risk

This indicator represents the lifetime cancer risk from inhalation of air toxics, as risk per lifetime per million people. Lifetime risks refer to the risk of developing cancer due to inhalation exposure to each air toxic compound over a normal lifetime of 70 years. Air toxics, often referred to as hazardous air pollutants (HAPs), are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. HAPs are emitted from a wide variety of sources including motor vehicles, industrial facilities, and power plants. In some cases, these substances react with other constituents in the atmosphere or break down into other chemicals. The National Air Toxics Assessment (NATA) is EPA's ongoing review of outdoor air quality and the risks to human health that would result if air toxic emission levels remain unchanged.



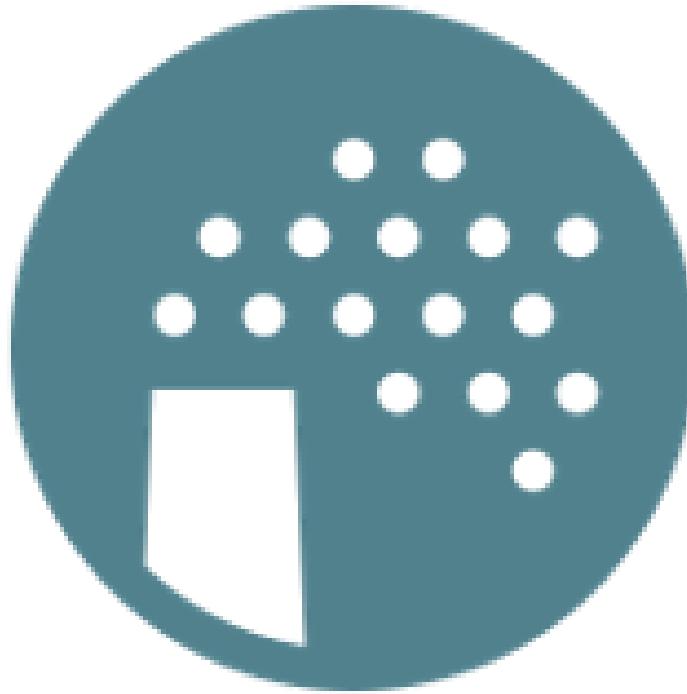
NATA respiratory hazard index

The air toxics respiratory hazard index indicator reflects the sum of hazard indices for those air toxics with reference concentrations based on respiratory endpoints, where each hazard index is the ratio of exposure concentration in the air to the health-based reference concentration set by EPA. The National Air Toxics Assessment (NATA) is EPA's ongoing review of outdoor air quality and the risks to human health that would result if air toxic emission levels remain unchanged.



NATA diesel particulate matter

This indicator provides data on the diesel particulate matter level in air in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Diesel particulate matter is mixture of particles that is part of diesel exhaust. EPA lists diesel exhaust as a mobile-source air toxic due to the cancer and noncancer health effects linked to exposure to whole diesel exhaust. Diesel PM has been used as a surrogate exposure measure for whole diesel exhaust. The National Air Toxics Assessment (NATA) is EPA's ongoing review of outdoor air quality and the risks to human health that would result if air toxic emission levels remain unchanged.



Particulate matter

PM 2.5 are very small particulate matter in the air that are 2.5 micrometers or less in diameter, or about 30 times smaller than the thickness of a human hair. These particulates are present as a mix of substances and may contain organic chemicals, dust, soot, metals, or other materials. There are many sources of PM 2.5 such as vehicles, construction sites, and power plants. The fine nature of these PM 2.5 makes the particles inhalable, which can cause and worsen serious health problems such as cardiovascular diseases. Local ecosystems are also impacted by PM 2.5 pollution. Particles can settle on land or water and cause harm to forests lands, acidify waterways, and deplete nutrients in the soil. PM 2.5 in the air is also known to form haze and reduce visibility.





Ozone

This indicator provides important data on the concentration of ozone in air in parts per billion. Ozone is often discussed with reference to the stratospheric ozone layer which protects the Earth from the ultraviolet radiation of the sun. However, ground-level, or tropospheric ozone is a common harmful air pollutant and the main ingredient in smog. Ozone forms in the environment when pollutants emitted from cars, industrial plants, refineries, and other sources react chemically in the presence of sunlight. Thus, ozone is more readily produced and more likely to reach harmful levels on warm, sunny days without wind. High concentrations of ozone have been associated with a number of adverse health effects, specifically respiratory diseases such as asthma. Sensitive populations to ozone include children, the elderly, Black people, people with asthma, and people who spend a significant amount of time outdoors. You can find more information and resources on ozone at EGLE's [ozone webpage](#).



Traffic density

This indicator represents traffic density as the count of vehicles per day on major roads in the area. Vehicles on Michigan's network of roads are a major source of air pollution. The exhaust fumes from cars and trucks contain noxious chemicals that are associated with some cancers, poor respiratory health, low birth weight, and other adverse health outcomes. Traffic density is also a quality-of-life issue as it generates a significant amount of noise pollution. Transportation planning in the last century that has given Michigan many of its major highways contributes to the environmental injustices playing out today. Low-income and communities of color often found themselves razed or bisected by road construction and eventually surrounded by busy roadways. Such sensitive populations, along with linguistically isolated populations, are more likely to live near areas of high traffic density today.

Environmental effects indicators



Proximity to clean up sites

Land that has been environmentally degraded due to contamination by hazardous substances must undergo clean up efforts to be safe and usable. EGLE staff and property

owners follow a process of investigating, remedial action, and monitoring to restore such sites. EGLE's remediation team maintain information about the state's clean-up efforts that can be found on their webpage. This indicator specifically uses proximity to Part 201 clean-up sites, Part 213 leaking underground storage tank sites, and Superfund sites. It can take years to fully clean up a site and during this time there are real concerns about the impact these sites have of human and environmental health. People living close to clean up sites are more likely to be exposed to the contamination of concern via air, water, or soil than those further away. These impacted communities have been shown in research disproportionately represent low-income people and people of color. Studies on the health of people living in proximity to Superfund sites suggest a range of associated negative health outcomes, including increased risk of cancer.



Proximity to hazardous waste facilities

Waste products are considered hazardous if it has or may have harmful effects on human health or the environment. Many discarded materials and by-products from industrial, mining, and agricultural operations or community activities are considered hazardous. The EPA and EGLE have requirements and maintain data regarding the generation, treatment, storage and disposal of this waste. Most hazardous waste products must be transported in accordance with regulations from the location it was generated to a permitted TSDF. This indicator reflects the proximity of communities to Treatment, Storage, and Disposal Facilities (TSDF) and Large Quantity Generators (LQG). Due to the hazardous nature of these materials, there is widespread concern for the health of the people and environment surrounding such sites.



Impaired water bodies

Michigan's rivers, streams, wetlands, inland lakes, and Great Lakes are each important in many ways and support a diversity of uses. Pollutants in Michigan surface waters can affect their ability to support various designated uses such as eating fish, providing safe drinking water, wading, swimming, fishing, and the protection of aquatic animals. This indicator takes into account the sum of all pollutants recorded in water bodies designated as impaired within the area. Because not all communities interact with, and rely on, waters in the same way, the number of identified pollutants impairing water quality may provide a helpful context in combination with other environmental effects indicators when exploring potential community-level impacts. For example, communities of color, low-income communities, and tribes generally depend on the fish, aquatic plants, and wildlife provided by nearby surface waters to a greater extent than the general population.





Proximity to solid waste sites and facilities

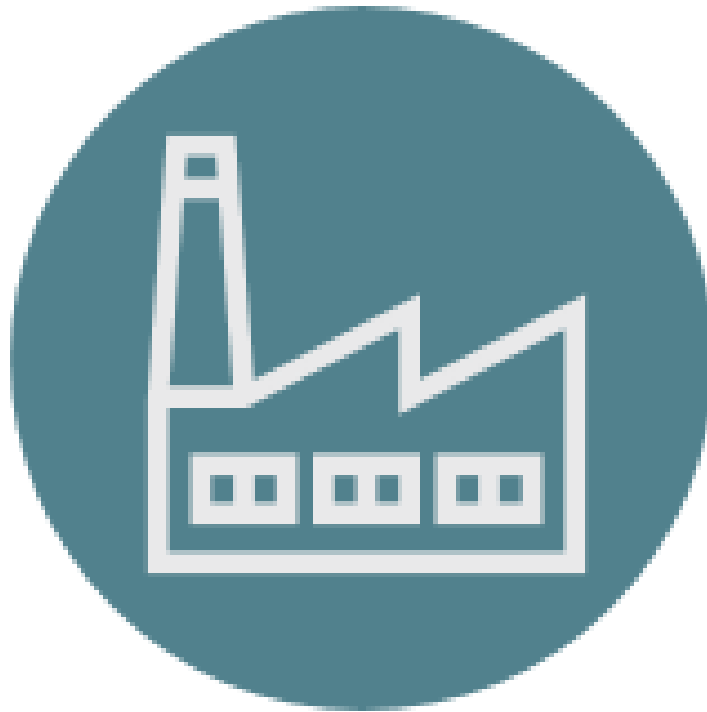
Solid waste facilities are places where waste from homes, industry or other commercial sources are collected, processed, or stored. This indicator specifically represents the proximity of communities to licensed landfills, old dumpsites, and scrap tire sites. Solid waste sites and facilities sites have multiple impacts on the communities that house them. Older or abandoned facilities and sites out of compliance with EGLE regulations may have negative impacts on the surrounding environment, creating risk of exposure for those living nearby. These sites can also raise concerns of odors, vermin, and increased truck traffic and diesel pollution. Such concerns can affect quality of life and health of residents by negatively impacting the perceived desirability of the community which can have serious socioeconomic consequences.



Lead paint indicator

This indicator reflects the percent of households in a census tract built before 1960, which have been found to be significantly more likely to contain lead-based paint than those built after 1960. Lead is a heavy metal and a neurotoxin that can accumulate in soft tissues and

cause serious health complications. Lead has no known safe level of exposure for humans. While lead exposure can occur through interactions with contaminated air, water, dust, food, or consumer products, historically used lead paint is a main lead exposure pathway for many people living in the United States and the most significant pathway for children. Sensitive populations to this environmental effect have been demonstrated in research to be low-income people, children, BIPOC populations, and those with cardiovascular disease.



Proximity to RMP sites

RMP sites refer to facilities that are required by federal legislation to file risk management plans. These regulations establish a List of Regulated Substances including 72 substances known to have high acute toxicity and 60 flammable or explosive substances as well as threshold quantities (TQ) for each. Accidental releases of these hazardous substances during production, use, or transportation have resulted in evacuations, injuries and even death. Facilities are obligated to file risk management plans with the EPA if it maintains a quantity of any of the listed regulated substances above the TQs. Such industrial facilities may have routine releases of residuals following pollution control measures to remove most of the waste stream into local air or water ways. People in surrounding areas can therefore be exposed indirectly or directly through ingestion or inhalation. However, the primary public health risks for RMP sites are accidental releases and fires or explosions. Local residents, workers, and emergency responders can suffer severe adverse health effects from these incidents.



Wastewater discharge indicator

Water pollutants can have both adverse effects on public health and the environment. The severity of this impact depends on the concentration of pollutant in the water, the toxicity of the chemical in question, the exposure pathway, and other factors. Potential exposure pathways include swimming or other recreation in downstream waters and infiltration of drinking waters sources. The wastewater discharge indicator describes pollutant loadings from the Discharge Monitoring Report (DMR) Loading Tool (which include NPDES DMR discharges and TRI releases) for toxic chemicals reported to the Toxics Release Inventory (TRI). This data was also treated by the [Risk-Screening Environmental Indicators](#) model, which incorporates information from TRI on the amount of toxic chemicals released, factors such as the chemical's fate and transport through the environment, relative toxicity, and potential human exposure.

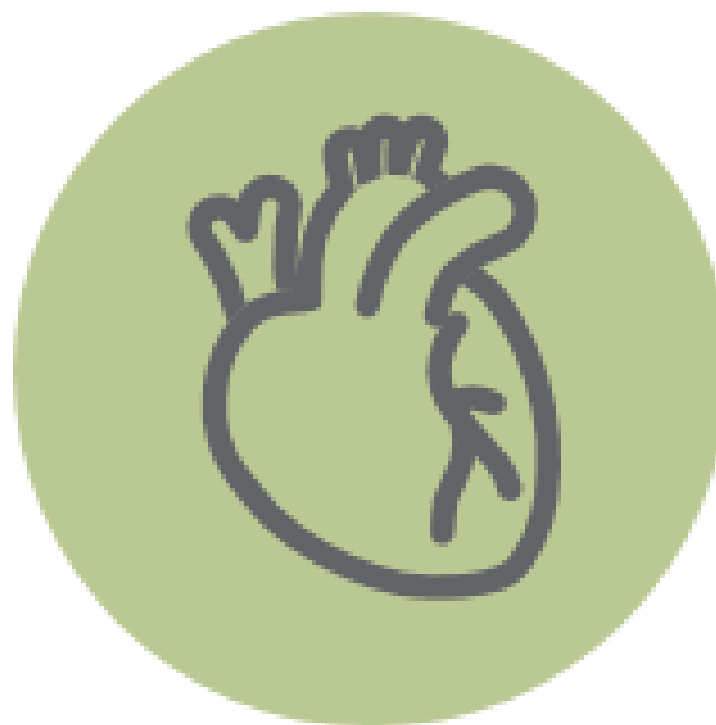
Sensitive populations indicators





Asthma

Asthma is a disease affecting the lung that can cause in shortness of breath, wheezing, coughing, and chest tightness. Asthma is the most common chronic disease in children and in 2020, 16% of Michigan adults were known to have the disease. Although actions can be taken to reduce the severity of symptoms, including avoiding triggers, access to medicines and regular medical care, without proper care asthma can be a life-threatening condition. While the causes of asthma are unknown, known risk factors include a family history of asthma, exposure to environmental pollutants, and preexisting health conditions. Asthma is an important indicator of population sensitivity as the condition increases one's vulnerability to pollutants. Exposure to air pollution can cause asthma attacks or worsen the disease. Black people and low-income populations are significantly more likely to be hospitalized for asthma than any other group.



Cardiovascular disease

Cardiovascular or heart disease includes several health conditions related to blocked or narrowed blood vessels such as acute myocardial infarction (AMI), commonly known as a heart attack. Other conditions such as arrhythmias, congenital heart defects, coronary artery disease, and more fall into this category as well. Heart disease is the leading cause of death in the United States, accounting for nearly one in four deaths. Heart attacks are the most common cardiovascular event and although the survivorship of heart attacks has increased significantly in recent years, survivors can experience profound impacts on their quality of life and long-term survival. Survivors are highly vulnerable to future cardiovascular events. This risk increases when exposed to environmental stressors, particularly high concentrations of particulate matter air pollution which has been associated with reduced life expectancy for people with preexisting heart disease. Thus, measures of cardiovascular disease in Michigan's communities are an important indicator of populations sensitive to environmental degradation.



Low birth weight infants

This indicator provides data on the percent of infants born at a low birth weight. Low birth weight (LBW) infants include those weighing less than five and a half pounds or 2500 grams at birth. These babies are often born premature, but full-term infants can also be LBW if growth is restricted during pregnancy. LBW is associated with many social and environmental risk factors, including low socioeconomic status, lack of prenatal care, exposure to toxic air pollution and lead. Several of the health conditions associated with LBW, such as asthma, can put children at increased risk when exposed to environmental stressors. Research has also provided evidence that LBW is more common among black

women than Hispanic and non-Hispanic white women even when controlling for social risk factors.



Blood lead level

This indicator provides data on the percent of children under 6 that tested to have elevated blood lead levels (≥ 5 $\mu\text{g}/\text{dL}$). According to the CDC's Advisory Committee on Childhood Lead Poisoning Prevention, there is no safe level of lead in the blood (CDC, 2012). This indicator focuses on the lead exposure of children as they are at increased behavioral risk for encountering lead and increased biological risk for the negative health affects associated with lead exposure.



Life expectancy

Life expectancy refers to the average number of years a person can expect to live from birth if the mortality patterns that exist during the original estimate persist over their lifetime. Life expectancy serves as an indicator of overall public health as it speaks to the cumulative impact of socioeconomic and environmental factors, behavioral and genetic risk factors, and access and quality of health care. While the principles of Environmental Justice prescribe that everyone should be able to live a long and healthy life, many inequities in these factors create disparities in the longevity of community members. Research has suggested environmental quality is positively correlated with longevity; lack of access to safe drinking water, sufficient nutrition, and public health expenditures was linked with a shorter life expectancy at birth.

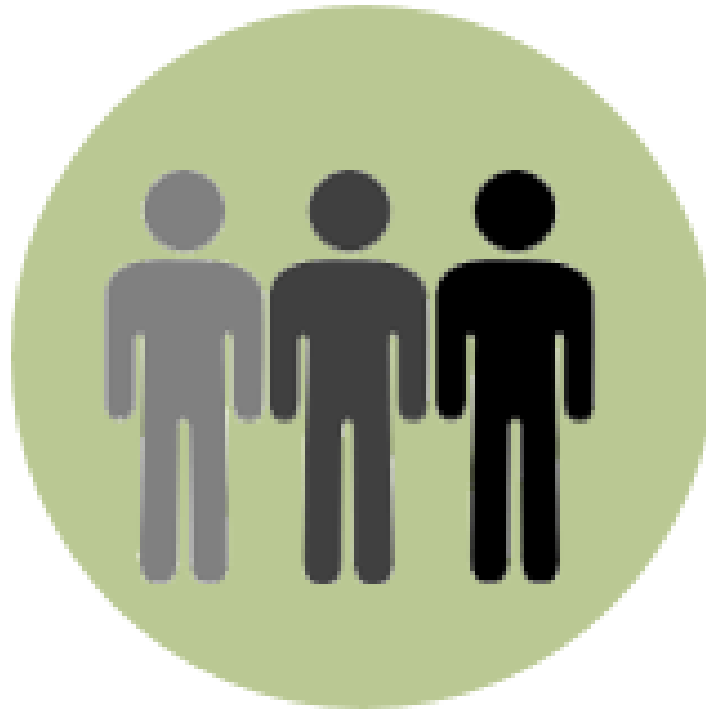
Socioeconomic factors indicators



Low income population

The US Census Bureau sets the Federal Poverty Level, a measure of income adjusted for the size of a household, annually. The low-income population indicator in MiEJScreen refers to

the percent of the population living below double the federal poverty level. Income is a social determinant of health as it can determine key risk factors such as housing status and location, educational attainment, access to health insurance, and mental health status. Low-income populations are more likely to live with pollution and suffer the negative health outcomes associated with such exposure than economically secure populations.



Black, Indigenous, People of Color population

This indicator represents the number of people within a census tract that consider themselves Black, American Indian/Alaskan Native, Asian, Native Hawaiian-Other Pacific Islander and two or more races. It is well understood through research that non-White racial and ethnic groups are disproportionately affected by environmental risk factors. Non-White populations are not only more likely to live near pollution, but also more likely to experience negative health impacts associated with exposure. Outcomes such as heart disease, mortality, premature birth, low birth weight, and miscarriage mainly associated with air pollution are more prevalent in these populations, particularly black populations. Ultimately, the causes of racial and ethnic disparities in health status associated with environmental pollutants are still not completely understood and very complex. However, the experience of racism in the form of segregation and reduced access to healthcare, social goods and resources acts as a barrier to health and wellbeing (Pascoe and Smart Richman, 2009; Williams and Mohammed, 2009).



Educational attainment

The MiEJScreen educational attainment indicator measures the percent of the population over age 25 with less than a high school education. Educational attainment is an important element of socioeconomic status and a social determinant of health. People with higher levels of educational attainment usually earn more, live longer, and are at a reduced risk for developing age-associated diseases. Contrastingly, adults with less education are more likely to develop pollution-related health problems and to die from the effects of air pollution.



Linguistic isolation

The term linguistic isolation is used by the US Census Bureau to mean limited English-speaking households. The percent of these households in a population is represented in the MiEJScreen linguistic isolation indicator. Michigan is home to many people who speak languages other than English, mainly Spanish, Arabic, and Chinese. Yet, these people can encounter language barriers to vital resources such as access to healthcare and social services. Linguistic isolation may also affect a community's capacity for civic engagement affecting environmental policies, which can lead to environmental health disparities.



Population under age 5

This indicator takes into account the percent of a census tract's population under the age of five years old. Children have an increased susceptibility to environmental stressors relative to adults; this is due to biological factors such as smaller airways, lower body weight, and higher metabolism. These can increase the risk that children develop asthma, experience poisoning, or other health complications when exposed to pollution. This increased susceptibility can also be a function of behavioral risks specific to childhood. Research has shown that children under two years old have the greatest exposure to lead in soils and household dust due to hand-to-mouth contact.



Population over age 64

This indicator takes into account the percent of a census tract's population over the age of sixty-four years old. Elderly populations have an increased sensitivity to exposure to environmental stressors compared to the general population. Biological processes such as metabolism, distribution, and excretion can lose efficiency with age. Other reductions in total body water, lean body mass, kidney function, and some blood proteins may also contribute to an increase susceptibility to pollutants. Age-associated diseases that are more prevalent in elderly populations also increase the risk of developing negative health outcomes from exposure to pollutants.



Unemployment

Unemployment is considered to be the percent of the population over the age of 16 that is unemployed and eligible for the labor force. This does not include retirees, students, homemakers, or institutionalized persons. While unemployment is often used as a measure of health for the economy, it can also signal health outcomes for communities.

Unemployment is representative of poor health and vulnerability to environmental burden as lack of employment and corresponding low income can act as risk factors within the population. Long term unemployment is also associated with increased stress and prevalence of age-related diseases.



Housing burden

Housing burdened populations are the percent of households paying more than 30% of their income on shelter costs. This level of housing unaffordability may lead to housing-induced poverty, and this population has been increasing in recent years. Having continued access to a stable housing situation is necessary to improve health, educational, and economic outcomes for households. High values of this indicator indicate areas where many resident households struggle to pay for their shelter.



MiEJScreen: Environmental Justice Screening Tool (Version 1.0)

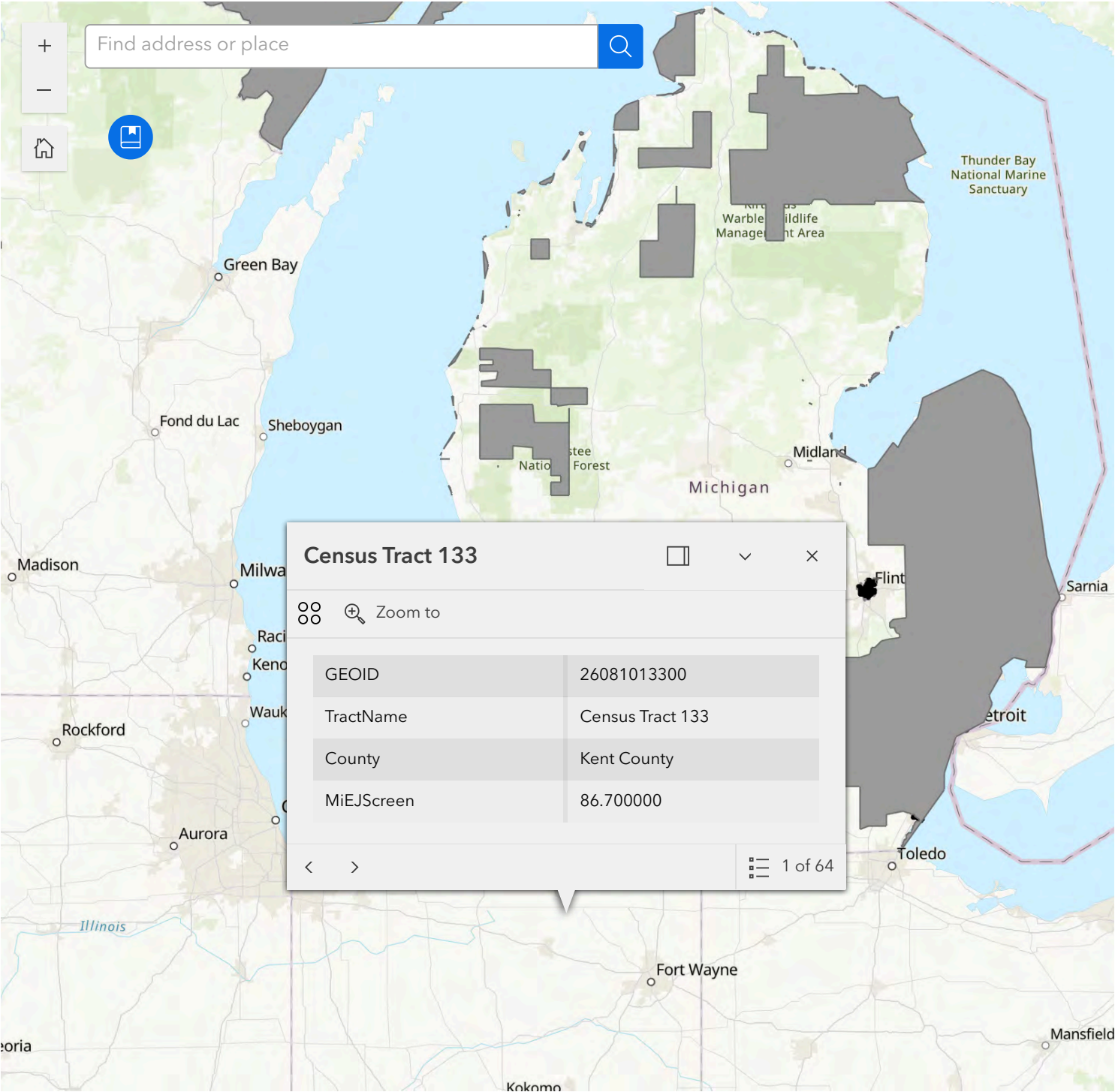
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Solar Integration: Distributed Energy Resources and Microgrids



 **Rooftop photovoltaics in Boulder, CO. Photo by Dennis Schroeder.**

Simply put, we need a reliable and secure energy grid. Two ways to ensure continuous electricity regardless of the weather or an unforeseen event are by

using distributed energy resources (DER) and microgrids. DER produce and supply electricity on a small scale and are spread out over a wide area. Rooftop solar panels, backup batteries, and emergency diesel generators are examples of DER. While traditional generators are connected to the high-voltage transmission grid, DER are connected to the lower-voltage distribution grid, like residences and businesses are.

[Microgrids](#) are localized electric grids that can disconnect from the main grid to operate autonomously. Because they can operate while the main grid is down, microgrids can strengthen grid resilience, help mitigate grid disturbances, and function as a grid resource for faster system response and recovery.

Distributed Energy Resources

Solar DER can be built at different scales—even one small solar panel can provide energy. In fact, about [one-third](#) of solar energy in the United States is produced by small-scale solar, such as rooftop installations. Household solar installations are called behind-the-meter solar; the meter measures how much electricity a consumer buys from a utility. Since distributed solar is “behind” the meter, customers do not pay the utility for the solar power generated.

The cost of owning DER varies from state to state and among utility companies. One way the electric bill is determined is through net metering, where utilities calculate the total power generated by the customer’s solar system and subtract it from the total power the customer consumes. Customers are credited for the amount of power they supply to the grid.

DER could fundamentally change the way the electric grid works. With DER, power is generated right where it is used and can be connected with other DER to optimize its use. Households and other electricity consumers are also part-time producers, selling excess generation to the grid and to each other. Energy storage, such as batteries, can also be distributed, helping to ensure power when solar or other DER don’t generate power. Electric cars can even store excess energy in the batteries of idle cars. DER can also include controllable loads, like water heaters or air-conditioning units that the utility can use to shift power consumption away from peak hours. While the grid was designed to generate power at large facilities and move it through the transmission grid to the

distribution grid for consumption, DER enable local generation and consumption of electricity.

Islands and Microgrids

Distribution grids are vulnerable to outages that can affect large regions and millions of people and businesses, particularly as a consequence of extreme, destructive weather events. When parts of the grid are equipped with DER, they can continue serving other loads on the same distribution network, meeting local needs with local generation. This is called islanding. Electrical systems that can disconnect from the larger grid, engaging in intentional islanding, are often called microgrids.

Microgrids vary in size from a single-customer microgrid to a full-substation microgrid, which may include hundreds of individual generators and consumers of power. Small, off-the-grid electrical systems are not a recent invention. Ships, military bases, remote outposts, and communities around the world have long relied on local generation and electricity management to meet their energy needs. DER make microgrids a more widespread option, because the means of energy production are now more easily obtained and sited in neighborhoods. Community-scale microgrids may provide resiliency and backup during and after disasters like hurricanes.

Technology is advancing to manage the risks caused by islanding with better control software and to provide [grid services](#). Without the larger grid to help stabilize the power supply, an islanded grid could damage connected equipment or injure workers who think it is disconnected from power. For this reason, many solar energy systems are programmed to detect islanding and disconnect from the grid if it occurs. Beyond microgrids, some researchers are studying nanogrids—smart electricity systems on the scale of a single building.

Black Start

Another way DER and microgrids can contribute to grid stability is by aiding “black start” processes, which turn power on after it has gone down. During a

widespread electrical failure, electrical generators can be put offline. To come back online, many electrical generators require an external battery to start, just like a car engine does. To achieve this, utilities create black start plans, in which small generators start larger ones to steadily bring generation online. Throughout this process, service restoration must be well-timed, to ensure that generation and load are matched continuously. DER could become a valuable black start resource by allowing communities with microgrids to begin start-up processes on their own and provide the capacity required to start up larger generators.

ADDITIONAL INFORMATION

- [U.S. Department of Energy Combined Heat and Power and Microgrid Installation Databases](#)
- Report: [Cybersecurity Considerations for Distributed Energy Resources on the U.S. Electric Grid \(PDF\)](#)

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Sharing the Sun Market Report Details Expansive Growth, Recent Trends in Community Solar

Sharing the Sun Market Report Details Expansive Growth, Recent Trends in Community Solar

Co-Authors Share Findings on Policy Changes and Which States Are Leading Growth in Oct. 26 Webinar

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Flowers grow along some of the rows at Jack's Solar Garden in Longmont, Colorado, to attract pollinators such as honeybees, bumblebees, and butterflies. Jack's is a 1.2-MW, five-acre community solar farm and is the largest agrivoltaic research project in the U.S. The solar project was designed and built by Namasté Solar. *Photo by Werner Slocum, NREL*

More and more Americans are gaining access to clean energy through community solar. On Oct. 26 at 12 p.m., the authors of a new market report, [Sharing the Sun: Community Solar Deployment, Subscription Savings, and Energy Burden Reduction](#) [PDF](#), will discuss policy changes, recent market trends, subscriber value proposition, and how a handful of

states are leading the charge when it comes to the tremendous growth seen in community solar projects over the past decade.

Community solar allows customers within a geographic area to benefit from solar energy, even if they are unable to install solar in their individual residences or businesses. Most often, community solar customers subscribe to an off-site array and then receive credits on their electric utility bill for a portion of the energy generated.

Community solar can be a great option for people who are unable to install solar panels on their roofs because they do not own their homes; have insufficient solar resources or roof conditions to support a rooftop PV system due to shading, roof size, or other factors; or face financial/other reasons.

Co-authored by researchers from the National Renewable Energy Laboratory and the University of Minnesota, the new report shows the tremendous growth of community solar over the past decade, which now consists of about 1,600 projects in the United States exceeding 3.2 gigawatts in capacity.

According to the report, cumulative community solar capacity has grown by about 121% year over year since 2010, more than doubling in capacity on average.

During the webinar, the authors will discuss the financial value that community solar brings to its subscribers and the potential for community solar to reduce consumers' energy burden. Community solar can lead to substantial bill savings—from 5% to as much as 25%.

According to the report, the bill savings from community solar can also help reduce households' energy burden, or the share of gross household income spent on energy costs such as electricity and heating fuel. In Washington, D.C., for example, community solar subscriptions provided through the Solar for All program reduced energy burdens for the lowest income households from 13.5% to 8.8%.

The webinar will also review the policy and deployment status of programs targeting low- and moderate-income (LMI) subscribers.

The U.S. Department of Energy (DOE) recently announced a goal to expand community solar to power the equivalent of 5 million households

by 2025 and create \$1 billion in energy bill savings through the National Community Solar Partnership (NCSP). The NCSP is a coalition of community solar stakeholders working to expand access to affordable community solar to every American household. A key aspect of meeting the \$1 billion DOE target will be to ensure that those savings reach those who need them most.

The Sharing the Sun market report was funded by the NCSP, a DOE initiative led by the [Solar Energy Technologies Office](#), in collaboration with NREL and the Lawrence Berkeley National Laboratory.

Learn more about the [National Community Solar Partnership](#).

This article has been updated to reflect an editorial change made after its original publication.

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22,618,636

Miles Driven



3,402

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69

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When you subscribe to the program, you agree to pay a low monthly fee on your electric bill each month** and receive a monthly solar energy credit based on the amount of energy produced.

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There are several payment plans available to fit your lifestyle – and for as little as \$6 per month, you can promote a cleaner Michigan for decades to come. For additional details see Program [Terms and Conditions \(/media/CE/Documents/renewables/Solar Gardens/solar-gardens-terms-and-conditions.pdf\)](/media/CE/Documents/renewables/Solar Gardens/solar-gardens-terms-and-conditions.pdf).

[See more about the Solar Gardens experience. \(/media/CE/Documents/renewables/Solar Gardens/consumers-energy-solar-garden-experience.pdf\)](/media/CE/Documents/renewables/Solar Gardens/consumers-energy-solar-garden-experience.pdf).

*Full-service electric customers are served on rates RS, RDP, RDPR, RT, GS, GSTU, GSD, GP, GPD, EIP and GPTU. To confirm your rate classification, please reference the back of your monthly bill under Rate Information.

**Customers who participate in the budget plan, winter protection plan, or shut-off protection plan will receive a second invoice for their participation rather than a consolidated electric bill.

[Join Now \(https://www.consumersenergy.com/residential/renewable-energy/solar-gardens/enrollment-form\)](https://www.consumersenergy.com/residential/renewable-energy/solar-gardens/enrollment-form)

FLEXIBLE SUBSCRIPTION OPTIONS

We offer a couple options to fit every budget.

For as little as \$1.80 per month, you can subscribe to solar energy and reduce your carbon footprint.

Subscription Options:

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SolarBlocks: \$6 per month

In 2024, credits averaged \$3.18 per SolarBlock per month or \$0.95 per MicroBlock per month.

[See more about the Solar Gardens experience. \(/media/CE/Documents/renewables/Solar Gardens/consumers-energy-solar-garden-experience.pdf\)](/media/CE/Documents/renewables/Solar Gardens/consumers-energy-solar-garden-experience.pdf)

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SOLAR PRODUCTION

The data below illustrates how much solar energy has been generated in Michigan through the Solar Gardens program

to-date. As you can see, your participation in programs like this makes a big difference.

TOTAL GENERATION TO DATE: 55686 MWh

Click on boxes to turn off and on data.

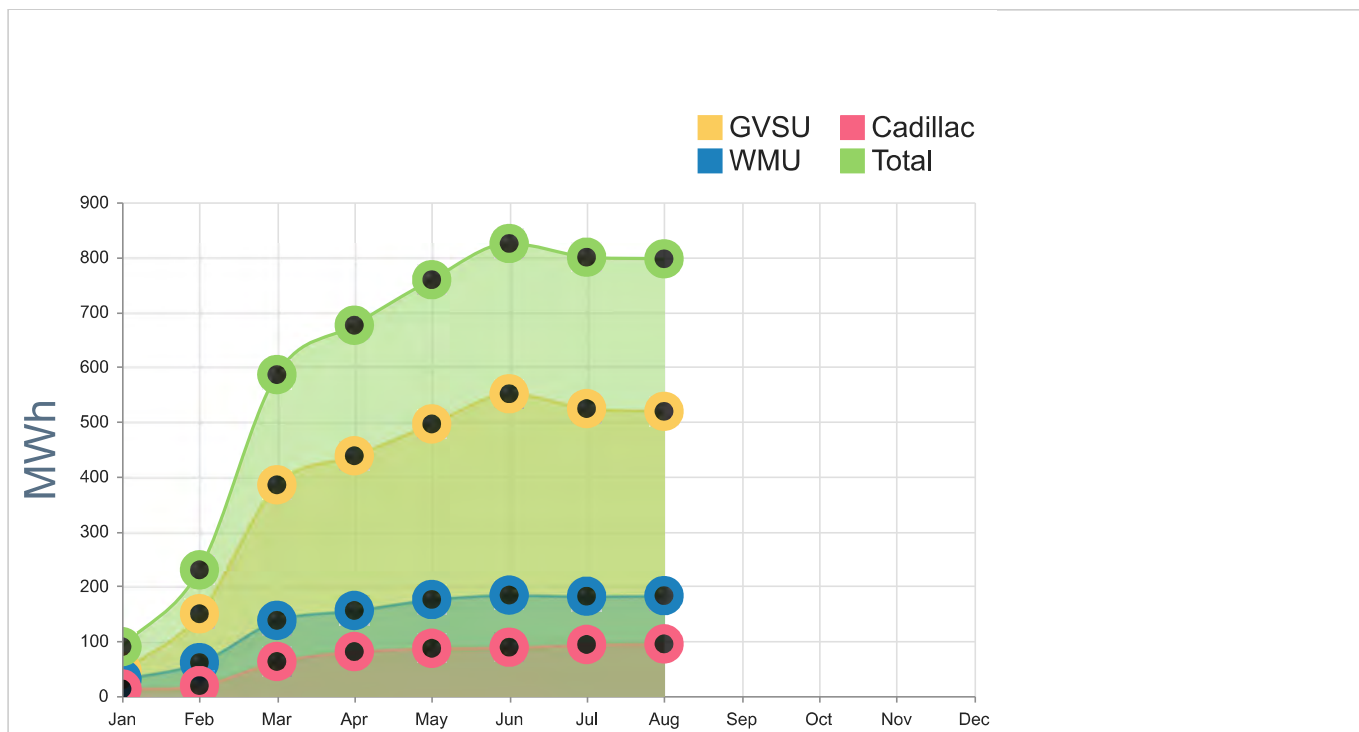
☐ TOTAL GENERATION IN THE PAST 30 DAYS: 797 MWh

☐ TOTAL GENERATION IN THE PAST YEAR: 6454 MWh

MONTH

YEAR

2025



Yearly Solar Production Total: 4762 MWh



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Consumers Energy Renewable Energy Program is Green-e® Energy certified and meets the environmental and consumer-protection standards set forth by the nonprofit, Center for Resource Solutions. Learn more at www.green-e.org. (<http://www.green-e.org>).

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IN THE NEWS

Kalamazoo Gets a New Solar Power Facility

[About The Facility \(http://michiganradio.org/post/kalamazoo-gets-new-solar-power-facility\)](http://michiganradio.org/post/kalamazoo-gets-new-solar-power-facility).

Consumers Energy Builds Solar Power Plant in WMU Business Park

[About The Plant \(http://www.mlive.com/news/kalamazoo/index.ssf/2016/08/western_michigan_university_ga_1.html\)](http://www.mlive.com/news/kalamazoo/index.ssf/2016/08/western_michigan_university_ga_1.html).

Michigan's First 'Solar Garden' Dedicated Under Partly Sunny Skies

[About The Garden \(http://www.mlive.com/business/west-michigan/index.ssf/2016/06/states_first_solar_garden_dedi.html\)](http://www.mlive.com/business/west-michigan/index.ssf/2016/06/states_first_solar_garden_dedi.html).

Solar Plant at GVSU Ready to Power Homes

[About GVSU Solar Plant \(https://www.youtube.com/watch?v=7Tna4Qt-W9Q\)](https://www.youtube.com/watch?v=7Tna4Qt-W9Q).

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Technical Potential and Meaningful Benefits of Community Solar in the United States

Katy Waechter,¹ Eric O'Shaughnessy,² Sudha Kannan,¹ and Robin Burton¹

1 National Renewable Energy Laboratory

2 Clean Kilowatts

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Technical Report
NREL/TP-6A20-87524
February 2024



Technical Potential and Meaningful Benefits of Community Solar in the United States

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and Robin Burton¹

1 National Renewable Energy Laboratory

2 Clean Kilowatts

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Acronyms

AC	alternating current
ACS	U.S. Census Bureau American Community Survey
AMI	area median income
BTM	behind-the-meter
CBA	community benefit agreement
DC	direct current
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
FCR	fixed charge rate
GW	gigawatt
GWh	gigawatt-hour
IRA	Inflation Reduction Act
JEDI	Jobs and Economic Development Impact
km ²	square kilometer
kW	kilowatt
kWh	kilowatt-hour
LCOE	levelized cost of energy
LEAD	Low-Income Energy Affordability Data
LMI	low- to moderate-income
m ²	square meter
MW	megawatt
MWh	megawatt-hour
NREL	National Renewable Energy Laboratory
NSRDB	National Solar Radiation Database
PV	photovoltaic
reV	Renewable Energy Potential
SAM	System Advisor Model
TWh	terawatt-hour
W	watt

Executive Summary

Community solar is any solar project or purchasing program within a geographic area in which the benefits flow to multiple customers, such as individuals, businesses, nonprofits, and other groups. Community solar customers typically subscribe to or own a portion of the energy generated by a solar array and receive an electric bill credit for electricity generated by their share of the community solar system. Community solar can offer greater household savings for electricity customers, provide access to solar energy for low- to moderate-income (LMI) customers, generate resilience and grid benefits, and boost solar workforce development, among other benefits.¹ The goal of this study was to identify the maximum amount of community solar capacity that is physically feasible for development and the extent of the associated benefits.

The National Renewable Energy Laboratory (NREL) estimated the technical potential for community solar in the United States under two siting regimes (Limited Access and Reference Access). This analysis characterized the variability in local drivers of community solar siting and provided high and low bounds on community solar technical potential. For this analysis, we modified existing siting regimes for ground-mount solar photovoltaics (PV) to reflect community solar siting constraints, including virtual hosting requirements, maximum interconnection distance, and inclusion of rooftop and ground-mount PV array types. This combination of land availability assumptions targeted developable spaces with characteristics reflective of existing community solar installations and that are incompatible with utility-scale renewable energy technology deployments, similar to the methodology in Lopez et al. (2024). This approach prioritizes exclusive siting of community solar. We applied one technology scenario per array type. We used the PV Rooftop model (Gagnon et al. 2016) to estimate PV-developable areas on individual buildings, and we used the Renewable Energy Potential (reV) model (MacLaurin et al. 2019) to estimate developable areas for ground-mount PV and to estimate energy production for both rooftop and ground-mount systems across the United States for our two siting regimes.

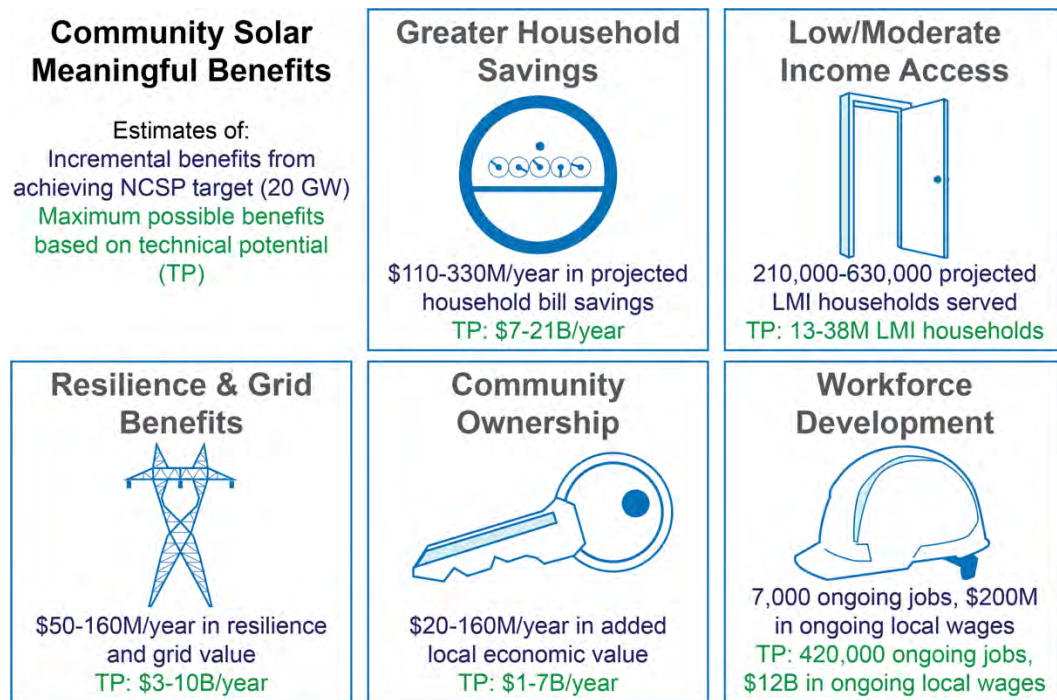
At a national level, we estimate that there are 967 gigawatts alternating current (GW_{AC}) of community solar technical potential under the Limited Access regime, amounting to 1,710 terawatt-hours (TWh) of annual energy production. We estimate that there are 2,862 GW_{AC} of community solar technical potential under the Reference Access regime, amounting to 5,921 TWh of annual energy production (Table ES-1). The resource area for rooftop community solar systems (2,776.64 square kilometers [km²]) is consistent across the Limited Access and Reference Access siting regimes due to its low land conflict potential. The resource area for ground-mount community solar systems ranges from nearly 12,000 to 53,000 km². This wide range represents 30% to 126% of the maximum land area for ground-based solar identified for the highest land-use scenario (Decarb+E) in the *Solar Futures Study* (DOE 2021). These resource areas are largely in addition to resource areas considered for utility-scale renewable energy technologies in urban and suburban areas where only smaller systems can be deployed and on not federally owned lands. However, these resource areas are in competition with utility-scale renewable energy technologies in rural areas with larger contiguous developable tracts of land within proximity of substation interconnections, primarily affecting the largest ground-mount PV systems modeled in this study.

¹ “Community Solar Basics,” DOE, <https://www.energy.gov/eere/solar/community-solar-basics>

Table ES-1. Technical Potential Estimates by Siting Regime and Array Type

Siting Regime	Array Type	Developable Area (km ²)	Net Capacity Factor (mean)	Capacity (GW _{AC})	Annual Energy Production (TWh)
Limited Access	Rooftop	2,776.64	20.65%	396.99	718.24
	Ground	15,437.60	19.85%	570.51	991.98
Reference Access	Rooftop	2,776.64	20.65%	396.99	718.24
	Ground	53,378.03	20.77%	2,465.14	4,484.77

Our technical potential estimation suggests that community solar could conceivably serve 53.2 million households and 311,750 businesses that cannot access behind-the-meter solar in the United States. In practice, market, economic, and policy constraints mean that the actual number of households and businesses potentially served by community solar is much smaller. Our analysis suggests that community solar could theoretically grow to serve all residential electricity customers who are unable to adopt behind-the-meter solar, including low- to moderate-income (LMI) households. We found that 42% of households and 44% of businesses are unable to access behind-the-meter solar, a decrease from previous estimates that represents a lower overall demand for community solar. Not all community solar capacity is located within the same communities as subscribers, particularly for households renting and multifamily buildings, but it is accessible to subscribers within the same electricity utility service territory.

**Figure ES-1. Summary of projected meaningful benefits based on near-term community solar deployment**

In this report, we also explore the potential gross benefits from the ongoing deployment of community solar, as shown in Figure ES-1. We estimate that, if all technically viable potential community solar is deployed, it could save customers billions of dollars on their electricity bills,

serve tens of millions of LMI households, generate billions of dollars in grid resilience and grid service values, drive billions of dollars of economic benefits into host communities, and support hundreds of thousands of jobs. Realistically, the potential accrual of benefits is a fraction of the technical potential estimates. Still, using the 20-GW target set by the U.S. Department of Energy National Community Solar Partnership as a more realistic target for near-term deployment, we estimate that community solar could reduce subscriber electricity costs by around \$110 million–\$330 million per year, serve 210,000–630,000 LMI households, generate \$50 million–\$160 million per year in grid resiliency and service value, drive \$20 million–\$160 million per year in economic benefits into host communities, and support around 7,000 permanent jobs.

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1 Introduction

The U.S. Department of Energy (DOE) defines community solar as any solar project or purchasing program, within a geographic area, in which the benefits flow to multiple customers, such as individuals, businesses, nonprofits, and other groups.² In most cases, customers benefit from energy generated by solar panels at an off-site array. Community solar customers typically subscribe to—or in some cases, own—a portion of the energy generated by a solar array, and receive an electric bill credit for electricity generated by their share of the community solar system. Community solar can be a great option for people who are unable to install solar panels on their roofs because they are renters, can’t afford solar, or because their roofs or electrical systems aren’t suited to solar.

Community solar is a business model that allows multiple electricity customers to “subscribe” to the output of a shared solar photovoltaic (PV) array. Some definitions of community solar include geographic restrictions, such as requiring that systems serve subscribers in the same utility service territory. Community solar is growing rapidly, with cumulative installed capacity in the United States increasing from around 1 gigawatt (GW_{AC}) in 2018 to more than 7.045 GW_{AC} by the end of 2023 (Xu 2024). The growth of community solar has partly been enabled by state policies that facilitate the subscription business model—namely, policies that allow subscribers to use community solar credits against their utility bill obligations.

Community solar could expand solar access to households and businesses that cannot adopt on-site solar (e.g., rooftop solar). Previous work by the National Renewable Energy Laboratory (NREL) found that community solar could be a viable option for around half of U.S. homes and businesses facing significant barriers to adopting on-site solar due to rooftop constraints, property ownership issues, or other challenges (Feldman et al. 2015). Participation in community solar generally entails no or minimal upfront costs, making community solar adoption a viable option for budget-constrained households. Further, unlike rooftop solar, community solar poses no specific barriers to adoption for households that rent or live in multifamily housing. As a result, community solar expands solar access to populations underserved by conventional on-site solar business models (Heeter et al. 2018; Michaud 2020; Abbott et al. 2022; Hausman 2022). The role of community solar in expanding solar access is further promoted by a growing suite of federal and state policies to promote community solar adoption among low- to moderate-income (LMI) households (Cook and Shah 2018; Heeter et al. 2018; Connelly 2023).

The purpose of this report is twofold: First, we estimate the nationwide technical potential capacity of community solar in the states and the District of Columbia. Other territories were not included due to a lack of accessible data. Second, we explore the implications of our technical potential estimates in terms of the social, economic, and technical benefits of community solar, along with estimated benefits from projects projected to be deployed in the near term. We begin with brief background discussions of both topics.

² “Community Solar Basics,” DOE, <https://www.energy.gov/eere/solar/community-solar-basics>

1.1 Background: Technical Potential

Technical potential is an estimate of the renewable energy capacity that could physically be deployed without regard to market, economic, or policy constraints. NREL has conducted several studies to estimate technical potential, including a broad study of renewable energy resources (Lopez et al. 2012), a focused study on rooftop solar technical potential (Gagnon et al. 2016), a study on the siting considerations of offshore wind technical potential (Zuckerman et al. 2023), a focused study on floating solar technical potential (Spencer et al. 2019), and a study of the technical potential of clean hydrogen production (Ruth et al. 2020), in addition to per-technology estimates in the Annual Technology Baseline's Standard Scenarios. NREL leveraged data from the previously mentioned rooftop solar technical potential work to assess the feasibility of meeting the electricity consumption of households that rent, live in multifamily buildings, or have low-to-moderate incomes (Mooney and Sigrin 2018). Nonetheless, estimating the technical potential of community solar is distinct. Community solar is unique among renewable energy resources primarily because it is defined by how electricity is consumed rather than how it is generated. Different scales of PV deployment, like utility- or large-scale solar and behind-the-meter solar, are terms typically associated with technical potential discussions. These scales dictate siting based on system sizing and interconnection processes, among other factors: Large-scale solar requires larger tracts of land for deployment and produces more energy than can be used by distribution feeders, whereas behind-the-meter solar requires little to no land and does not require distribution to customers. Solar installations that can provide community solar energy are sized in between large-scale and behind-the-meter solar. Community solar is not defined by a nationally standardized size constraint, although policies at the municipal and state levels can set varying caps on system sizes allowed within their jurisdictions. In addition, community solar can be installed anywhere, including on rooftops and as ground-mounted systems. A defining feature of community solar is that system output is virtually delivered to a specific subset of electricity customers.

Our approach to estimating the technical potential of community solar is informed by the unique aspects of the business model. We estimate the technical potential of community solar through three steps (Figure 1). First, we estimate the technical potential supply of solar systems that could be used for community solar. This step is fundamentally the same as technical potential estimation for other PV energy resources, as described by Gagnon et al. (2016) for rooftop systems and Maclaurin et al. (2019) for ground-mounted systems. The second step expands upon previous PV technical potential analyses by applying localized maximum potential market share thresholds. These thresholds include two primary constraints: (1) a supply constraint that limits modeled ground-mount solar supply sites to those within an economically feasible interconnection distance to substations within a respective electricity service territory, and (2) a demand constraint that limits the capacity of modeled solar supply sites to not exceed local gross electricity consumption. This step identifies how much of the community solar can feasibly be hosted based on potential market share; it is unique to community solar and is a novel contribution of this report. The third step brings the two concepts together: the technical potential of community solar is determined by the overlap of technical potential supply and demand. We explicitly address the ability of community solar technical potential to meet electricity demand from all households and businesses that cannot adopt or face significant barriers to adopting on-site solar. Although there is a wider market for households that prefer community solar over other energy options even when they're able to host on-site solar, this analysis focuses on serving

electricity customers without feasible or clear access to on-site solar. We describe our specific methodology for implementing these three steps in Section 2.

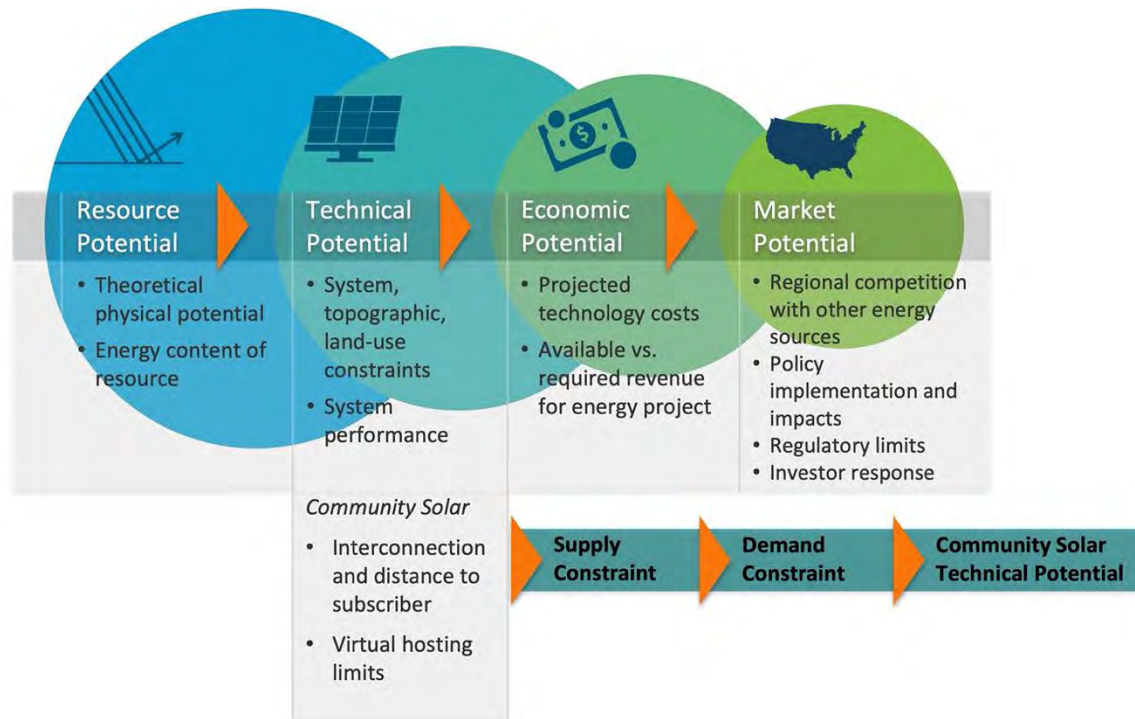


Figure 1. Community solar technical potential framework (modified from Brown et al. 2016)

Our analysis constrains the definition of community solar to require that projects (supply) serve subscribers (demand) within the same utility service territory. As a result, community solar technical potential can be set by supply or demand constraints. In some areas, a lack of developable spaces or high population density mean that supply is the constraining factor that determines community solar technical potential. In other areas, abundant developable spaces or low population density mean that supply exceeds demand, and thus demand is the constraining factor that determines community solar technical potential. We present the results of our technical potential estimation based on these constraints in Section 3.

1.2 Background: Meaningful Benefits

Community solar is also unique among renewable energy resources in terms of its potential benefits. Community solar can provide comparable benefits to rooftop solar by directly serving specific customers, while also expanding solar access to customers not traditionally served by rooftop solar. Community solar can also provide similar benefits as utility-scale solar by leveraging economies of scale and larger project sizes. The unique combination of characteristics that define community solar yield a unique suite of social, economic, and technical benefits.

DOE has identified five meaningful benefits provided by community solar projects.³ The five meaningful benefit categories are:

- **Greater household savings:** Provide a reduction in electricity bills for residential subscribers.
- **LMI household access:** Include subscribers from LMI households.
- **Resilience and grid benefits:** Include the capability to deliver power to households and/or critical facilities during a grid outage or strengthen grid operations.
- **Community ownership:** Local community members, subscribers, or local community organizations own or have equity in the project, or the project employs other wealth-building strategies.
- **Equitable workforce development:** Support prevailing wages, support pre-apprenticeship programming, and ensure women- and minority-owned businesses have equitable opportunity.

In Section 4, we explore the meaningful benefits in further depth and estimate the potential magnitude of these benefits in the context of our technical potential estimates.

³ “Community Solar Education and Outreach,” DOE, <https://www.energy.gov/communitysolar/education-and-outreach>

2 Methodology

Estimating the technical potential of community solar is a nuanced process that considers installations ranging from individual rooftop solar installations to large-scale utility solar projects. Community solar systems, by definition, operate at flexible scales, including both types of solar energy deployment. In our assessment, we considered rooftop solar and ground-mount solar systems greater than 38 kilowatts alternating current (kW_{AC}) as potential community solar systems. This system size threshold is indicative of PV systems larger than typical single-customer nonresidential systems. Figure 2 compares utility-scale solar, community solar, and behind-the-meter solar deployments and shows to-scale representations of each deployment type's typical system size with accompanying comparative descriptions. This assumption does not take state or utility community solar program caps into account and relies on sample statistics taken from community solar installations through mid-2022 (Chan, Heeter, and Xu 2022).

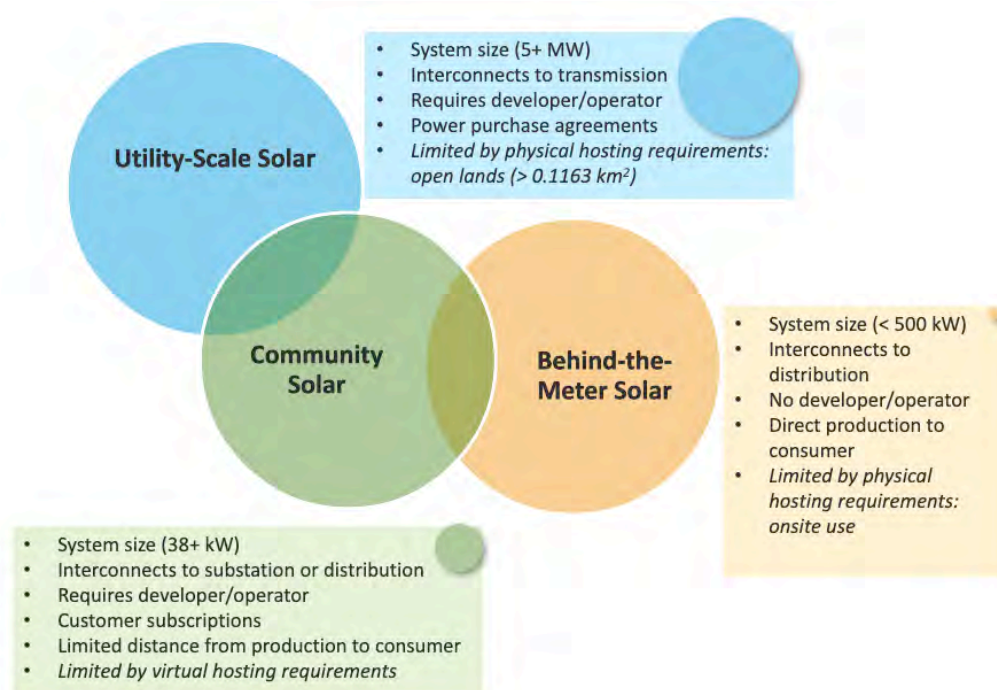


Figure 2. Size range of solar PV deployments with scaled system size indicator

To ensure accuracy and relevance in our estimations, we excluded areas otherwise not developable for solar and considered virtual hosting requirements unique to community solar (e.g., maximum interconnection distance, co-location within an electricity service territory, capacity not exceeding within-territory gross electricity consumption). In utility-scale ground-mount PV technical potential analyses, spatial contiguity thresholds of 0.3 square kilometers (km²) or less are typically applied to exclude potential PV sites smaller than utility-scale size. This filter for utility-scale PV is equivalent to omitting ground-mounted PV sites of 1.2 MW_{AC} or less, assuming the same capacity density used here. The approach used in this study positions the community solar systems modeled in this technical potential assessment as a distinct modeled solar energy deployment type. Ground-mount PV systems modeled can range from 38 kW_{AC} to 67 MW_{AC}, based on modeling parameters discussed further in Section 2.2.2.

This analysis builds on previous work by Lopez et al. (2012), Gagnon et al. (2016), Feldman et al. (2015), and Waechter and Williams (2021). We used both the PV Rooftop model (Gagnon et al. 2016), a legacy software that delineates suitable areas for rooftop PV, and the Renewable Energy Potential (reV) model (Maclaurin et al. 2019), an open-source software used for renewable energy technical potential analysis. reV uses the System Advisor Model (SAM; Blair et al. 2014) within its modeling pipeline to calculate PV system performance and costs for specified technology assumptions. By combining rooftop solar siting results from PV Rooftop and system performance with high-resolution ground-mount solar siting, we estimated community solar technical potential within U.S. Census Bureau (2020) tracts across the United States.

2.1 Estimating Generation

We calculated PV system performance using the reV model and hourly solar irradiance and weather data from the National Solar Radiation Database (NSRDB; Sengupta et al. 2018). We used four resource years (2018–2021) from the Extended CONUS (Continental United States) set from the NSRDB for all states except Alaska. Because the NSRDB is not available above 60° latitude (Figure 3), we used ERA5⁴ hourly solar resource data (Copernicus Climate Change Service 2017) covering the same resource years for Alaska. We used the reV model to estimate PV system performance and incorporate siting constraints for community solar installations. We focused on modeling system performance and community solar siting for this technical potential analysis rather than community solar financial models, production and subscriber costs, and interconnection costs.

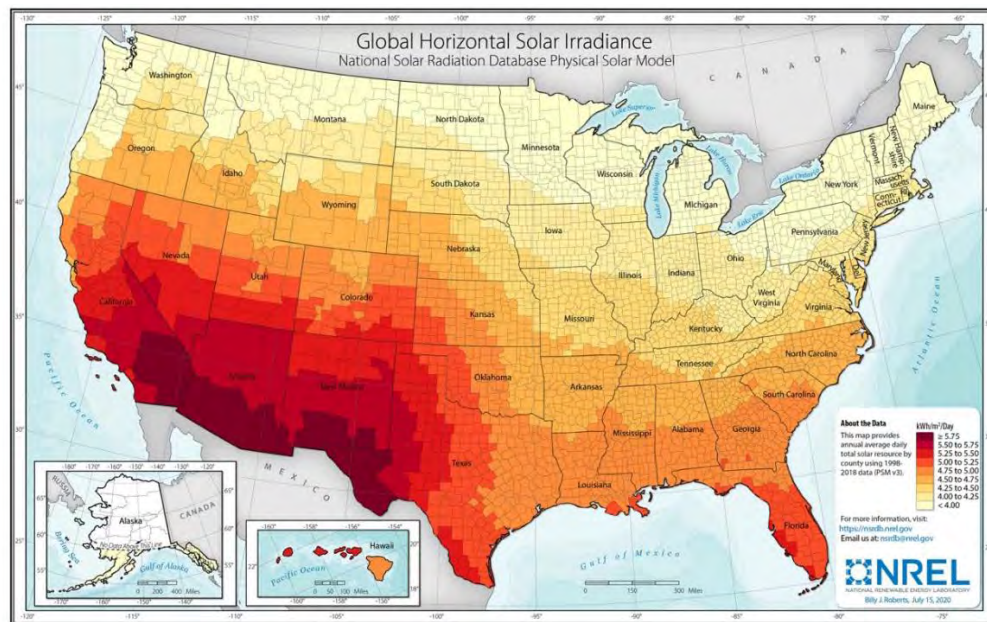


Figure 3. Annual mean global horizontal irradiance from 1998 to 2018 (National Solar Radiation Database for the continental United States, Alaska, and Hawaii)

⁴ ERA5 is the fifth generation European Centre for Medium-Range Weather Forecasts atmospheric reanalysis of the global climate covering the period from January 1940 to present.

Rooftop system performance in reV was modeled for one system configuration of rooftop PV for 21 unique tilt and azimuth combinations to maintain consistency with previously published rooftop PV siting data (Gagnon et al. 2016, pages 9, 11). Roof areas classified as suitable for PV installation by Gagnon et al. 2016 were used to model and identify buildings with potential to host rooftop community solar systems. For flat roof planes (tilt $< 9.5^\circ$), the azimuth was assumed to be south and the tilt was assumed to be 15° , with a module area to roof area ratio of .7. For tilted roof planes (tilt $> 9.5^\circ$), azimuths were assumed to be between 67.5° and 292.5° , and tilts were assumed to be between 9.5° and 60° , with a module area to roof area ratio of .98. We made changes to PV technology based on improvements made since Gagnon et al.'s 2016 publication. In particular, we assumed that the inverter load ratio was 1.22 (Barbose et al. 2022), inverter efficiency was 98%, losses were 8.06%, module efficiency was 20.3% (Ramasamy et al. 2022, pages 22–23), and modules were monocrystalline with a capacity density of 172 watts (W) per square meter.

Ground-mount system performance in reV was modeled for one configuration of ground-mount PV for one tilt and azimuth combination. We assumed an inverter load ratio of 1.34 (Bolinger et al. 2022), inverter efficiency of 98%, losses of 10.4% (NREL 2022), module efficiency of 20.3% (Ramasamy et al. 2022), monocrystalline modules, and one-axis tracking arrays with a capacity density of $48 \text{ MW}_{\text{DC}}/\text{km}^2$ or $37 \text{ MW}_{\text{AC}}/\text{km}^2$. These technology assumptions reflect recent reports of trends (Barbose et al. 2023; NREL 2022) in distributed solar and utility-scale solar PV deployment, and they correspond with the calculated capacity density of selected community PV plants' indirect use footprints (EIA 2023b). Multiyear mean capacity factors for each system, described above, were computed across the United States at a four-kilometer resolution with SAM's PVWatts8 under the LCOE Calculator (FCR Method) financial model.

2.2 Siting Constraints and Regimes

As the community solar market has matured in the past decade, generalized community solar siting constraints have emerged. These constraints include closer proximity to subscribers than utility-scale generation sources, interconnection to electricity distribution infrastructure, and co-location with feeders and substations with sufficient available hosting capacity. The latter two constraints are difficult to model, as individual utilities own and maintain both distribution geospatial datasets and hosting capacity information with no complete data proxy available. For this analysis, we assume that rooftop solar interconnects to distribution without limitation, that ground-mount solar interconnects at substations, and that ground-mount solar is in the same electricity service territory as subscribers. Aside from these constraints, local siting drivers of community solar are uncertain, particularly in states without established community solar legislation and programs. We account for some of this uncertainty by presenting two siting regimes for community solar in Section 2.2.2. With community solar's flexible size and form, there are additional benefits for local communities in strategically siting community solar (Gahl and Norris 2022). In a recent study (Heleno et al. 2023), under baseline conditions, community solar projects were found to not require additional distribution grid infrastructure investments and were more likely to defer distribution system upgrades while potentially reducing line losses in primary distribution feeders.

2.2.1 Rooftop Siting Constraints

Siting constraints for rooftop solar are inherited from the PV Rooftop model. The PV Rooftop model uses high-resolution 3D digital surface models that represent the built environment and potential shading obstructions to identify discrete planes that are suitable for rooftop PV development based on plane direction, tilt, massing, and shading (Figure 4). These high-resolution classified data are only available for 128 cities in the continental United States and are limited to 3D representations at the time of data capture (2006–2013), representing up to 23% of the national building stock of the time.



Figure 4. Elevation digital surface model and derived roof area characteristics used by the PV Rooftop model

These classified data were used to train a k-nearest neighbors imputation for PV-developable roof percent across buildings not represented in the PV Rooftop data archive (NREL 2016). The k-nearest neighbors imputation was calculated within a maximum-distance, non-overlapping (Thiessen) polygon basin for each sample city from PV Rooftop’s archive. Buildings within each city’s basin were imputed based on the PV-developable area characteristics of overlapping training data from PV Rooftop, building occupancy (Lutz et al. 2022), canopy cover (MRLC 2021), and topographic position index. Each building was attributed an occupancy-specific and regionally appropriate distribution of the azimuth, tilt, and developable area of PV-suitable roof planes. In this analysis, rooftop solar followed a singular siting regime based on maximizing per-system capacity. We used USA Structures (ORNL 2023) for building geometries across the United States and the National Structure Inventory (Lutz et al. 2022) for occupancy and building heights.

2.2.2 Ground-Mount Siting Constraints

Ground-mount solar has greater siting variability than rooftop solar. Here, we used methods for assessing siting constraints and regimes for ground-mount solar that were inherited from the reV model and ongoing research by NREL. For this analysis, we used the same solar PV siting regimes as in NREL’s Solar Ordinances database (NREL 2022). These regimes with ordinances were found to reduce utility-scale solar PV resources up to 38% (Lopez et al. 2023). reV utilizes a 90-meter grid across the study area and builds locational indices across multiple scales to geospatial datasets pertaining to solar PV exclusion or inclusion. Individual locations are typically identified for each siting regime with a Boolean exclusion or inclusion. This is not the case with solar setbacks. Solar setbacks are often smaller than the standard 90-meter Boolean exclusion or inclusion raster of reV. For setbacks, we calculated the inclusion area as a percentage within a 90-meter raster cell as dictated by the finer-resolution source data, as shown in Figure 5. Figure 5 shows (a) the national solar and transmission infrastructure and (b) a zoomed-in grid cell for PV siting. For each grid cell, setbacks are imposed from features such as

roads, structures, and waterways. The remaining area is assumed to be available for PV development. This percent inclusion value was calculated by rasterizing features (e.g., structures, roads, railroads) onto a spatially upscaled Boolean exclusion layer and then totaling the area of the resulting non-excluded sub-90-meter cells normalized by the area of the original 90-meter cell.

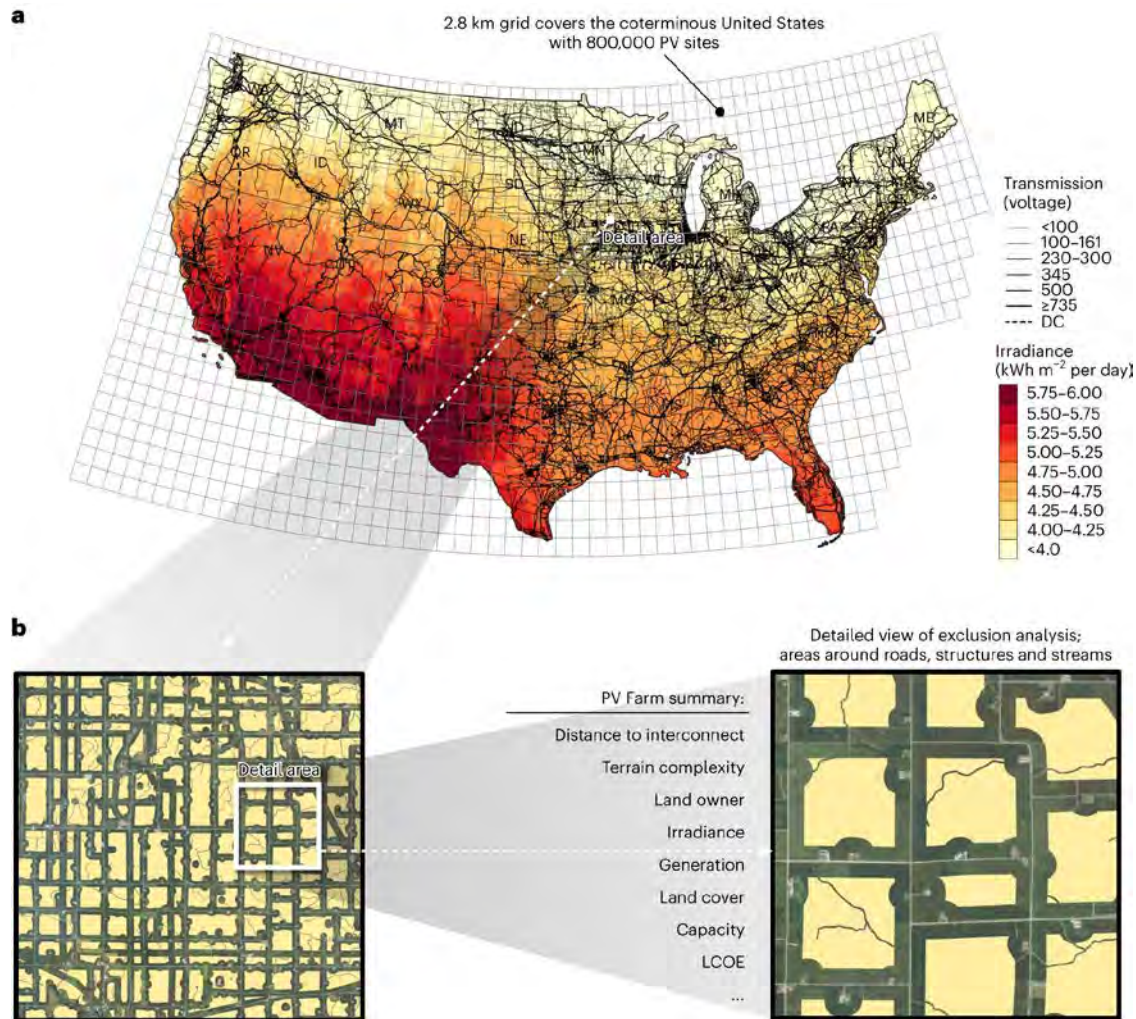


Figure 5. Overview of the method used to determine resource availability after applying solar PV ordinance setbacks (from Lopez et al. 2023)

We utilized two of NREL’s three solar PV siting regimes, Reference Access and Limited Access, each of which represents a collection of individual siting constraints, to reflect the plausible differences in solar PV siting restrictions. An overview of these adapted siting regimes is shown in Figure 6, and the two regimes are described as follows:

1. **Reference Access** is a regime that balances siting considerations and is informed by common practices to guide development. For example, a 10% slope restriction is used to prevent complicated racking needs, in addition to other physical restrictions that are assumed under the Open Access scenario. The Reference Access scenario also applies seven documented types of setbacks and restrictions (property line, structures, roads,

water, height, sound, and minimum lot size). For areas without enumerated setback requirements, we apply setbacks scaled to the 50th percentile of enumerated setbacks. Reference Access community solar potential sites are also required to be within two miles of existing substations.

Limited Access is a combination of more stringent siting considerations. Limited Access applies greater setback requirements (90th percentile) from buildings and other infrastructure as well as more comprehensive exclusions. The setback types are consistent with Reference Access. The additional exclusions include additional restrictions of protected areas (categories 3 and 4, PADUS 2023), conservation easements (NCED 2022), stricter slope requirements (0%–5%), and additional incompatible land covers (pasture, gradients of inclusion for low- and moderate-density development). Limited Access community solar potential sites are also required to be within one mile of existing substations.



Figure 6. Ground-mount PV technical exclusions adapted from utility-scale solar siting regimes

We did not model the Open Access regime because its purpose is to define a ceiling for a technology's technical potential, something that has been previously established and does not add information to community solar siting. These siting regimes were created to capture a range of deployment barriers, in effect bracketing estimates of solar PV potential along a theoretical gradient of site restrictiveness. We did not analyze the probability of any siting regime, and these siting regimes are not intended to predict future community solar growth. The siting considerations applied within each siting regime are not mutually exclusive. Technical exclusions and setbacks were aggregated at a fixed scale to calculate location-based economics, such as interconnection distance, costs, and interconnection capacity. Community solar installation economics were captured at 1.44 km x 1.44 km² (2.07-km²) resolution, totaling from 650,000 to over 3,000,000 locations across the United States, depending on spatial exclusions. These aggregated community solar supply units include cumulative physically potentially developable spaces for ground-mount community solar PV arrays and range in capacity from 38 kW_{AC} to 67 MW_{AC}.

2.2.3 Virtual Hosting Limitations

The preceding subsections describe physical hosting for community solar arrays. In addition to limitations to physical hosting, community solar relies on virtual hosting limitations to distinguish it from other forms of solar deployment. We define virtual hosting limitations as constraints applied to solar supply that limit the theoretical maximum amount of solar that can be added in an area. In this analysis, these limitations were applied exclusively to ground-mount PV hosting sites. The first virtual hosting limitation that was applied limited the subscriber pool for community solar to electricity customers within each electric retail service territory (EIA 2023a), a common siting requirement for community solar. Second, we limited the potential ground-mount community solar supply to economically feasible interconnection distances of one mile (Limited Access) and two miles (Reference Access) from substations. In the future, community solar interconnection should be mapped to distribution feeders in addition to substations. Third, we applied a demand constraint to not exceed the serviceable demand within each utility service territory. In service territories where the retail electricity consumption (EIA 2022) exceeded modeled community solar supply, supply was not changed from the direct model outputs. In service territories where the retail electricity consumption was less than the modeled community solar supply, supply was limited within that service territory: We omitted potential community solar sites (1.44 x 1.44 km²) with the highest site-based levelized cost of energy in the service territory until modeled ground-mount community solar supply fell below annual electricity retail sales. Because retail service territories overlap geographically, tracts were assigned to utility service territories based on majority overlay and weighting by territory area and customer count. Figure 7 shows how potential community solar sites are affected by demand or supply constraints for each siting regime across the continental United States. Areas in brown denote tracts where potential community solar supply falls short of total electricity demand in the Reference siting regime, and areas in red denote the same situation for the Limited Access siting regime. Where Limited Access supply shortages are not shared with the Reference Access scenario, the map shows brown. Areas in yellow denote tracts where potential community solar supply exceeds total electricity demand in the Reference Access siting regime, and areas in orange denote the same situation for the Limited Access siting regime. Where Limited Access supply overages are not shared with the Reference Access scenario, the map shows yellow.

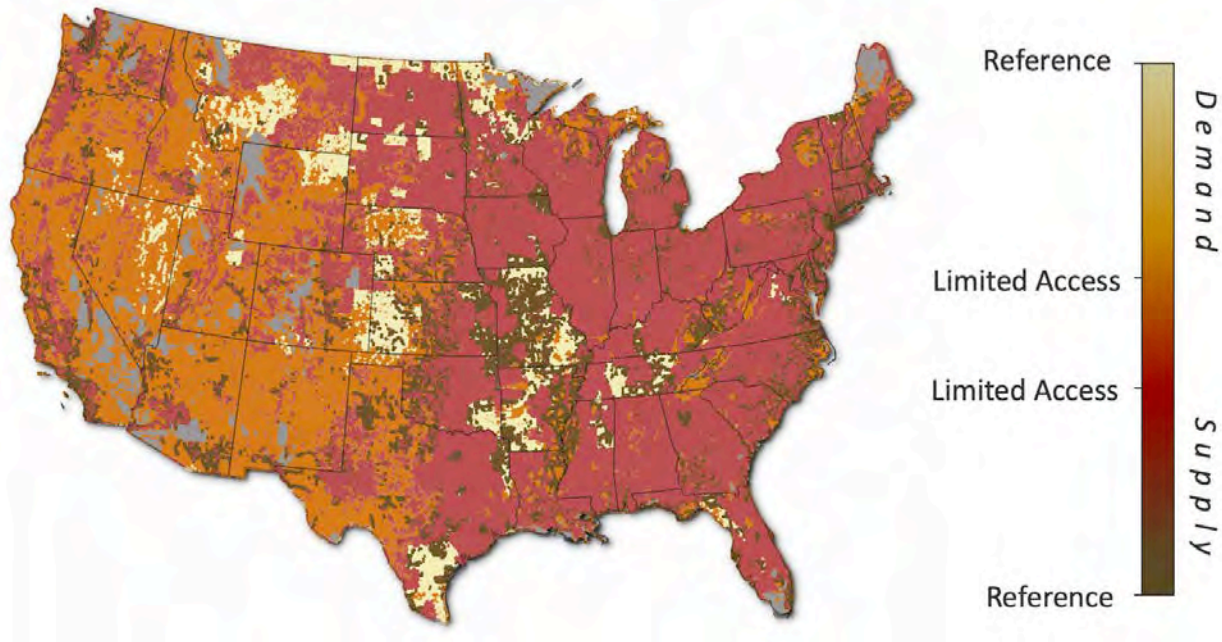


Figure 7. Geographic distribution of potential community solar sites by supply or demand constraint (gray indicates no data)

2.3 Estimating Technical Potential and Offsetable Consumption

For each solar array technology, we calculated capacity (Equation 1) and generation (Equation 2), where developable area includes the roof planes considered suitable for rooftop PV as well as the aggregated ground-mount developable area ($1.44 \times 1.44 \text{ km}^2$). The capacity density for rooftop PV is 172 W/m^2 , and the capacity density for ground-mount PV is $48 \text{ MW}_{\text{DC}}/\text{km}^2$ or $37 \text{ MW}_{\text{AC}}/\text{km}^2$. Capacity factors refer to the corresponding multiyear mean capacity factors for each system at 4-km^2 resolution (described in Section 2.1), and time equates to time series length (8,760). For each siting regime, we combined overlapping rooftop and ground-mount system capacities and annual energy production within each tract (Manson et al. 2022) to create tract-level community solar technical potential estimates.

$$\text{Capacity}_W = \text{Developable Area}_{m^2} * \text{Capacity Density}_{watts/m^2}$$

Equation 1: Capacity expressed for solar PV technology

$$\text{Annual energy production}_{MW_h} = \text{Capacity}_{MW} * \text{Capacity Factor}_{\%} * \text{Time}$$

Equation 2: Technical potential expressed for solar PV technology

We extended the tract-level community solar technical potential estimates by household income, tenure, and building type. Unlike aggregation and Mooney and Sigrin's (2018) methods for normalizing households and buildings for exclusively behind-the-meter rooftop solar modeling, we intersected all community solar suitable building technical potential estimates described in Section 2.2.1 with community solar suitable ground-mount areas within tracts. We then compared that supply to residential and commercial electricity consumption for households and businesses that face significant barriers to adopting on-site solar. Feldman et al. (2015) identified

residential demand for solar energy that likely will not be met by behind-the-meter solar as households that rent, are located in buildings with more than three stories (excluding basements), or are located in buildings with roofs that are unsuitable for rooftop solar (e.g., excessive shading, structural or panel issues). Additionally, we considered households that reside in impermanent dwellings (vans, recreational vehicles, boats, mobile homes) to be unsuitable for rooftop solar. Feldman et al. (2015) identified commercial demand for solar energy that likely will not be met by on-site solar as businesses that are located in buildings with more than five establishments, buildings with less than 10,000 square feet with 2–5 establishments, or buildings with less than 10,000 square feet with one establishment and PV-developable roof areas that cannot support at least 20% of the building’s overall electricity demand. The ability to meet 20% or more of electricity load was not included in this analysis. Additionally, ground-mount behind-the-meter solar generation was not considered.

Demographic data were disaggregated within tracts based on household income, tenure (own, rent), and building type (single-family, multifamily) (Manson et al. 2022: Tables B19001, B25001, B25003, B25032) using random weighted sampling and proportional allocation methods similar to Mooney and Sigrin (2018). We maintained a consistent definition of previous NREL works focused on LMI households, following the U.S. Department of Housing and Urban Development’s 2020 area median income (AMI) limits and binning income limits:

- Very low income: 0%–30% of AMI
- Low income: 30%–50% of AMI
- Moderate income: 50%–80% of AMI
- Middle income: 80%–120% of AMI
- High income: >120% of AMI.

Household income was discretized from the American Community Survey’s income bins to \$1,000 increments and applied to the U.S. Department of Housing and Urban Development’s income breakpoints by household size. Household electricity consumption data from the Low-Income Energy Affordability Data (LEAD) Tool (Ma et al. 2019) was summed across tracts and resampled to match AMI bins, tenure, and building type. Electricity consumption was stratified by income, tenure, and building type and was divided by gross community solar supply within tracts to calculate a per-category percent of electricity demand. Additionally, offsetable electricity consumption for customers unable to access behind-the-meter solar was calculated by dividing that consumption by gross community solar supply within tracts.

3 Technical Potential Results

Overall, we estimate that over 31% (809 TWh) of annual commercial and residential electricity consumption cannot be met by behind-the-meter or on-site solar, including 42% of residential electricity consumption (out of 1,049 TWh total) and 23% of commercial electricity consumption (out of 1,558 TWh total). We found that 42% of households and 44% of businesses are unable to access behind-the-meter solar, which is lower than previous estimates of 49% of households and 48% of businesses (Feldman et al. 2015). This opportunity space for community solar equates to 20% of domestic gross electricity consumption. It is clear from this analysis that access to community solar is highly localized and subject to local supply and demand constraints. The opportunity space for community solar is not uniformly distributed across income levels, tenure, or building types. Figure 8 shows that more than 50% of LMI households likely lack access to on-site solar, and this demonstrates an opportunity space for community solar to benefit LMI customers. Conversely, a majority of middle- and high-income households (>60%) face no discernible physical barriers to accessing behind-the-meter solar.

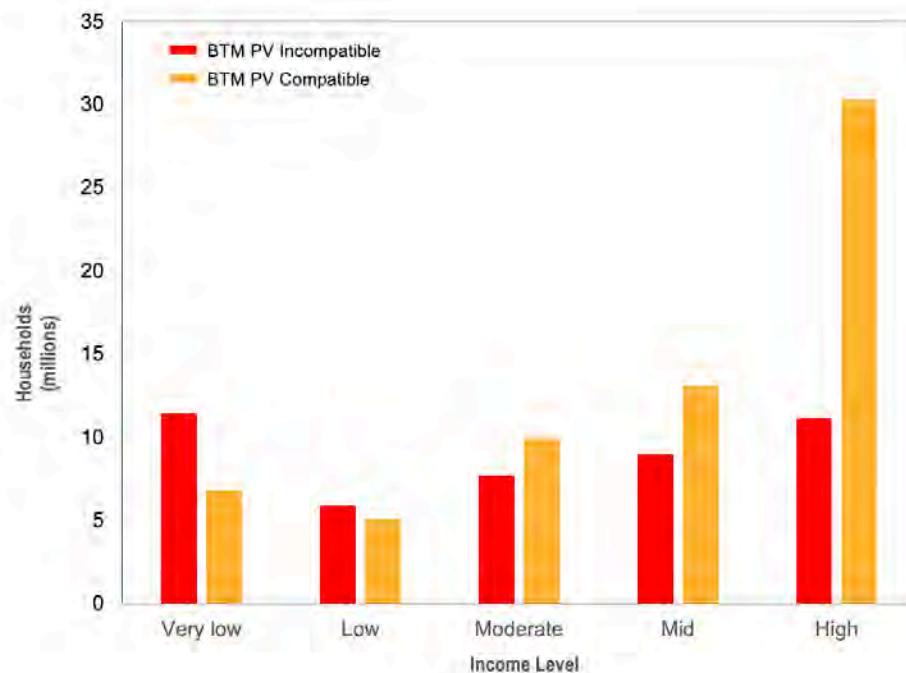


Figure 8. Distribution of households by income with significant barriers for behind-the-meter (BTM) PV compatibility based on tenure, building type, and individual building suitability

Opportunities for community solar and other sources of renewable energy are significant, and the potential community solar supply is significant. We estimate that there is sufficient community solar potential to offset 211% and 643% of electricity consumption for customers unable to access behind-the-meter or on-site solar (Tables 1 and 2) in the Limited Access and Reference Access siting regimes, respectively. This is not uniformly distributed geographically, as shown in Figures 11 and 12. Areas lacking wide access to ground-mount community solar installations are less likely overall to be able to fully offset unmet residential and commercial electricity consumption with community solar.

Table 1. Limited Access Siting Regime Community Solar Technical Potential Results by State

State	ROOFTOP PV			GROUND-MOUNT PV			COMBINED		Percent of Unmet Electricity Consumption Offsetable by Community Solar
	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	
Alabama	6,902	13,569	50%	6,868	13,718	50%	13,771	27,287	205%
Alaska	913	867	14%	5,721	3,959	86%	6,634	4,827	409%
Arizona	7,260	12,046	33%	14,848	27,487	67%	22,108	39,534	229%
Arkansas	4,751	9,053	51%	4,548	9,634	49%	9,300	18,687	220%
California	36,108	48,482	59%	25,526	48,085	41%	61,635	96,568	135%
Colorado	6,244	12,053	13%	41,931	66,523	87%	48,175	78,577	633%
Connecticut	3,785	7,582	96%	152	1,144	4%	3,937	8,726	90%
Delaware	1,114	2,215	92%	97	614	8%	1,211	2,829	116%
District of Columbia	465	813	100%	0	0	0%	465	813	32%
Florida	19,793	38,700	60%	13,083	23,506	40%	32,876	62,206	104%
Georgia	14,021	27,407	63%	8,319	19,263	37%	22,340	46,671	156%
Hawaii	909	1,917	16%	4,776	7,903	84%	5,686	9,820	425%
Idaho	2,467	4,077	21%	9,209	13,567	79%	11,676	17,645	474%
Illinois	16,059	29,760	78%	4,572	12,337	22%	20,632	42,098	162%
Indiana	11,369	21,486	77%	3,449	11,585	23%	14,819	33,071	250%
Iowa	5,889	11,703	46%	6,992	14,473	54%	12,882	26,176	428%
Kansas	5,756	11,118	19%	23,799	38,496	81%	29,556	49,614	795%
Kentucky	6,423	12,451	45%	7,710	15,057	55%	14,134	27,509	225%
Louisiana	5,454	10,165	71%	2,252	5,339	29%	7,706	15,504	118%
Maine	1,535	3,030	51%	1,501	3,184	49%	3,037	6,214	172%
Maryland	5,832	11,468	87%	851	2,833	13%	6,683	14,301	96%
Massachusetts	5,912	11,716	86%	955	3,228	14%	6,868	14,945	73%
Michigan	13,229	26,017	76%	4,247	11,030	24%	17,476	37,048	193%
Minnesota	8,153	15,947	40%	12,024	20,788	60%	20,178	36,735	354%
Mississippi	4,679	9,434	59%	3,302	8,194	41%	7,981	17,628	206%
Missouri	8,130	15,978	29%	19,722	30,988	71%	27,853	46,967	361%
Montana	2,483	4,497	8%	28,245	37,876	92%	30,728	42,373	1,731%
Nebraska	3,306	6,460	9%	33,834	49,894	91%	37,141	56,355	1,395%
Nevada	3,167	5,162	55%	2,575	5,108	45%	5,742	10,271	131%
New Hampshire	1,461	2,765	87%	221	1,001	13%	1,682	3,766	106%
New Jersey	9,194	18,254	93%	743	3,606	7%	9,937	21,861	84%
New Mexico	2,113	4,113	14%	13,320	23,883	86%	15,434	27,997	532%
New York	17,824	35,651	74%	6,122	13,792	26%	23,946	49,443	69%
North Carolina	13,704	26,994	64%	7,706	19,629	36%	21,410	46,623	154%

State	ROOFTOP PV			GROUND-MOUNT PV			COMBINED		Percent of Unmet Electricity Consumption Offsetable by Community Solar
	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	
North Dakota	2,909	5,523	11%	22,624	31,147	89%	25,534	36,670	2,049%
Ohio	18,758	36,548	83%	3,769	14,344	17%	22,528	50,893	210%
Oklahoma	4,746	9,110	12%	33,236	51,728	88%	37,982	60,838	568%
Oregon	5,196	7,827	37%	8,866	14,355	63%	14,062	22,183	309%
Pennsylvania	17,215	26,171	87%	2,578	9,314	13%	19,793	35,485	104%
Rhode Island	1,093	2,068	86%	177	467	14%	1,270	2,536	77%
South Carolina	6,756	12,051	51%	6,430	12,731	49%	13,187	24,782	172%
South Dakota	2,450	4,123	7%	30,541	42,170	93%	32,992	46,294	2,409%
Tennessee	8,946	14,987	69%	3,941	8,964	31%	12,887	23,951	131%
Texas	38,206	72,170	29%	93,404	159,795	71%	131,611	231,965	292%
Utah	3,857	7,291	33%	7,824	14,206	67%	11,682	21,498	349%
Vermont	814	1,173	39%	1,270	2,122	61%	2,084	3,295	194%
Virginia	8,907	14,833	57%	6,838	12,533	43%	15,745	27,366	124%
Washington	7,958	11,106	60%	5,251	8,739	40%	13,209	19,845	160%
West Virginia	2,292	3,470	75%	756	2,071	25%	3,049	5,542	116%
Wisconsin	9,422	14,934	69%	4,316	11,101	31%	13,739	26,035	218%
Wyoming	1,035	1,881	5%	19,445	28,453	95%	20,480	30,334	2,293%
Total	396,988	718,241	41%	570,508	991,984	59%	967,49	1,710,226	211%

Table 2. Reference Siting Regime Community Solar Technical Potential Results by State

State	ROOFTOP PV			GROUND-MOUNT PV			COMBINED		Percent of Unmet Electricity Consumption Offsetable by Community Solar
	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	
Alabama	6,902	13,569	17%	33,213	58,019	83%	40,115	71,589	537%
Alaska	913	867	12%	6,562	5,048	88%	7,476	5,916	502%
Arizona	7,260	12,046	7%	99,617	223,185	93%	106,877	235,232	1,365%
Arkansas	4,751	9,053	17%	23,651	40,524	83%	28,403	49,577	584%
California	36,108	48,482	22%	126,147	261,014	78%	162,25	309,497	432%
Colorado	6,244	12,053	7%	84,761	167,535	93%	91,006	179,589	1,446%
Connecticut	3,785	7,582	54%	3,244	5,055	46%	7,030	12,638	130%
Delaware	1,114	2,215	34%	2,131	3,555	66%	3,245	5,770	237%
District of Columbia	465	813	88%	61	101	12%	527.38	914	36%
Florida	19,793	38,700	32%	42,219	79,807	68%	62,012	118,508	198%

State	ROOFTOP PV			GROUND-MOUNT PV			COMBINED		Percent of Unmet Electricity Consumption Offsetable by Community Solar
	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	
Georgia	14,021	27,407	23%	48,084	85,723	77%	62,105	113,130	379%
Hawaii	909	1,917	9%	9,575	19,255	91%	10,485	21,172	915%
Idaho	2,467	4,077	5%	43,431	77,741	95%	45,899	81,818	2,200%
Illinois	16,059	29,760	34%	31,188	51,325	66%	47,248	81,085	312%
Indiana	11,369	21,486	23%	37,313	60,194	77%	48,683	81,681	616%
Iowa	5,889	11,703	13%	38,857	63,872	87%	44,746	75,576	1,237%
Kansas	5,756	11,118	8%	65,302	121,734	92%	71,059	132,852	2,130%
Kentucky	6,423	12,451	13%	42,230	68,685	87%	48,654	81,137	664%
Louisiana	5,454	10,165	24%	17,509	31,229	76%	22,963	41,394	315%
Maine	1,535	3,030	18%	7,041	10,640	82%	8,576	13,670	378%
Maryland	5,832	11,468	43%	7,840	12,879	57%	13,673	24,347	163%
Massachusetts	5,912	11,716	43%	7,959	12,411	57%	13,872	24,128	117%
Michigan	13,229	26,017	26%	37,908	58,338	74%	51,137	84,355	440%
Minnesota	8,153	15,947	12%	59,333	93,638	88%	67,487	109,585	1,056%
Mississippi	4,679	9,434	19%	19,784	34,617	81%	24,464	44,051	516%
Missouri	8,130	15,978	9%	87,446	148,193	91%	95,576	164,172	1,262%
Montana	2,483	4,497	2%	105,005	168,873	98%	107,48	173,371	7,084%
Nebraska	3,306	6,460	3%	115,212	205,610	97%	118,51	212,071	5,251%
Nevada	3,167	5,162	14%	18,826	39,483	86%	21,994	44,646	568%
New Hampshire	1,461	2,765	36%	2,639	4,000	64%	4,100	6,766	191%
New Jersey	9,194	18,254	50%	9,063	14,613	50%	18,257	32,868	127%
New Mexico	2,113	4,113	3%	77,693	171,659	97%	79,807	175,773	3,340%
New York	17,824	35,651	36%	31,374	46,275	64%	49,198	81,926	114%
North Carolina	13,704	26,994	25%	41,224	71,894	75%	54,928	98,889	327%
North Dakota	2,909	5,523	3%	82,972	132,545	97%	85,882	138,069	7,716%
Ohio	18,758	36,548	34%	36,095	55,703	66%	54,854	92,252	381%
Oklahoma	4,746	9,110	5%	87,938	165,656	95%	92,684	174,766	1,631%
Oregon	5,196	7,827	11%	40,419	69,027	89%	45,615	76,855	1,070%
Pennsylvania	17,215	26,171	40%	25,583	38,425	60%	42,798	64,596	190%
Rhode Island	1,093	2,068	49%	1,139	1,805	51%	2,232	3,873	118%
South Carolina	6,756	12,051	19%	28,927	51,408	81%	35,684	63,459	440%
South Dakota	2,450	4,123	3%	81,437	138,302	97%	83,888	142,426	7,412%
Tennessee	8,946	14,987	22%	31,109	52,218	78%	40,056	67,206	368%
Texas	38,206	72,170	8%	434,960	860,080	92%	473,166	932,250	1,174%

State	ROOFTOP PV			GROUND-MOUNT PV			COMBINED		Percent of Unmet Electricity Consumption Offsetable by Community Solar
	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	Percent of Capacity	MW _{AC}	GWh	
Utah	3,857	7,291	7%	48,923	97,114	93%	52,781	104,406	1,693%
Vermont	814	1,173	13%	5,599	8,019	87%	6,413	9,193	5,40%
Virginia	8,907	14,833	21%	33,956	56,290	79%	42,863	71,124	3,22%
Washington	7,958	11,106	21%	29,572	46,854	79%	37,530	57,960	4,66%
West Virginia	2,292	3,470	30%	5,304	8,030	70%	7,597	11,501	2,40%
Wisconsin	9,422	14,934	18%	43,634	69,061	82%	53,057	83,996	705%
Wyoming	1,035	1,881	2%	64,107	117,481	98%	65,143	119,362	9,023%
Total	396,988	718,241	14%	2,465,142	4,484,768	86%	2,862,130	5,203,010	643%

3.1 Community Solar Capacity and Annual Energy Production

The United States has 940 GW_{AC} of community solar capacity under the Limited Access siting regime, amounting to 1,710 TWh of annual energy production (Table 1). Of this, rooftop solar systems comprise 41% of developable capacity, with 2,776 km² of developable roof area across commercial, industrial, and residential buildings. Ground-mount solar contributes the remaining 58% of developable capacity, with 15,437 km² of developable area. In the Reference Access siting regime, potential community solar capacity increases to 2,862 GW_{AC}, amounting to 5,921 TWh of annual energy production (Table 2). Of this, rooftop solar systems comprise 14% of developable capacity, with 2,776 km² of developable roof area across commercial, industrial, and residential buildings. If rooftop solar was limited to public buildings exclusively, only 1.7% of overall community solar technical potential would be available from rooftop arrays. As rooftop community solar projects represent a small minority of community solar projects to date, this is an important consideration for feasibility and future economic and market potential studies. Ground-mount solar contributes the remaining 86% of developable capacity, with 53,378 km² of developable area. The Limited Access regime reduces community solar developable area and capacity by 88% from the Reference Access regime, reducing annual energy production by 71%. Figure 9 shows the comparative distribution of ground-mount community solar capacity across the continental United States. Within these estimates, 167 GW_{AC} and 407 TWh/yr of community solar potential is located in disadvantaged communities (DOE 2022a) under the Limited Access siting regime. Community solar sited within disadvantaged communities can offset 91% of those communities' current electricity consumption levels that cannot be met by behind-the-meter solar (441 TWh), as well as providing longer-term community benefits.

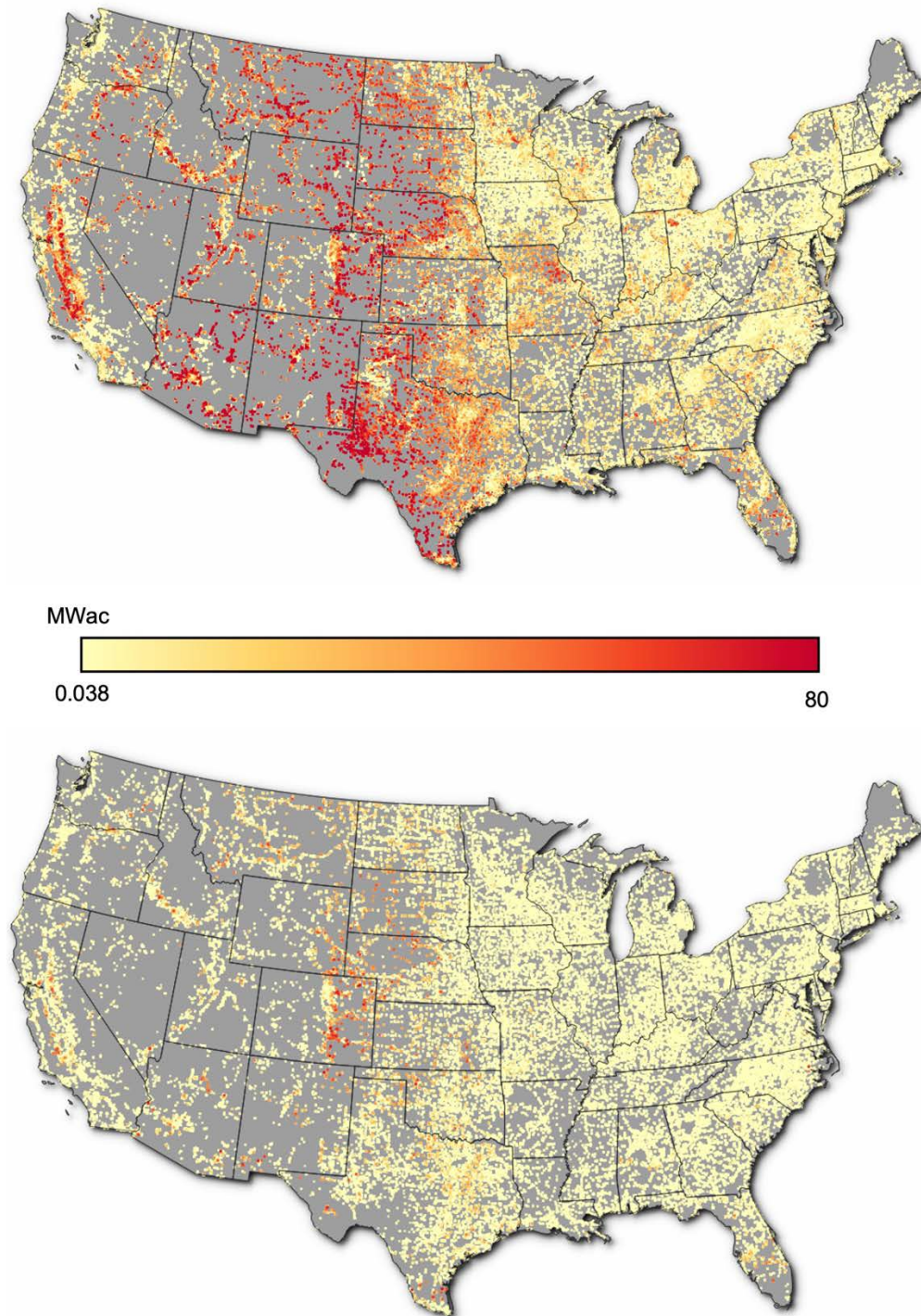


Figure 9. Modeled community solar capacity for Reference Access siting regime (top) and Limited Access siting regime (bottom)

3.1.1 Opportunities for Strategically Siting Community Solar

Overall, rural areas and areas with intensive build-out of grid infrastructure are best suited to host community solar installations, given interconnection assumptions. Dense urban, mountainous, or forested areas, or areas with other preclusions, are least suited to host a cost-competitive, sizeable community solar supply. For ground-mount solar, we found population density, land cover, and ordinances/setbacks to be the most impactful factors in siting community solar supply. Figure 10 shows that 1%–4% of ground-mount PV potential is outside of rural areas⁵ and has medium- and low-density development land covers.⁶ The majority of community solar potential lies in ground-mount arrays in exurbs and rural contexts, most commonly with open space, grassland, pasture, and barren land covers. Solar ordinances and setbacks within each siting regime decreased gross community solar supply potential by less than 20%. These constraints had a significantly smaller impact on the community solar technical potential estimates than the utility-scale solar estimates, which were found to potentially reduce utility-scale solar capacity by 38% (Lopez et al. 2023). The diminished impact of ordinances and setbacks is due to community solar’s unique size—community solar is able to maximize potential deployment by fitting into infill and other areas that large-scale solar cannot. Figure 11 shows that the majority of modeled community solar occurs in aggregations of <10 MW_{AC} in both siting regimes within the interconnection distance required per regime.

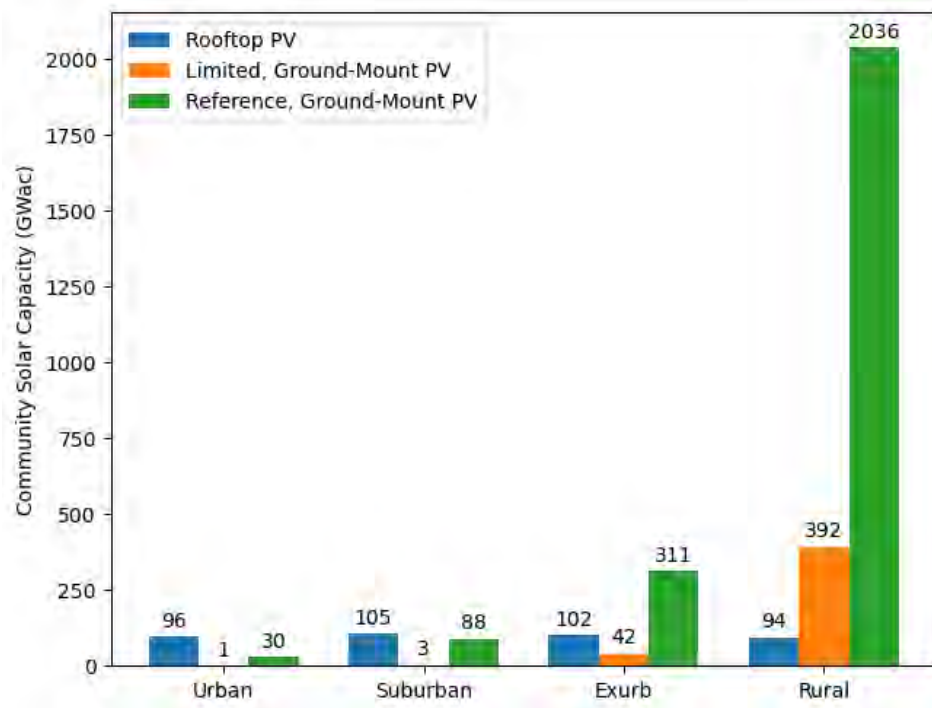


Figure 10. Community solar potential capacity by technology, siting regime, and context

⁵ Based on spatial overlay of solar power plants (EIA 2023a) between 0.34 and 5 MW and the Global Human Settlement Layer’s Degree of Urbanization dataset (Schiavina, Melchiorri, and Pesaresi 2023).

⁶ Land cover descriptions are based on overlapping characterization with the National Land Cover Database (<https://www.mrlc.gov/data/legends/national-land-cover-database-class-legend-and-description>) from the Multi-Resolution Land Characteristics Consortium.

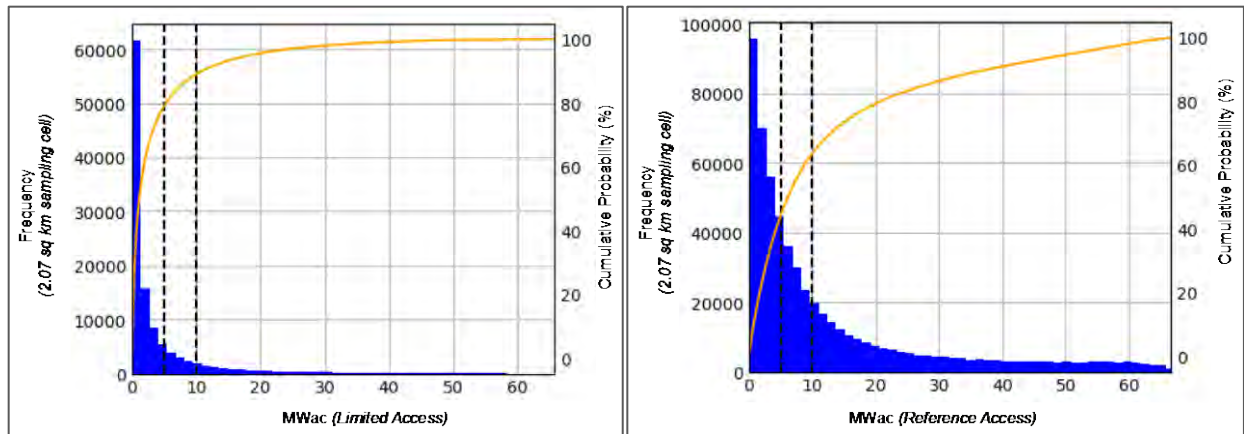


Figure 11. Cumulative distribution of modeled ground-mount PV by siting regime

Although the majority of community solar potential by volume lies in rural and exurb contexts, Figure 10 also shows that rooftop community solar holds significant potential in those areas with higher populations and built-out land covers. The need for community solar likely will not be met by ground-mount PV alone, especially in supply-limited areas and small electricity service territories. In some areas, like the District of Columbia (Table 2), we found no ground-mount PV sites available for community solar that met our siting assumptions, despite the presence of ground-mount community solar in the district (Ellfeldt 2019). Rooftop community solar is most impactful for offsetting unmet local electricity consumption in dense urban and urban contexts where clusters of large (15,000+ square feet) buildings can be found, like commercial or industrial districts. We found that building occupancies including professional/technical services, light industrial, wholesale trade, and K-12 schools offered the highest overall generation potential per building and contributed the highest share of potential capacity among community solar suitable buildings (Table 3). Table 4 lists the distribution of percent rooftop area considered developable for rooftop solar by occupancy type and census region, highlighting regional architecture trends in solar-suitable buildings. Rooftop PV siting is more constrained in regions with an older building stock, regardless of building density. Rooftop arrays on residential buildings have lower capacity per building than industrial and public buildings. Each building was assessed independently and not based on overlaying parcel ownership, potentially understating the impacts of deployment for multiple building complexes.

Community solar is better able to conform to urban and suburban siting constraints than utility-scale solar. However, not enough community solar can be sited within those settings to meet the maximum potential market share for community solar in tracts with large populations or high electricity consumption. Larger ground-mount community solar installations will be most competitive against lower-cost utility-scale solar by focusing on deployment in exurbs and rural areas within demand-constrained service territories. Within urban and suburban areas, municipal lands and repurposed lands⁷ (EPA 2023) may serve as potential anchor points for community solar development. Jurisdictions benefitting from utilities with expansive service territories—particularly those encompassing rural areas—demonstrate the greatest opportunity space for community solar. In these areas, it may be necessary to look farther afield, tapping into

⁷ More information can be found through the U.S. Environmental Protection Agency’s RE-Powering initiative (<https://www.epa.gov/re-powering>).

community solar resources available elsewhere within the utility's service domain. Figures 12 and 13 show the opportunity space for community solar as the percent of electricity consumption that cannot be offset by behind-the-meter on-site solar: Tracts with low offsetable energy levels will likely need to access the community solar supply outside of their own tract and within their service territory, whereas tracts with high offsetable energy levels can host more community solar supply than they can consume, making them hotspots for community solar deployment at larger scales.

Community solar supply was most constrained by the applied virtual hosting limitations and interconnection distance and type requirements. The broader landscape of community solar potential also mirrors regional patterns. These patterns encompass factors like competitive land usage, land valuation metrics, the prevalence of federal lands, and the density of existing grid infrastructure. It is noteworthy that, while this analysis did not factor in agrivoltaic systems, it did account for community solar with conventional inter-row spacing on pastoral lands within the Reference Access siting regime alone.

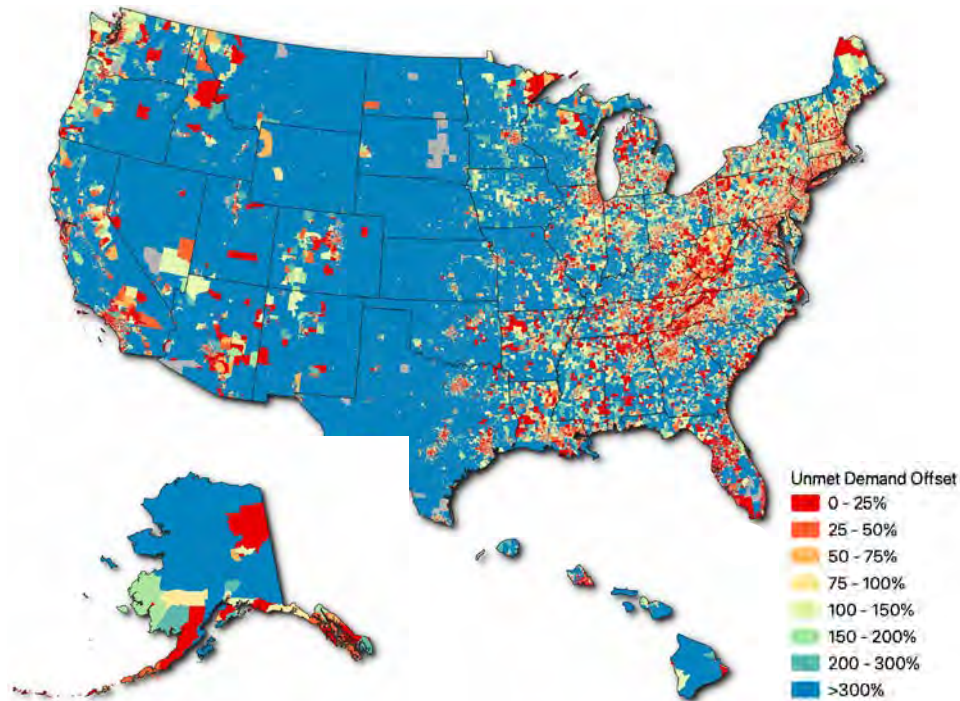


Figure 12. Percent of electricity consumption that cannot be met by behind-the-meter PV that can be offset by modeled community solar under the Reference Access siting regime

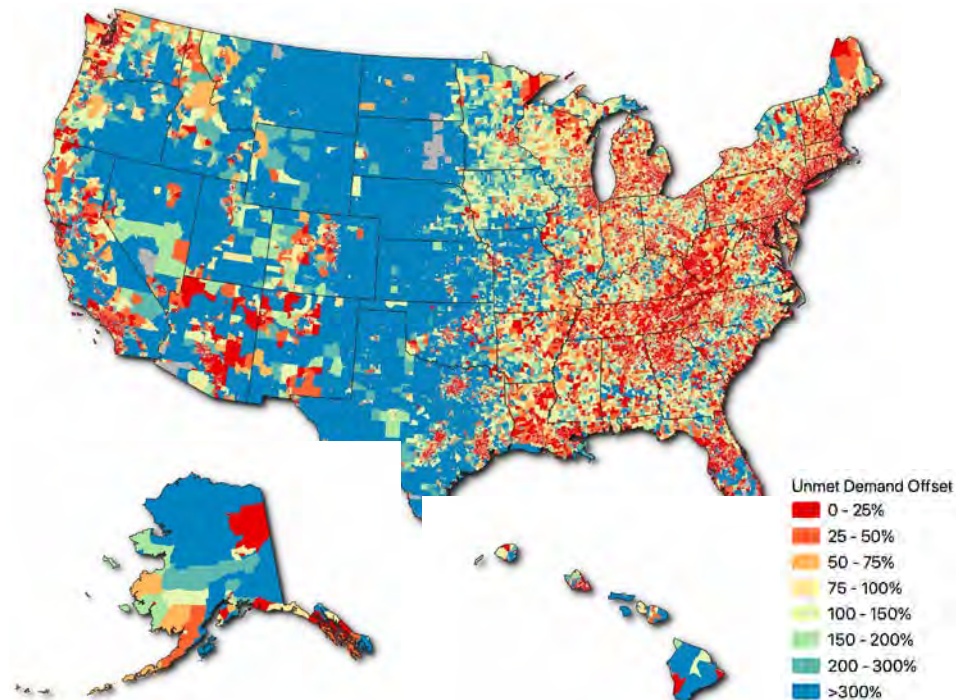


Figure 13. Percent of electricity consumption that cannot be met by behind-the-meter PV that can be offset by modeled community solar under the Limited Access siting regime

Table 3. Distribution of Rooftop PV Capacity by Building Occupancy Type

Sector	Occupancy	Building Count (thousands)	GW _{AC}	Percent of Developable Buildings	Percent of Developable Rooftop Capacity
COMMERCIAL	Banks	29.894	3.0807	0.77%	0.76%
	Entertainment/Recreation	192.435	15.6608	4.94%	3.88%
	Medical Office/Clinic	144.872	11.4305	3.72%	2.83%
	Personal and Repair Services	230.815	18.1668	5.93%	4.50%
	Professional Services	768.993	64.1048	19.74%	15.87%
	Retail	382.722	43.3017	9.83%	10.72%
	Temporary Lodging	66.403	5.6214	1.70%	1.39%
	Theater	7.491	0.9048	0.19%	0.22%
	Wholesale	290.726	43.3146	7.46%	10.72%
INDUSTRIAL	Construction	181.745	11.8024	4.67%	2.92%
	Food/Drug/Chemical	20.903	3.5166	0.54%	0.87%
	Heavy Industrial	90.28	16.9353	2.32%	4.19%
	High Technology	51.158	5.2413	1.31%	1.30%
	Light Industrial	377.466	48.1256	9.69%	11.91%
	Metals/Minerals Processing	20.086	2.9456	0.52%	0.73%
RESIDENTIAL	Single-Family Residential	127.499	10.4291	3.27%	2.58%
	Multifamily Residential (2)	125.268	7.1505	3.22%	1.77%
	Multifamily Residential (3)	37.725	2.2521	0.97%	0.56%
	Multifamily Residential (5)	59.997	3.2425	1.54%	0.80%
	Multifamily Residential (10)	45.605	2.4720	1.17%	0.61%
	Multifamily Residential (20)	40.809	2.6205	1.05%	0.65%
	Multifamily Residential (50)	27.253	2.6839	0.70%	0.66%
OTHER	Church/Nonprofit	172.181	13.6366	4.42%	3.38%
	College/University	10.663	1.9304	0.27%	0.48%
	Emergency Response	17.348	1.6529	0.45%	0.41%
	Government Services	135.88	14.3447	3.49%	3.55%
	Grade School	105.538	23.9871	2.71%	5.94%
	Hospital	22.114	3.3789	0.57%	0.84%
	Institutional Dormitory	45.837	10.7090	1.18%	2.65%
	Nursing Home	47.405	6.5353	1.22%	1.62%
	Parking	17.893	2.8628	0.46%	0.71%

Table 4. Percent of Rooftop Area Developable for PV by Building Occupancy Type

Sector	Building Occupancy	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central
COMMERCIAL	Banks	63%	65%	54%	51%	50%	58%	60%	58%	64%
	Entertainment and recreation	58%	60%	50%	47%	50%	54%	57%	55%	59%
	Medical office/clinic	60%	59%	50%	44%	49%	55%	56%	56%	63%
	Personal and repair services	62%	62%	53%	48%	49%	57%	58%	56%	64%
	Professional/technical services	57%	58%	49%	44%	44%	53%	52%	51%	60%
	Retail trade	61%	65%	57%	52%	52%	60%	62%	59%	65%
	Temporary lodging	53%	62%	52%	41%	43%	46%	56%	50%	59%
	Theaters	64%	77%	56%	54%	63%	53%	58%	61%	70%
	Wholesale trade	67%	68%	59%	58%	53%	62%	66%	60%	71%
INDUSTRIAL	Construction	58%	60%	50%	43%	45%	54%	52%	51%	61%
	Food/drug/chemicals	73%	62%	63%	57%	55%	61%	65%	64%	69%
	Heavy industry	70%	70%	63%	56%	56%	62%	66%	53%	71%
	High technology	63%	66%	52%	53%	49%	57%	56%	61%	58%
	Light industrial	68%	68%	62%	56%	58%	60%	62%	64%	68%
	Metals/minerals processing	75%	64%	65%	60%	62%	61%	65%	53%	64%
RESIDENTIAL	Single-family dwelling	39%	34%	33%	28%	31%	40%	35%	33%	35%
	Multifamily dwelling (2)	43%	41%	37%	30%	34%	43%	38%	37%	40%
	Multifamily dwelling (3)	45%	43%	38%	31%	35%	44%	40%	37%	45%
	Multifamily dwelling (5)	51%	44%	39%	34%	40%	45%	44%	43%	49%
	Multifamily dwelling (10)	53%	49%	42%	35%	46%	49%	43%	42%	51%
	Multifamily dwelling (20)	50%	60%	47%	32%	48%	50%	43%	47%	42%
	Multifamily dwelling (50)	58%	54%	51%	36%	39%	42%	48%	53%	55%
OTHER	Church/nonprofit	58%	55%	47%	43%	45%	55%	54%	56%	61%
	College/universities	61%	62%	51%	58%	65%	62%	56%	49%	56%
	Emergency response	66%	67%	59%	55%	51%	59%	60%	61%	66%
	General services	64%	62%	50%	52%	46%	57%	61%	58%	67%
	Grade schools	66%	64%	63%	55%	59%	59%	65%	65%	67%
	Hospitals	56%	58%	53%	49%	52%	59%	60%	58%	70%
	Institutional dormitory	54%	60%	47%	43%	48%	48%	54%	49%	64%
	Nursing home	57%	60%	53%	40%	45%	48%	53%	50%	58%
	Parking	57%	67%	52%	52%	48%	52%	55%	61%	65%

3.2 Community Solar Technical Potential by Household Income, Tenure, and Building Type

Our exploration of community solar technical potential reveals its ability to bridge the gap for households without access to behind-the-meter solar. Overall, there is sufficient community solar technical potential to serve all residential income levels, tenures, and building types without significant competition, as shown in Table 6. Even in the Limited Access siting regime, community solar has the technical potential to address the entire annual electricity consumption of these households. The annual energy produced by developing 67% of the community solar technical potential under the Limited Access siting regime would entirely offset current residential electricity consumption in the United States. Table 5 shows the breakdown of community solar supply potential and residential electricity consumption. However, households without behind-the-meter solar access—attributed to factors like housing tenure (such as renters), building types (like multifamily or manufactured homes), or building unsuitability due to shading or structural challenges—consume a cumulative 5% more electricity than their counterparts without physical barriers to on-site solar (53% versus 47%, respectively). To satisfy the electricity needs of these households through community solar alone, 53% (495 GW) of the modeled community solar potential would need to be developed. Regionally, the capacity of states in the Central Plains, Midwest, and Southeast to host community solar supply significantly surpasses the electricity consumption that can't be met by behind-the-meter solar. In contrast, the Mid-Atlantic and West Coast states are more balanced, and the Northeast and select areas of the Southwest are the most challenged, where potential supply trails behind the existing consumption levels that cannot be offset by on-site solar.

Table 5. Annual Residential Electricity Consumption by Income, Tenure, and Dwelling Type

	Very Low 0%–30% AMI	Low 30%–50% AMI	Moderate 50%–80% AMI	Mid 80%–120% AMI	High 120+% AMI
Owner Occupied, Single-Family	65,350,294	43,536,741	95,785,401	252,458,022	365,500,349
Owner Occupied, Multifamily	932,641	1,364,245	2,499,454	6,401,835	12,061,394
Renter Occupied, Single-Family	44,816,169	17,700,346	29,342,621	84,211,171	28,605,584
Renter Occupied, Multifamily	34,796,418	19,427,293	26,679,484	48,757,529	30,033,638
Mobile Dwelling	2,976,650	5,504,750	19,239,550	59,869,800	38,406,300
Total	148,872,172	87,533,375	173,546,510	451,698,358	474,607,265

Table 6. Percent of Modeled Community Solar Supply (Limited Access) Needed To Offset Residential Electricity Consumption by Income, Tenure, and Dwelling Type

	Very Low 0%–30% AMI	Low 30%–50% AMI	Moderate 50%–80% AMI	Mid 80%–120% AMI	High 120+% AMI
Owner Occupied, Single-Family	3.3%	2.2%	4.8%	12.6%	18.2%
Owner Occupied, Multifamily	Less than 1%	Less than 1%	Less than 1%	Less than 1%	Less than 1%
Renter Occupied, Single-Family	2.2%	Less than 1%	1.45%	4.2%	1.4%
Renter Occupied, Multifamily	1.7%	Less than 1%	1.3%	2.4%	1.5%
Mobile Dwelling	Less than 1%	Less than 1%	1.0%	3.0%	1.9%
Total	7.5%	4.4%	8.7%	22.5%	23.7%

4 Meaningful Benefits

DOE has identified five meaningful benefits that can be provided by community solar projects: greater household savings, LMI household access, resilience and grid benefits, community ownership, and equitable workforce development (DOE 2024). All estimates in this section are based on gross estimated impacts of community solar. Gross estimates do not consider potential interactions between community solar into other domains. For instance, gross estimates of jobs created by community solar do not account for the fact that jobs may be displaced in other industries. In this section, we explore the potential magnitude of these meaningful benefits in the context of our community solar technical potential estimates.

We discuss each meaningful benefit separately in individual sections. In each section, we begin by establishing a baseline of the meaningful benefits provided by existing community solar projects to understand the plausibility of DOE’s meaningful benefit targets. We then estimate ranges of the future accrual of meaningful benefits at a national scale. The ranges of meaningful benefits are based on two book-end estimates:

- **Benefits under the National Community Solar Partnership (NCSP) target:** We estimate meaningful benefits at the DOE NCSP deployment target of 20 GW of cumulatively installed community solar. Assuming that at least 6 GW of community solar has been installed as of 2023 (Xu et al. 2023), we estimate the *incremental* benefits that will be achieved if the remaining 14 GW is deployed and provides the associated meaningful benefits.
- **Benefits from technically potential projects:** We estimate the potential accrual of meaningful benefits if DOE targets are achieved and all technically potential community solar is deployed (based on estimates from Section 3). These estimates should be understood as an upper-bound accrual of benefits if all technically potential projects yield feasible levels of benefits, as discussed in each subsection.

4.1 Greater Household Savings

Community solar can reduce household electricity bills. According to DOE, *community solar projects provide meaningful benefits when reducing residential subscriber electricity bills by at least 20%.*

4.1.1 Household Savings Baseline

Subscribers to existing and planned community solar projects generally reduce electricity bills by around 5%–15% (DC DOEE n.d.; Heeter et al. 2021; Mooney 2022; Kennedy 2023).⁸ While most typical community solar projects may not currently achieve the 20% meaningful benefit threshold, the target is financially plausible. Ramasamy et al. (2022) estimate that a benchmark, ground-mounted, 500-kW commercial solar system costs around \$1,940/kW. Tax credits would

⁸ Mooney and Kennedy both cite ranges on the order of 5%–15%. Heeter et al. (2021) estimate a nationwide median net value from bill savings of about \$24/kW/year for projects that came online in 2021. According to EIA (2023) data, households earning less than \$60,000/year use around 9.3 megawatt-hours (MWh)/year, spending around \$1,400/year using an average nationwide retail rate of \$0.15/kWh. We assume a typical community solar subscription size of 4 kW, consistent with DOE assumptions for NCSP targets (DOE 2022b). That subscription size equates to annual savings of around \$96 using the Heeter et al. median estimated savings, or roughly a 7% reduction from current electricity expenditures.

offset at least 30% of those costs, bringing the effective cost down to about \$1,360/kW. Assuming the project aims to recoup those costs over 10 years, the project would require annual revenues of about \$140/kW. In addition to those installation costs, community solar projects incur ongoing costs to manage subscribers on the order of \$30/kW/year (Elevate 2021), increasing minimum revenues to \$170/kW/year. For a 4-kW subscription, those costs equate to minimum subscription costs of \$680/year. For projects that credit subscribers at the full retail rate, a subscription priced at the minimum cost would yield a roughly 27% electricity bill reduction for a typical household earning less than \$60,000/year (see assumptions in Footnote 5). In a more realistic scenario where bill credits are valued at less than the retail rate (e.g., 80%), the bill reduction would be closer to 20%. Clean energy provisions in the federal Inflation Reduction Act (IRA) make the target more plausible (see Text Box 1). Indeed, for certain projects, IRA-based tax credits alone could drive bill savings well above 20%.

Text Box 1. Community solar provisions in the Inflation Reduction Act

The federal Inflation Reduction Act (IRA), passed in 2022, contains several provisions that will support future community solar deployment:

- **Extended and expanded tax credits:** The IRA extends existing tax credits and expands eligibility for tax credits, including by allowing solar projects to choose between upfront investment tax credits and ongoing production-based tax credits.
- **Tax credit transferability and direct payments:** The IRA makes tax credits transferable, meaning that project owners can easily sell the tax credits to other entities. The IRA also allows some entities (e.g., nonprofits) to apply for direct payments of tax credits rather than monetize the value via tax liabilities. See the bottom of this text box for a discussion of how transferability and direct payments affect community solar deployment.
- **Tax credit adders:** The IRA includes several tax credit adders for projects, including a 10-point bonus for projects that meet domestic content standards, a 10-point bonus for projects developed in energy communities (e.g., coal mining communities), a 10-point bonus for projects in or benefiting low-income communities or on tribal lands, and a 10-point bonus for projects sited on low-income housing in low-income communities. These adders can be stacked such that a community solar project could offset as much as 70% of the initial costs through tax credits.
- **Grants:** The IRA includes billions of dollars in grants to be distributed to communities pursuing clean energy investments such as community solar, including funding from the U.S. Environmental Protection Agency's Solar For All program.

How do tax credit transferability and direct payments affect community solar?

Tax credits can only be monetized by entities with sufficient tax liabilities. As a result, federal tax credits have distorted solar markets by driving project owners to work with tax-equity investors who monetize the tax credits. Tax equity is a complex and costly form of financing, and has created barriers to solar deployment, especially for small projects. The IRA's transferability and direct payment provisions will reduce financing costs by obviating the need for tax equity or other complex financing structures to monetize tax credits. The reduced barriers could facilitate smaller-scale community solar projects with higher levels of community ownership (see Section 4.4).

4.1.2 Greater Household Savings Estimates

Benefits under NCSP target: \$110 million–\$330 million/year; \$8 million–\$24 million/GW	Benefits from technically potential projects: \$7 billion–\$21 billion/year

We estimate potential bill savings as a function of three inputs:

- **Residential share of community solar capacity:** Most projects reserve a large share of capacity for a single “anchor tenant,” typically a large commercial or industrial customer. Anchor tenants help improve project financeability by providing a stable, long-term revenue source. Several states restrict anchor tenants to subscribe to no more than 40% of project capacity. In such projects, the remaining 60% of project capacity is split between some mix of residential and nonresidential subscribers. To provide lower- and upper-bound estimates, we assume that residential customers account for 25%–75% of the non-anchor capacity, equating to 15%–45% of total project capacity.
- **Annual project output:** We use annual output estimates from our technical potential analysis for the technical potential estimates and apply a single 20% capacity factor to convert nationwide projected deployment to annual output for the projected potential estimates.
- **Electricity rates:** For the technical potential estimates, we multiply system output aggregated to the zip code level by average zip-code-level residential rates⁹ to estimate the total amount that residential customers would pay to buy the equivalent amount of electricity from their electric utilities. For the projected potential estimates, we multiply the projected output by a nationwide average retail electricity rate of \$0.15/kWh, given that the projected capacity is at the national level rather than a more geographically granular level.

Estimated bill savings are 20% of the product of the assumed residential share (15%–45%), the annual output, and retail electricity rates. The estimated bill savings from technically potential projects are \$7 billion–\$21 billion per year. To put those numbers in context, \$7 billion is roughly the annual electricity expenditure of all residential customers in Pennsylvania, while \$21 billion is roughly the annual residential expenditure in California. The potential bill savings under the NCSP target are \$110 million–\$330 million per year, or about \$8 million–\$24 million for each additional GW, a range comparable to the annual residential electricity expenditure of Washington, D.C.

4.2 LMI Household Access

LMI households are underrepresented among PV adopters (Forrester et al. 2023). Community solar could increase LMI household access by addressing several key barriers to LMI PV adoption, such as reducing upfront costs and barriers to adoption for renters (Heeter et al. 2018; Michaud 2020). According to DOE, *community solar projects provide meaningful benefits when at least 40% of subscribers are from LMI households.*

⁹ Retail rate data are available by utility at the zip code level (Huggins 2022). We first generate zip-code-level residential rates based on residential sales-weighted averages across utilities within zip codes using U.S. Energy Information Administration electricity sales data.

4.2.1 LMI Household Access Baseline

LMI participation in existing community solar projects is far below the meaningful benefit target (Chwastyk et al. 2018). However, state community solar policies are likely to accelerate LMI adoption of community solar. Connelly (2023) projects that about 18% of community solar capacity deployed from 2023–2027 in 15 states will be reserved for LMI customers, largely reflecting state-level LMI community solar policies. The LMI share of subscribers—the criterion in the DOE target—exceeds the LMI share of capacity for two reasons. First, large shares of project capacity are held by anchor tenants, as discussed in Section 4.1. Assuming anchor tenants hold 40% of capacity while smaller subscribers split the remaining 60% of capacity evenly, an 18% LMI share of project capacity equates to a roughly 29% LMI share of subscribers. Second, LMI households tend to use less electricity than more affluent households and may thus subscribe to less capacity on average. Based on U.S. Energy Information Administration (EIA) data, households earning less than \$60,000 per year tend use around 10% less electricity per year than more affluent households, implying that the future LMI share of subscribers may be slightly greater than 30%. Hence, while LMI access in existing community solar projects is far below the 40% DOE target, state community solar policies are likely to substantially close that gap in the near future.

4.2.2 LMI Household Access Estimates

Benefits under NCSP target: 210,000–630,000 LMI households served; 15K–45K/GW	Benefits from technically potential projects: 13 million–38 million LMI households served

We estimate a technical potential range of LMI households served based on a range of assumptions about the number of residential subscribers per MW of community solar capacity. In Section 4.1, we assumed that residential customers subscribed to 15%–45% of project capacity. Under that assumption, residential households subscribe to 150–450 kW for each MW of community solar capacity. Assuming that households subscribe to 4 kW on average (DOE 2022b), and that LMI households account for 40% of residential subscribers, each MW of community solar capacity would serve around 15–45 LMI subscribers. Under these assumptions, the number of LMI households served by technically potential projects is 13 million–38 million. Applying the same process to incremental NCSP community solar capacity, the nationwide number of LMI households served is about 210,000–630,000, or about 15,000–45,000 per additional GW. To place both numbers in context, data from Forrester et al. (2023) and Davis et al. (2023) suggest that around 860,000 LMI households cumulatively had adopted rooftop solar by the end of 2022.¹⁰

4.3 Resilience and Grid Benefits

Energy resilience refers to the power system’s ability to prevent long-duration electrical outages, mitigate the impacts of outages, and restore power after outages.¹¹ According to DOE,

¹⁰ Data from Forrester et al. (2023) suggest that 22% of rooftop solar adopters through the end of 2022 earned less than 80% of area median income, a typical threshold for identifying LMI households. Davis et al. (2023) estimate that about 3.9 million households had adopted rooftop solar by the end of 2022. The product of the two numbers suggests that around 860,000 LMI households had adopted rooftop solar by the end of 2022.

¹¹ Resilient Energy Platform [defines](#) power sector resilience as “the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions to the power sector through adaptable and holistic planning and technical solutions.”

community solar projects provide meaningful resilience and grid benefits by delivering power to households and critical facilities during grid outages and strengthening grid operations through demand response and other actions.

4.3.1 Resilience and Grid Benefits Baseline

While reliable data are lacking, the use of community solar systems to provide resilience and grid benefits is likely rare. Resilience and grid benefits have generally not been prioritized in community solar planning to date (Abbott et al. 2022). Still, anecdotal evidence suggests that a growing number of community solar projects are exploring how to factor resilience into system design (DOE 2023). Theoretically, community solar systems—like all distributed solar systems—can reduce the grid’s vulnerability to outages at any one location. Community solar systems that are strategically sited near or on critical facilities can ensure a power source for critical services during broader grid outages. Further, solar systems are not susceptible to short-run supply chain shocks, such as fuel shortages that may arise during natural disasters.

The resilience value of community solar is inherently limited by the intermittent nature of solar output, especially during prolonged storms. As a result, recent research examines solar resiliency in the context of co-located solar plus storage (Anderson et al. 2018; Laws et al. 2018; Abbott et al. 2022). Battery storage enhances the resiliency value of solar by storing and shifting solar output during grid outages. Through battery storage, solar output can more effectively meet critical loads and be shifted to meet nighttime loads. Battery storage can also enhance the grid value of community solar—the second component of DOE’s meaningful benefit—strengthening grid operations. Battery storage can effectively convert community solar systems into quasi-dispatchable resources, meaning that solar output can be stored and shifted to provide a broader variety of grid services (e.g., demand response, frequency regulation, capacity reserves).

Battery storage is poised for significant growth (Frazier et al. 2021). Still, significant deployment of battery storage does not imply co-location with community solar. Battery storage is typically more economical when sited at strategic points on the grid rather than co-located with renewable energy projects such as solar (Gorman et al. 2022). The popularity of solar-plus-storage co-location has been enabled in part by incentives created by federal tax credits (Gorman et al. 2022). The IRA removes those distorted incentives by allowing independently sited storage projects to receive tax credits. With the new tax credit structure, the efficiency and value of co-location will need to be evaluated on a case-by-case basis (Gorman et al. 2022). The primary value proposition of co-location moving forward lies in providing grid services (Gorman and Seel 2022). As a result, it is likely that community-solar-plus-storage co-location will only be economically attractive for projects that can effectively monetize the value of grid services provided by batteries.¹² We incorporate these considerations into our estimation of potential benefits in the following section.

¹² Some caution is required in evaluating investments in storage solely based on supporting grid resiliency during infrequent grid outages. Such investments add to project costs without increasing project revenues, such that inefficient storage investments would likely deflate subscriber bill savings. Further, most battery storage deployed today uses battery chemistries that rely on supply chains associated with substantial social and environmental risks and damages. The need for battery storage should thus be evaluated carefully on a case-by-case basis.

4.3.2 Resilience and Grid Benefits Estimates

Benefits under NCSP target: \$30 million–\$100 million/year in avoided outage damages (\$2 million–7 million/GW); \$20 million–\$60 million/year in grid services (\$1 million–4 million/GW)	Benefits from technically potential projects: \$2 billion–\$6 billion/year in avoided outage damages; \$1.3 billion–\$3.8 billion/year in grid services

We estimate potential community solar resilience and grid benefit values as a function of five inputs:

- Community solar projects co-located with storage:** The future prevalence of community solar co-location with storage remains uncertain. Davis et al. (2023) estimate that 20% of new nonresidential solar projects will be co-located with storage by 2027. To provide a rough technical potential analysis, we assume that 10%–30% of technically potential community solar projects could be co-located with storage. Of those projects, we assume that battery storage capacity equates to 60% of deployed solar capacity, based on typical solar/storage ratios for existing utility-scale solar systems (Bolinger et al. 2022).
- Reserve capacity for resilience:** For simplicity, we assume that 50% of storage capacity is reserved for backup power (resilience) and 50% is reserved for providing ongoing grid services. Of the battery storage reserved for backup power, we assume that batteries can provide 2 hours of backup power, on average, based on typical storage durations for existing projects (Bolinger et al. 2022). We assume that storage capacity is fully used in a typical outage incident, which lasts around 4 hours on average (EIA 2023d).
- Value of lost load:** The value of lost load refers to the monetary value of damages caused by blackouts, such as lost economic activity, thermal discomfort, and food spoilage. Most estimates for values of lost load are on the order of \$1–\$30/kWh, though some estimates range over \$100/kWh (Schröder and Kuckshinrich 2015). We assume a value of lost load of \$30/kWh.
- Frequency of outages:** According to EIA (2023) data, the nationwide average number of interruptions from 2013–2021 is 1.3 interruptions per customer, with an average interruption duration of 4.2 hours.
- Value of grid services:** The value of non-energy grid services (e.g., capacity reserves, ancillary services) has been estimated to be on the order of \$10–\$100/kW (Balducci et al. 2021). For simplicity, we assume a single value of \$50/kW.

We estimate the annual value of backup power as the product of the potential backup gigawatt-hours (GWh), the value of lost load, and the number of outages per year. Under that approach, the estimated value of grid resilience provided by technically potential community solar projects is \$2 billion–\$6 billion per year, while the estimated value under the NCSP target is \$30 million–\$100 million per year, or about \$2 million–\$7 million per each additional GW. To contextualize those numbers, the annual cost of weather-related outages is estimated to be on the order of \$18 billion–\$33 billion nationally (EOP 2013). Finally, assuming the other half of capacity provides ongoing grid services at an average value of \$50/kW, our technical potential grid service value estimate is \$1.3 billion–\$3.8 billion per year and \$20 million–\$60 million per year for the estimate under the NCSP target, or about \$1 million–\$4 million for each additional GW.

4.4 Community Ownership

According to DOE, *community solar projects provide meaningful benefits when community members own or hold equity in project assets*. Community ownership refers to projects where community members have equity ownership rights in community solar projects (Grimley and Chan 2023). In addition to equity ownership, DOE recognizes other community wealth-building strategies such as community benefit agreements (CBAs), meaning contractual agreements to distribute some portion of project benefits into host communities.

4.4.1 Community Ownership Baseline

Community ownership of community solar projects is rare (Bolinger and Paulos 2023). While specific estimates are lacking, community-owned projects account for no more than 5% of installed community solar project capacity.¹³ Most community solar projects are owned by for-profit entities not directly tied to host communities (Heeter et al. 2021; Paulos 2022). Financing challenges, regulatory barriers, and lack of expertise impede community ownership (Farrell 2016; McHarg 2016; Paulos 2022; Bolinger and Paulos 2023). Notwithstanding these challenges, the potential benefits of community ownership provide an ongoing incentive for communities to pursue greater ownership of community solar projects (Lantz and Tegen 2009; Kienbaum et al. 2023). Further, communities have a plethora of strategies to achieve community ownership, and tax credit reforms implemented in the IRA have renewed interest in community ownership (Grimley and Chan 2023).

Alternative wealth-building strategies such as CBAs provide practical alternatives to community ownership that still drive economic benefits into host communities. Under a CBA, the project owner contractually agrees to invest in the host community, such as by hiring local labor or contributing to local economic trust funds (DOE 2023). CBAs are an increasingly common model for redistributing the values of large-scale projects that require community acceptance (Wolf-Powers 2011), though the prevalence of CBAs in community solar is unclear.

4.4.2 Estimated Benefits of Community Ownership

Benefits under NCSP target: \$20 million–\$160 million/year in added local economic value, out of a total of about \$550 million/year in economic impacts (\$1 million–\$11 million/GW)	Benefits from technically potential projects: \$0.9 billion–\$7.2 billion/year in added local economic value, out of a total of about \$25 billion/year in economic impacts

We estimate the potential benefits of community ownership as a function of two inputs:

- **Community-owned and CBA shares of capacity.** We were unable to develop literature-based assumptions for the potential future uptake of community ownership and CBAs. To estimate a range of potential benefits, at the low end, we assume that 1% of future community solar capacity is community owned, while the remaining share of capacity is developed with CBAs. At the high end, we assume that 25% of capacity is community owned and the remaining 75% of capacity is developed with CBAs.

¹³ Customer-owned projects account for a fraction of a percent of installed capacity. According to data collected by the authors as part of NREL's Sharing the Sun project, electric cooperative projects, some of which may meet community ownership criteria, accounted for around 4.7% of capacity as of the end of 2022.

- Economic benefits of community ownership and CBAs.** Several studies suggest that community ownership roughly doubles the local economic benefits of renewable energy projects relative to absentee ownership models (Lantz and Tegen 2009; Kienbaum et al. 2023). These economic impacts reflect the accrual of project revenues into the community as well as economic “multipliers” that result when those revenues circulate around local businesses. We therefore assume that the local value of community-owned capacity is double the estimated economic impact of typical projects. Research on the quantitative value of CBAs is sparse (Gunton et al. 2023), but Cowell et al. (2011) found that CBAs may redistribute around 5% of annual project earnings to host communities. To explore a plausible range, we assume the economic value of CBAs ranges from 5%–10% of project earnings.

We use NREL’s Jobs and Economic Development Impact (JEDI) model to estimate the economic impacts of community solar projects. We then multiply the state-level economic impacts from JEDI by our assumed multipliers as follows:

$$CO\ value = \sum_s CBA\% \left(L\% \times GW_s \times \frac{earnings_s}{GW} \right) + CO\% \left(GW_s \times \frac{impact_s}{GW} \right)$$

Equation 3: Community ownership value based community solar estimated capacity

In Equation 3, *CO value* is the estimated additional local value generated by community ownership or community benefit agreements, *CBA%* is the assumed share of project capacity with CBAs (75%–99%), *CO%* is the assumed share of project capacity that is community owned (1%–25%), *L* is the percent of project earnings that are redistributed locally through CBAs (5%–10%), *GW_s* is the estimated technically potential community solar in state *s*, and *earnings_s* and *impacts_s* are the estimated annual earnings and local economic impacts in state *s* as estimated by JEDI, respectively. Under that approach, the estimated impact of technically potential projects on *local* economic value from community ownership is \$0.9 billion–\$7.2 billion per year. That is, if all technically potential community solar capacity is developed, and all that capacity includes some form of community ownership, an additional \$0.9 billion–\$7.2 billion of annual economic benefits will accrue to host communities. In terms of the potential under the NCSP target, the JEDI model suggests nationwide average earnings of \$19,000/MW and average economic impacts of \$39,000/MW. Applying those inputs to the process outlined in Equation 3 above, we estimate that community ownership and CBAs could add \$20 million–\$160 million/year in local economic value, or about \$1 million–\$11 million per each additional GW.

It is important to emphasize that these estimates reflect the economic impacts accruing to host communities, not the full economic value of projects. The total economic impact of all technically potential projects using the JEDI model is estimated to be about \$25 billion per year. The total estimated economic impact of incremental capacity under the NCSP target is about \$550 million per year, or about \$40 million per each additional GW.

4.5 Equitable Workforce Development

According to DOE, *community solar projects achieve meaningful benefits by advancing high wages, reducing income disparities across demographic lines, ensuring a workforce that is reflective of the community, and creating a safe working environment.*

4.5.1 Equitable Workforce Development Baseline

The U.S. solar industry actively promotes a more equitable workforce (Gilliland et al. 2022). The U.S. solar industry is more racially diverse than the broader U.S. workforce, though the solar industry exhibits a more significant gender imbalance (Keyser et al. 2023). Solar industry wages are generally competitive, with median industry wages higher than construction industry median wages and slightly higher than the U.S. median wage for all occupations (Gilliland et al. 2022). The solar industry is unionized at comparable levels to the broader U.S. workforce (Keyser et al. 2023).

Further equitable workforce development is compatible with other clean energy and decarbonization objectives. Mayfield and Jenkins (2021) show that efforts to ensure an equitable workforce—such as higher wages, local hiring requirements, and gender and racial equity hiring requirements—have minimal impacts on solar costs and deployment. The reason for these minimal impacts is that labor costs compose a small share of overall project costs—though community solar is more labor-intensive than other forms of solar given the need for ongoing subscriber management. Still, other political and social factors could impede equitable workforce development initiatives, such as political resistance to wage standards or unionization (Mayfield and Jenkins 2021). Further, the U.S. solar industry already faces broad labor shortages. Most surveyed solar companies report hiring difficulties at all levels of the solar supply chain (Gilliland et al. 2022; Keyser et al. 2023). Most solar companies attribute hiring difficulties to the limited supply of job seekers with adequate experience, training, and skills (Gilliland et al. 2022).

4.5.2 Estimated Benefits of Equitable Workforce Development

Benefits under the NCSP target: 290,000 construction positions (20K/GW), 7,000 ongoing jobs (300/GW), \$200 million–\$230 million in ongoing local wages in host communities (\$15 million/GW)	Benefits from technically potential projects: 18 million construction positions, 420,000 ongoing jobs, \$12 billion–\$13 billion in ongoing local wages in host communities

To explore the workforce development impacts of community solar, we estimate the number of jobs associated with new projects and the local wages generated by those projects.

Community solar jobs can be grouped into three categories: construction, operations and maintenance, and subscriber management (e.g., managing subscriber bills, acquiring new subscribers). These solar jobs reflect some combination of local hires (e.g., local hired workers during construction) and positions held outside of host communities (e.g., subscriber management organizations are not typically located in host communities). According to the NREL JEDI model, a typical project supports the equivalent of around 21 full-time construction jobs per MW for one year. After construction, a typical project supports around 0.3 full-time jobs per MW for operations and maintenance. Although similar estimates for subscriber management labor are unavailable, labor requirements estimated by Elevate (2021) suggest that subscriber management typically requires multiple staff on an ongoing basis. For simplicity, we assume that one full-time position is required to manage every 5 MW of community solar capacity.¹⁴

¹⁴ The number of employees per MW may currently be higher, but labor per MW will presumably decline over time as community solar scales and achieves growing economies of scale.

Using those assumptions, nationwide technical potential community solar capacity would support around 18 million construction positions, 250,000 ongoing jobs for operations and maintenance, and 167,000 ongoing jobs for subscriber management. For the NCSP target, incremental deployment would support 290,000 construction positions (about 20,000 per each additional GW), 4,200 ongoing jobs for operations and maintenance (300 per GW), and 2,800 ongoing jobs for subscriber management (200 per GW). For comparison, the entire U.S. solar industry currently employs around 260,000 individuals (IREC 2023).

As already noted, many and possibly most of those jobs would be filled by employees who do not reside in the communities that host community solar projects. To estimate the *local* impacts of wages, we calculate total wages paid for ongoing jobs in operations and maintenance—positions that are presumably held by individuals who live in or near host communities. We assume that average wages could vary from the current industry average for solar photovoltaic installers (\$47,970/year) to the industry's 75th percentile wage (\$53,700) (BLS 2023). Under those assumptions, local wages accruing to host communities range from \$12 billion–\$13 billion per year for technically potential capacity and \$200 million–\$230 million per year for incremental capacity to meet the NCSP target, or about \$15 million per each additional GW.

5 Conclusions

This report presents a first-of-its-kind assessment of the technical potential of community solar and provides insight into the distribution of community solar potential by tenure, income, and other building characteristics. This research indicates that a substantial fraction of residential and commercial electricity consumption can be met by community solar across siting regimes intended to represent both balanced, common practices for community solar as well as more restrictive exclusions and setbacks. Our technical potential estimates suggest that the maximum feasible deployment of projects with characteristics typical of community solar projects could generate enough electricity to meet the electricity consumption of 53.2 million households in the United States. In practice, market, economic, and policy constraints mean that the actual number of households potentially served by community solar will be much smaller. Still, our analysis suggests that community solar could conceivably grow to serve a significant portion of those customers who are unable to adopt rooftop or other behind-the-meter solar.

We find that community solar potential can significantly contribute to meeting electricity consumption for households and business that are unable to access on-site solar, such as the many LMI households, renters, and households residing in dwellings not suitable for behind-the-meter solar (e.g., unsuitable roofs for solar, structural problems, code or panel issues, or impermanent or modular housing types).

We also explore the potential benefits of the ongoing deployment of community solar. We estimate that, if all technically potential community solar is deployed, community solar could save customers billions of dollars on their electricity bills, serve tens of millions of LMI households, generate billions of dollars in grid resilience and grid service values, drive billions of dollars of economic benefits into host communities, and support hundreds of thousands of jobs. Realistically, the potential accrual of benefits is a fraction of those high-end estimates based on technical potential capacity. Still, using realistic projections for community solar deployed in the ensuing decade, we estimate that community solar could reduce subscriber electricity costs by around \$170 million–\$500 million per year, serve 320,000–950,000 LMI households, generate \$80 million–\$240 million per year in grid resiliency and service value, drive \$30 million–\$230 million per year in economic benefits into host communities, and support around 10,500 permanent jobs.

5.1 Future Work

We suggest four topics for future work to extend this analysis. First, community solar can be modeled in SAM (Blair et al. 2018) using the community solar financial model with community-solar-specific costs, incentives, and other financial parameters to increase the fidelity of techno-economic potential results. Site-based levelized costs of energy for modeled community solar supply were significantly below (50% less than) reported levelized costs of energy for community solar (Lazard 2023). From this, community solar supply curves could be modeled and could directly compete with other technology supply curves.

Second, community solar interconnection requirements should be expanded to include distribution-level interconnection constraints. Geospatial data representative of national and regional electricity distribution systems are not available, either publicly or as licensed data. Experimental methods exist to classify these data using optical remote sensing and may fit this

need if computed on a national scale. As part of distribution interconnection, hosting capacity assessment and power flow analyses can assist project developers and utilities in evaluating site-based community solar feasibility and overall impacts on feeders and downstream customers.

Third, offsetting electricity consumption for households and businesses that cannot access behind-the-meter solar is a first step in assessing community solar potential. A logical next step is furthering this work in developing market potential estimates for community solar, particularly in terms of local policy—including state-level enabling legislation, project size limits, and program and annual limits, among others. Part of developing community solar market potential could include matching electricity consumption and community solar generation time series. Assessing load and supply time series would help establish the degree of paired storage for community solar installations.

Finally, community solar and agrivoltaics are emerging solar PV deployment forms that can provide additional benefits to both communities and habitats beyond utility-scale solar and wind. Community solar and agrivoltaics can occupy the same system size niche, and both can act as a land-saving instance of renewable energy (The Nature Conservancy 2023), capitalizing on incentives and opportunities for programs under both forms. Future agrivoltaic techno-economic potential assessments could include a form of community solar.

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Community-Owned Community Solar

Opportunities and Challenges

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**ENVIRONMENTAL LAW
& POLICY CENTER**

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Church of the Brethren Community Solar, University Park, Maryland 2010. Courtesy of University Park Community Solar LLC)



Introduction

The premise of community-owned community solar is simple. A solar array is owned by community members or a community organization. Individuals or groups can purchase or subscribe to a portion of the array and receive benefits from that portion. The community decides **how** the solar project will be run, **who** will have access, **where** benefits will be distributed, and **what** benefits are most important. This report examines key decisions, tradeoffs, and options for building community-owned community solar.

Historically, the US energy system has relied on centralized power producing facilities, primarily run on fossil fuels. They have been owned and operated by wealthy individuals and corporations, with profit as the driving focus. Energy systems have also historically reinforced and exacerbated inequality, both economic and racial. While median-wealth U.S. households spend 2.3% of income on energy costs,

households at or below twice the federal poverty level spend 8.1%, over three times as much. In terms of race, Black households spend 43% more of their [income on energy bills](#) than their white (non-Hispanic) counterparts while Hispanic households spend 20% more and Native American households spend 45% more.

As the devastation of climate change and other negative effects of fossil fuel consumption become more visible than ever, communities are pushing for a transition to low- and zero-carbon energy sources, including solar. However, despite its widespread societal and environmental benefits, renewable energy does not inherently promote equity. Traditionally, solar energy has been owned by either wealthy individuals or utility monopolies.¹ Now is the time to think creatively about improving the energy system more holistically, rather than just replicating long-standing problems with new technology.

Figure 1: Community Solar Community solar allows many people to share in the benefits of a single solar installation. Subscribers can purchase or lease solar panels and receive a credit on their monthly electric bill.



¹ A 2022 Berkeley Lab found that “The median solar adopter income was about \$115k/year in 2020, compared to a U.S. median of about \$63k/year for all households and \$79k/year for all owner-occupied households.” However, this is an improvement from 2010 when the median income of solar adopter’s was about \$138k/year. <https://eta.lbl.gov/publications/residential-solar-adopter-income-o>

Community-owned community solar has the potential to be more equitable than other types of renewable energy because it provides the opportunity to own renewable energy systems. Communities can produce electricity rather than purchasing it from large utilities or meeting the requirements for rooftop solar (for example, home ownership, sufficient roof conditions and size, and the ability to pay high upfront costs). Community-owned community solar expands access to renewable energy, regardless of whether someone owns their home, and it puts communities in control of a portion of their energy. It can contribute to workforce development, building (financial) equity, home upgrades to improve energy efficiency, community investment and empowerment, and more benefits discussed below. While relatively new and comparatively small relative to other types of renewable energy, community-owned community solar has the potential to democratize the clean energy transition, deliver benefits to communities rather than individuals, and promote an equitable energy system.

The purpose of this report is to identify key concepts, lessons, and questions through examination of existing community-owned community solar projects. It draws on reports related to community ownership, community solar, and renewable energy in addition to 11 interviews with representatives of community-owned community solar projects as well as projects that are similar in spirit although they may not fit completely within the category.

By examining ownership models, benefits and their distribution, and barriers, this report is a resource for both **advocates** interested in furthering beneficial policies and **community organizations** who are potentially interested in investing in community-owned community solar projects. In other words, this report aims to thread the needle between two questions coming from each respective group:

- 1) What policy decisions will enable and support community-owned community solar?
- 2) What questions should groups interested in community-owned community solar ask before engaging in a project?

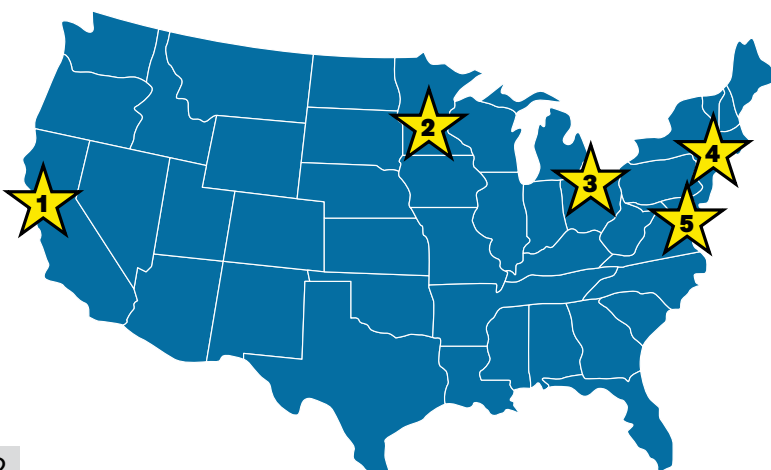
It is too early in the lifespan of community-owned community solar to provide definitive answers to almost any question posed herein. However, by clarifying key concepts, identifying barriers, and showcasing already existing examples, we can begin to evaluate—and advocate for—this alternative path within the clean energy transition.

What Do We Mean by Equity?

In financial contexts, such as the development of solar projects, equity refers to the value of a shareholder's stake in a company or project. In social contexts, equity, at its simplest, refers to fair and impartial practices.

For this report, the former use of equity will always include “financial” before equity (financial equity), while social equity will be referred to with just the word equity.

Figure 2: Map of Example Community-Owned Community Solar Projects and Organizations



1: People Power Solar Cooperative

Oakland, CA

2: Cooperative Energy Futures

Minneapolis, MN

3: Hough Block Club

Cleveland, OH

4: Co-Op Power

Northampton, MA

5: University Park Community Solar

University Park, MD

Table 1: Examples of Community-Owned Community Solar Projects and Organizations

Project / Organization²	Ownership type	Stage in development	Key policy drivers	Priority values
University Park Community Solar (University Park, MD) ³	LLC	Partnership flip completed with host institution	Lack of policy drivers	Showing feasibility and profitability of community-owned community solar program
Cooperative Energy Futures (Minneapolis, MN)	Cooperative that owns multiple LLCs	Operational	Uncapped community solar program ⁴	Renewable energy, community ownership, energy democracy
People Power Solar Cooperative (Oakland, CA)	Cooperative	Operational	2015 California Worker Cooperative Act	Energy democracy and sovereignty
Block Club/Cleveland Owns (Cleveland, OH) ⁵	LLC	In development	Lack of policy drivers	Bill savings, community empowerment, equity
Co-Op Power (MA and NY)	Cooperative	Operational	Massachusetts' Mass Solar Loan program	Local ownership, control, and distribution of benefits

² This column includes both stand-alone projects, such as University Park Community Solar, and organizations enabling projects, such as Cooperative Energy Futures.

³ University Park Community Solar no longer maintains a website. For an article examining the project, see "[University Park Community Solar LLC – the first Community Solar Power Initiative](#)."

⁴ For more information, see the Institute for Local Self-Reliance's article "[Why Minnesota's Community Solar Program is the Best](#)."

⁵ For more on this project, see the [Block Club, Cleveland Owns](#), and this [article](#).

What is Community-Owned Community Solar?

Community-owned community solar refers to both a specific type of solar project as well as a specific ownership type. Both *community-owned* and *community solar* can be used to describe very different phenomena. To understand what exactly community-owned community solar is, both terms must first be explained and defined.

Community Solar

The U.S. [Department of Energy](#) defines **community solar** as “any solar project or purchasing program, within a geographic area, in which the benefits of a solar project flow to multiple customers such as individuals, businesses, nonprofits, and other groups. In most cases, customers are benefitting from energy generated by solar panels at an off-site array.” Community solar allows those without rooftop solar capability (renters, condo/apartment owners, homeowners without satisfactory roofs) to enjoy the benefits of solar.⁶

Contextualizing Community Solar

Community solar accounts for approximately **3.6%** of installed solar in the United States.⁷

There is enough U.S. community solar as of 2021 to power **600,000** households.

The average residential community solar subscription in the US is 3 kW, or approximately enough to run most appliances in a small home with 2-3 occupants. It can save customers about **10% in utility costs** over the life of the subscription.⁸

The Department of Energy has a target of spurring enough community solar to power **5 million households** by 2025 and create \$1 billion in energy savings.⁹

About **1/3 of states** have policies ranging from stepping stones to community solar programs.

Figure 3: How Solar Works, the Special Purpose Entity Model (Courtesy of SolSmart)

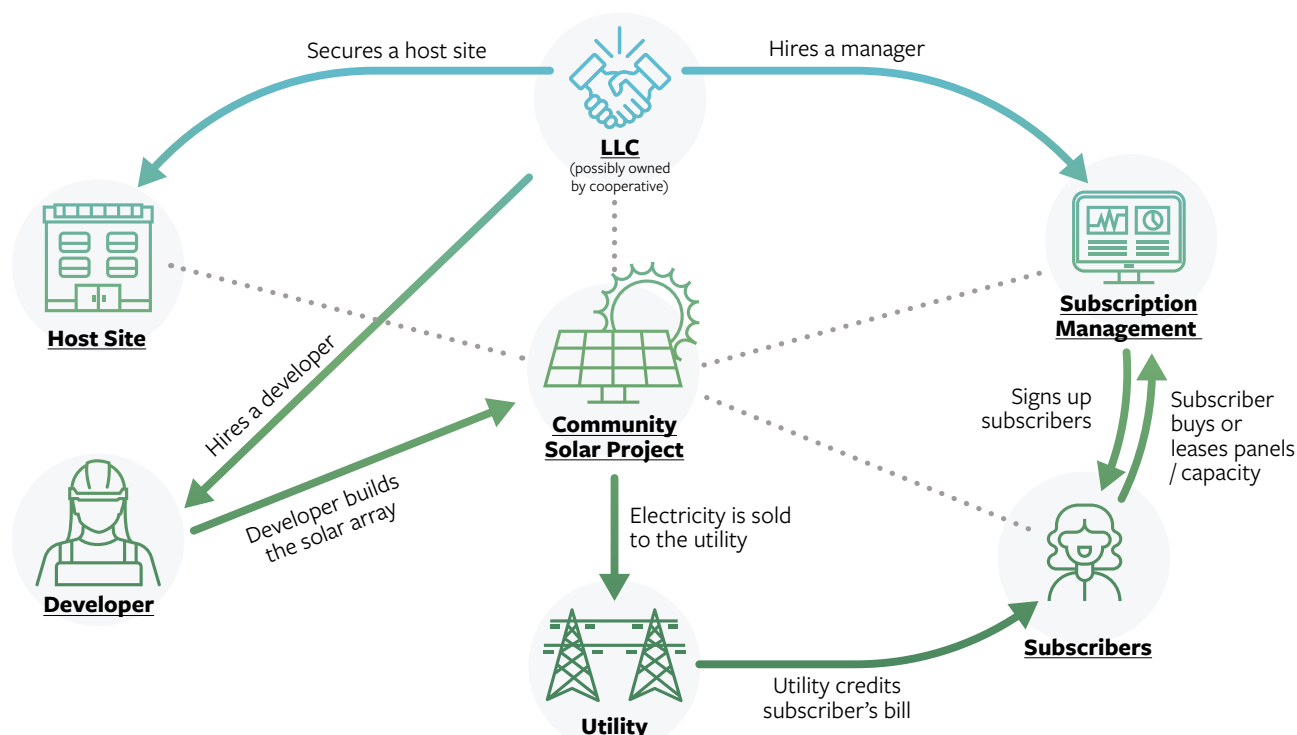
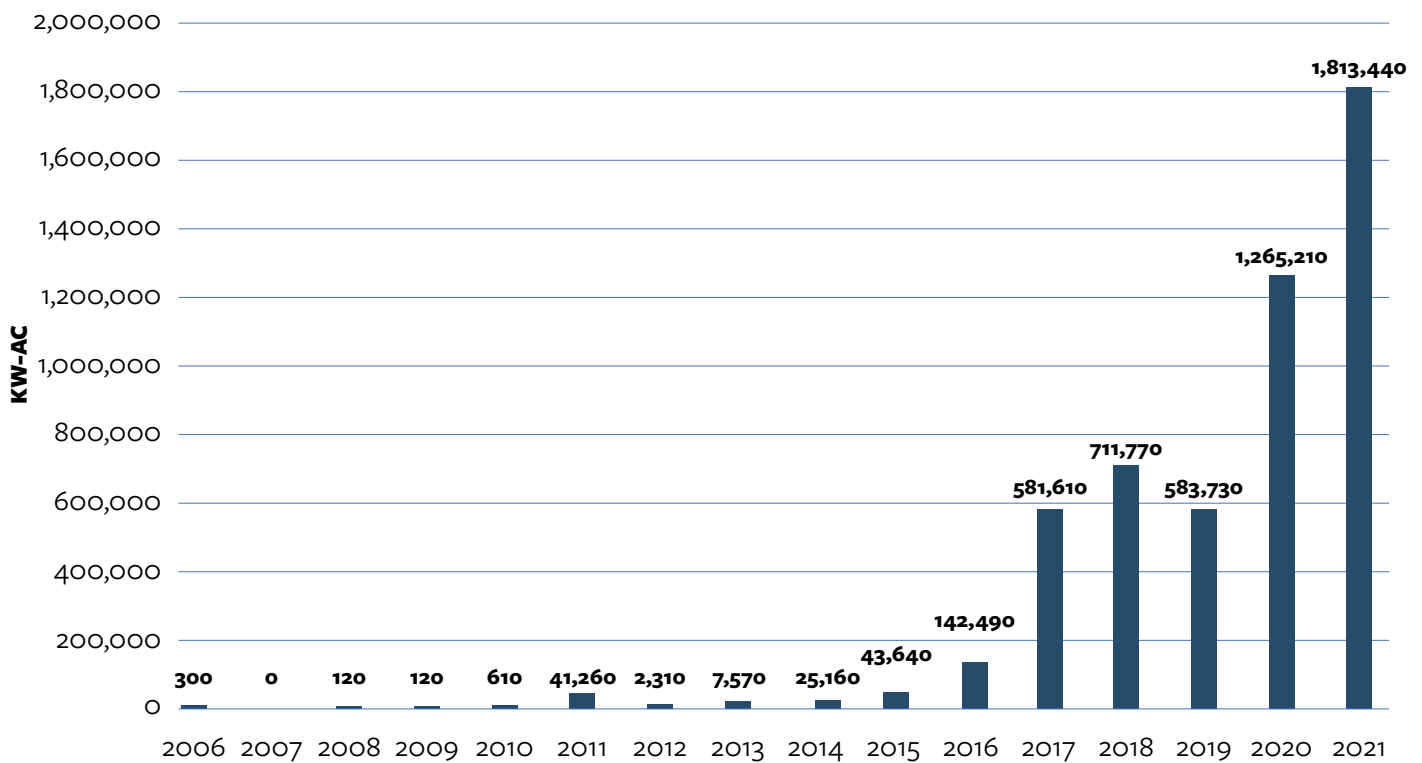


Figure 4: Figure 3: U.S. Community Solar Growth 2006-2021 by Annual Capacity Additions
(Courtesy of the National Renewable Energy Laboratory)



Bill Crediting and Community Solar

- With most community solar, a participant receives a monetary credit on their electricity bill for their share of the electricity generated from the community solar project. This **bill-crediting** arrangement is often the way the benefits of community solar are distributed to participants.
- Bill crediting is a generic term for this customer-billing process. **Net metering** refers to a specific bill crediting arrangement usually involving a 1:1 kWh bill offset (or the monetary equivalent) and has typically been used for rooftop solar. **Virtual net metering** expands the net metering mechanism to customers participating in an off-site solar project, such as community solar. A number of the largest community solar programs utilize a monetary bill credit based on a value-of-solar or other valuation methodology rather than virtual net metering. However, these terms are still sometimes used interchangeably.
- Most community solar has been developed in response to state policy-mandated bill crediting, but some utilities voluntarily provide bill crediting and some community solar projects have developed creative means to distribute benefits without bill crediting.

⁷ For more Community Solar data, see the Wood McKenzie [report](#)

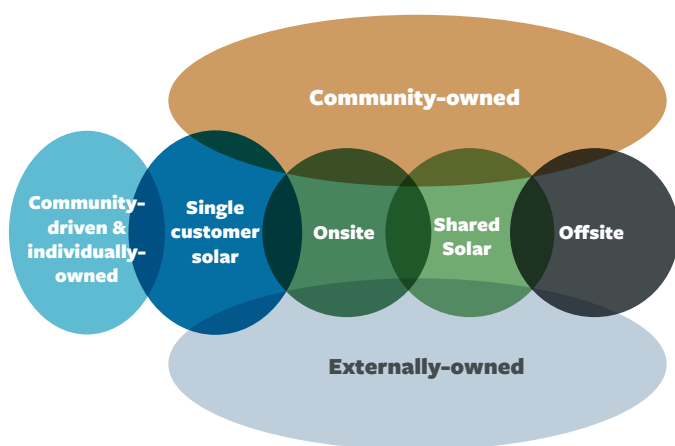
⁸ See National Renewable Energy Laboratory [video](#)

⁹ Department of Energy [Press Release](#)

Varieties of Community Solar

Community solar comes in many forms. Key variables that differentiate community solar projects are ownership, customer profile, location, size, and distribution of benefits. The diagram below focuses on ownership and location. Externally owned solar can be broken down further into third-party owned, where a solar company or other third party owns the project and participants are able to subscribe, or utility-owned in which participants may have a subscription or sign up for a green tariff or other utility rate.

Figure 5: Models within Community Solar (Courtesy of Subin DeVar)



Community Ownership

Under the broadest definition, a **community** is a *group of people living in the same place or having a particular characteristic in common*. Thus, it could mean people within a shared location, such as a neighborhood or a town, as well as geographically dispersed individuals with a shared identity, such as tribal members or members of an ethnicity, migrants, and others. Community is difficult to define, and there is debate over what can be called a community.

Community-owned community solar does not have strict demarcations and projects will define community in different ways. Community solar can also be owned by cities, municipalities, and other governmental entities. Assuming that these entities are democratically elected and representative of a community, their projects could be considered

community-owned community solar. However, this report excludes these examples in favor of more grassroots projects that are not affiliated with government entities.

Community ownership promotes equity by putting communities in charge of at least some energy production and by giving them the opportunity to distribute the multiple benefits that accrue from that production as they see fit. Ownership can therefore serve to increase a community's relative power in relation to utilities and other power sector incumbents. Community ownership, if it is structured democratically, also promotes equity within communities. It can give everyone a voice in how the project is run, through an equitable process and an equitable distribution of outcomes and opportunities.

In its 2020 “Community-Ownership Models: Innovation Landscape Brief,” the International Renewable Energy Agency (IRENA) defines **community ownership** as:

- “local stakeholders owning most of the project and voting rights and by control resting with a community-based organization”
- “the community owns, manages and takes the benefits of the project, while the main power grid operator and other parties have a secondary role.”
- A community model includes at least two of the following characteristics (ownership structure, democratic governance, distribution of profits).

As Timothy DenHerder-Thomas, co-founder of Cooperative Energy Futures, stated in an interview “we need space and grace when defining community ownership.” Community ownership is often subjective and requires evaluating how much control a community has compared to solar developers, utilities, and others involved in a community solar project. Often, it is easier to define what isn't community ownership than what is.

Ownership Models

“Ownership” in community-owned community solar usually refers to ownership of the solar panels and the electricity generated from them. The desire for ownership often comes from a desire for equity – financial and/or socioeconomic. Communities can advance equity further through ownership than by purchasing subscriptions to a community solar project owned externally by a utility or third party. Considerations of equity also play out internally within projects through decision-making regarding the type of ownership model. When considering ownership, it is important to distinguish between individual **projects** and **organizations**.

Today, in the United States, the majority of community-owned community solar projects are owned by a **Limited Liability Company (LLC)** some of which are in turn owned by **cooperatives**. Direct ownership of a project by a cooperative is hypothetically possible although rare in practice. Even non-profits that create projects typically form some combination of cooperatives or LLCs to own them. When community organizations plan to develop a single project, LLCs are often the simplest way to do so, while for organizations who plan to create multiple projects, cooperatives—which then own LLCs—are more common.

To reiterate, when it comes to ownership, it is important to differentiate between an individual community-owned community solar project and a community-owned community solar organization, which may own multiple individual projects. Due in large part to the importance of tax financing, most projects are owned by an LLC. On the other hand, a community organization may take the form of an LLC or another structure, such as a non-profit or a cooperative. The organization may own one project (like University Park Community Solar) or it may own several projects (like Cooperative Energy Futures). In the latter case, if it is not already an LLC, the organization typically forms one or more LLCs for project-ownership purposes (again, like Cooperative Energy Futures).

Cooperatives

A cooperative is a member-owned and -controlled business that distributes benefits equitably to those members on the basis of use. Like other businesses, cooperatives incorporate under state law. Daily operations are handled by staff with policy direction and executive management provided by a member-elected board of directors. Where they differ from other businesses is in their [purpose and principles](#), which include:

- **Service at cost** refers to the ability of cooperative members to receive the service provided by the cooperative at the lowest cost possible.
- **Proportional benefits and obligations** means that the more a member puts into the cooperative, the more benefits they should receive.
- **Limited returns on financial equity** means that the service provided by the cooperative is privileged over financial benefits. In other words, cooperatives are meant to be a means to procure a service or product at a lower cost, not to serve primarily as an investment opportunity.
- **Democratic control** means that every member has a voice either through direct or proportional voting.

For example, in a community-owned community solar project, members will ideally receive credit on their electricity bill for the energy produced with the lowest additional costs—such as subscriber management fees, operations and management, and others—as possible (service at a cost). Since the project is owned by a cooperative, a third-party owner is not trying to make a profit off of these other costs. The more a cooperative member pays into the cooperative, the greater their electric bill reduction and/or other benefit (financial benefits and obligation proportional to use). While participants receive bill reductions, cash, or equity, the goal

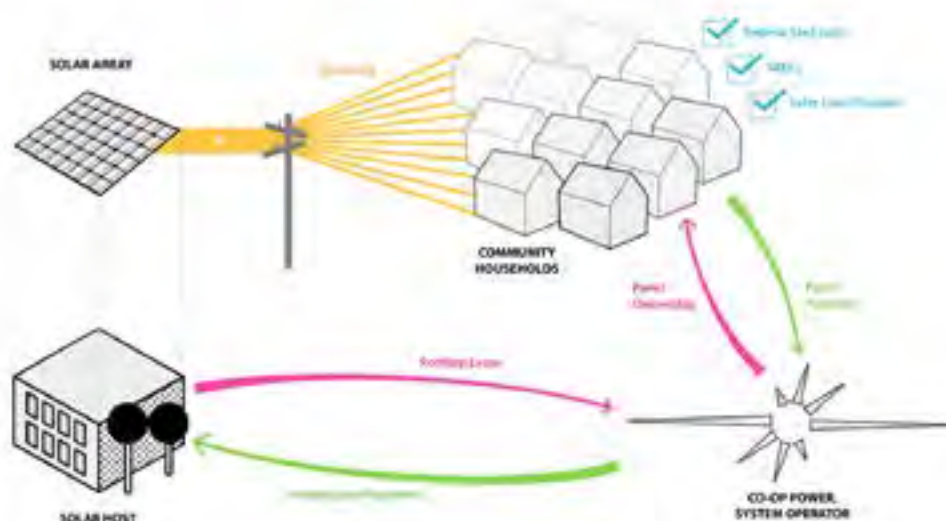
of the project is not to maximize returns (limited return on equity capital). Finally, all cooperative members have a vote in how the cooperative is run (democratic control). Cooperatives are appealing for community-owned community solar because of their inherently democratic control and built-in structure for distributing benefits. Cooperatives can also

help avoid the concerns associated with securities law and regulation that may arise with community solar (see below for more information). They are most commonly used as an ownership structure for organizations in conjunction with LLCs for individual projects.

Case Study 1: **Co-op Power**

- Incorporated in 2004, New England's Co-Op Power is one of the US's largest (4.5 MW as of 2020) and longest running community-owned community solar organizations. It offers both traditional subscription-based community solar as well as community-owned community solar.
- Co-Op Power is an organization with multiple projects. It is organized as a decentralized network of 7 Community Energy Co-Ops (CECs) that set their own agendas based on local energy priorities. CEC's priority is "to organize and educate people in their region and to facilitate the development of one or more community-owned, community-scale, clean energy businesses." Each CEC has one representative on the Co-Op Power board including veto power.
- Early on, Co-Op Power chose to focus on community solar rather than rooftop solar, recognizing that community solar provides more opportunities for low-income communities.
- Co-Op Power uses a cooperative ownership model and make decisions by consent rather than voting.
- A key enabling factor for Co-Op Power's growth was a Massachusetts's [Mass Solar Loan program](#) that allowed the co-op to monetize the federal investment tax credits rather than relying on tax equity partners.
- By acting as a federation of local cooperatives, Co-Op Power's community solar program has spread throughout Massachusetts and New York.
- In addition to electricity bill savings, Co-Op Power offers job training/workforce development, community education, and community strategic planning.
- The diagram below reflects Co-Op Power's community-owned community solar model. Participants purchase panels and co-locate them in a shared array. They pay monthly for system operations and management and will pay for the total cost of the panels in 7-8 years. In return, participants receive the federal tax credit and renewable energy credits as well as the electricity the panels generate for their lifespan of 20-25 years.

Figure 6: Co-Op Power's Rooftop Community-Owned Community Solar Model (Courtesy of Co-Op Power)



Limited Liability Companies (LLCs)

LLCs are businesses owned by members that can include individuals, corporations, other LLCs, and foreign entities. They allow community members or groups to own something—such as a solar array—without having personal liability associated with it. In other words, should anything go wrong with a community solar project, members of an LLC could only lose the money they have invested in the LLC—for example, paid towards the solar array—and would not risk any personal assets, such as any separate savings or other personal funds, or their house or car. LLCs are appealing for community-owned community solar projects because of the relative ease creating one and their compatibility with tax equity investors. An LLC can also be structured such that its members have democratic control similar to a cooperative. However, when not paired with a cooperative, an LLC may face requirements related to securities law and regulation, as discussed further below.

Community-Owned Community Solar and Community Institutions

Non-profits, houses of worship, and other community institutions are ideal hosts for community solar in that they often own land and/or structures that can accommodate relatively large arrays. They will also serve as the primary off-takers of the project; that is, the entity that purchases the majority of the electricity produced by the community solar array. These groups often (due to legal requirements) form a separate company (LLC or cooperative) to own a project.

Case Study 2: **University Park Community Solar**¹⁰

Maryland's University Park Community Solar, founded in 2010, is another example of an early community-owned community solar project. Initially community-owned and hosted on University Park Church of the Brethren, the 22.7 kW project was sold to the church in December 2021.

- The church signed a PPA (see text box) with University Park Community Solar and was the primary customer, often known as an “off-taker” (see Figure 5).
- Some people would not consider this community solar because of the lack of bill crediting for multiple offtakers. For the purposes of this report, it is considered within community solar due to community ownership and community distribution of benefits. People Power Solar Cooperative uses a similar model.
- The project started with 35 individuals who contributed between \$1,000 and \$7,000 to acquire and install the \$135,000 solar plant; thus avoiding the need for external financing.
- In an interview with founding member Richard Scorza, he stated that the group chose an LLC ownership model due to its minimal paperwork, protection of individuals, and to “demonstrate that solar can create a profit incentive.” The LLC paid no Maryland state taxes and was able to pass on tax liability to individual members.
- University Park Community Solar benefitted from the relative wealth, capacity, and connections of its membership. In the interview, the target demographic was described as “middle-class CD [certificate of deposit] holders” with “patience, lack of greed, tolerance for low returns, and already having some wealth,” a group of individuals “more interested in the environment than making money.” Participants included University of Maryland faculty and employees of various federal agencies.

¹⁰ University Park Community Solar no longer maintains a website. For an article examining the project, see [“University Park Community Solar LLC – the first Community Solar Power Initiative.”](#)

To summarize, community organizations face a variety of options when choosing ownership models for a community-owned community solar project. This can take the form of LLCs, cooperatives, or a combination of the two.

- LLCs are the least complicated to form and are highly compatible with tax equity investors. However, they have the highest potential for securities regulation. LLCs are particularly well-suited for individual projects.
- Cooperatives make distributing benefits relatively simple and mitigate the potential for securities regulation. They also have a high potential for replication and scaling. However, they are not compatible with tax equity investors and may be complicated to form depending on a state's cooperative laws. A cooperative ownership structure can be used for both individual projects and community organizations.
- Cooperatives that own LLC(s) maintain LLCs' compatibility with tax equity investors while also maintaining cooperatives' potential for replicability/scalability and mitigated potential for securities regulation.

Power Purchase Agreements (PPAs)

The Solar Energy Industries Association defines Power Purchase Agreements as, “a financial agreement where a developer arranges for the design, permitting, financing and installation of a solar energy system on a customer's property at little to no cost. The developer sells the power generated to the host customer at a fixed rate that is typically lower than the local utility's retail rate. This lower electricity price serves to offset the customer's purchase of electricity from the grid while the developer receives the income from these sales of electricity as well as any tax credits and other incentives generated from the system.”

PPAs are a critical financing tool for residential and small commercial solar by enabling third-party ownership and investment. PPAs also benefit non-profit and public sector entities who lack the tax burden necessary to monetize the investment tax credit. University Park Community Solar is an example of how community-owned solar projects can use PPAs to distribute cash payments rather than bill credits to owners.

Shiloh Temple International Ministries Community Solar Garden, Minneapolis, Minnesota 2018. (Courtesy of Cooperative Energy Futures)



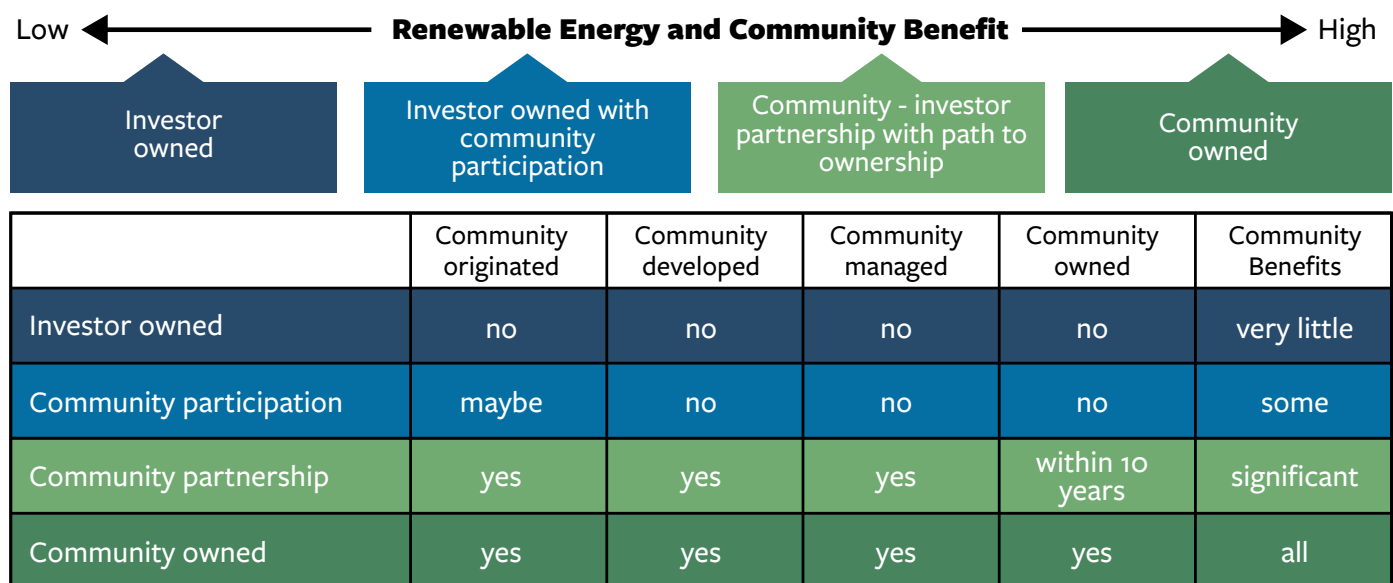
Benefits and their Distribution

The benefits of community-owned community solar range in scale from the individual (electricity bill savings) to the planetary (decarbonization benefits). They include relatively easy-to-quantify financial savings (again, electricity bills) to difficult-to-measure non-financial benefits such as community empowerment. Many low-income, environmental justice, and frontline communities have not benefited from renewable energy in the way wealthier communities have. Community-owned community solar opens the door for these communities to

benefit and to make community solar more equitable. Different communities will interpret this in different ways. Some may care more about direct financial benefits while others may prioritize social and environmental benefits.

A key area of concern for community-owned community solar projects is *how to distribute benefits*? This section first provides an overview of different types of benefits before looking at the question of distribution.

Figure 7: Community Benefits of Renewable Energy



Types of Benefits

- **Direct financial benefits** from community-owned community solar are the most obvious and easy to measure. They can include savings on electric bills, cash, and equity.
- **Indirect financial benefits** are benefits that can be assigned a monetary value but that do not flow directly to community member-owners. However, they do still benefit the community and may overlap with direct financial benefits and non-financial benefits. Examples of indirect financial benefits include energy efficiency funding, workforce

development, job creation, and income to grassroots organizations for conducting outreach (e.g. finding more subscribers).

- **Non-financial benefits** are the most difficult to measure or quantify and for some organizations the most important part of community-owned community solar. Social benefits of community ownership include less resistance to renewable energy projects, community empowerment and education, increased energy and environmental consciousness, and environmental benefits such as cleaner air and reduced carbon emissions.

Benefits Without Ownership

Although the focus of this report is community-owned community solar, as Figure 7 points out, community partnership projects also have significant benefits for communities. In some cases, community impact and benefits may be both greater and more quickly reached through partnership than direct ownership.

Noah Ginsburg, Director of Here Comes Solar at Solar One, lists best practices for community partnership community solar as:

- Community organization involvement from the beginning of the project, possibly including verifiable metrics such as letters of support from elected officials, community organizations, and community members.
- Community organizations informing the vision and approach of the project.
- Workforce training/hiring requirements and priority hiring for local minority- and women-owned businesses.
- Conversations with community organizations around who is being served and what is the target benefit (bill savings, workforce development, or others).
- Setting aside a portion of all revenue for a community fund (for example, 5%).

States are also working to make community solar projects more accountable to communities even when ownership is not possible. For example, in Illinois the Illinois Power Agency is in the process of developing carveouts for [community-driven community solar](#). These carveouts provide incentives for projects that meet criteria related to community engagement, but do not mandate community ownership. Programs like this are still in their infancy and it is too early to measure success or pinpoint best practices.

Distributing Benefits

- **Distribution** of benefits is one of the most important parts of community-owned community solar and one of the most difficult.
- When policy and regulatory frameworks (and/or utility policies) permit it, **bill crediting** is often the most direct and straightforward way to distribute benefits. Participants will receive a “credit” on their electricity bill for the electricity generated from their portion of the solar array and sold to their utility.
- Community-owned community solar projects may also distribute benefits through selling their electricity to off takers and making a profit. This profit can then be distributed as cash payments (if securities regulations permit) or invested in other projects (education, workforce development, marketing, and more).
- For **social and environmental benefits**, such as cleaner air or community empowerment, it is difficult to track how exactly they are distributed, but the final effects can be observed and sometimes measured. For example, a successful community-owned community solar project may spur a community to create other non-energy related cooperative projects or lead to less young people leaving a rural community.

Case Study 3: **Cooperative Energy Futures**

- Minnesota's Cooperative Energy Futures includes 6.9 MW of low-income accessible community-owned community solar and approximately 900 members.
- Cooperative Energy Futures uses a for-profit cooperative model (308B under Minnesota law), which makes it possible to distribute profits to members, reduces tax burdens, and provides an exemption from securities regulations. However, the cooperative model also presents a challenge as most small business financing is not intended for cooperatives.
- Direct financial benefits from Cooperative Energy Futures include bill savings and profits. Indirect financial benefits include home insulation and upgrades, pay for grassroots organizations to find more subscribers, and the use of 50% minority labor for all projects.
- Minnesota's uncapped and open-access community solar program is an enabling policy that has supported Cooperative Energy Futures. Challenges include interconnection queues and lack of sites.¹¹

Case Study 4: **People Power Solar Cooperative**

- Oakland, California's People Power Solar Cooperative operates three community-owned community solar projects. They use a unique model where community solar arrays are located on individual residential homes, who serve as the primary off takers.
- People Power Solar Cooperative's goals include decentralizing, democratizing, and diversifying the energy system; all part of the larger goal of energy democracy.
- In an interview with Co-Founder and CEO Crystal Huang, she emphasized the importance of non-financial benefits such as utility bill literacy as well as knowledge of how to develop projects and of the energy system. For the cooperative, community power is more important than bill savings or decarbonization.
- People Power Solar Cooperative's work was made possible by their advocacy with the Sustainable Economies Law Center for the 2015 California Worker Cooperative Act, which made it possible to form the cooperative.

¹¹ For more information, see the Institute for Local Self-Reliance's article "[Why Minnesota's Community Solar Program is the Best.](#)"

Barriers

With the numerous benefits that come from community-owned community solar, it would make sense for there to be a proliferation of community-owned community solar projects across the US. Why isn't there? Community-owned community solar faces many barriers to deployment including regulatory, policy, and financial barriers as well as external structural factors.

Barriers are important to consider because by studying them it is possible to make changes to enable development. These changes take place in a variety of arenas from state and local policy-making, to federal tax codes, to international supply chains. Although not an exhaustive list, below are common barriers to community-owned community solar deployment.

Case Study 5: **Equitable Community-Owned Community Solar in Cleveland**¹²

- In Hough, The BC Block Club is a group of diverse, like-minded homeowners in Cleveland's urban Hough neighborhood. They have partnered with cooperative developer Cleveland Owns to build an 11-acre, ~4-megawatt ground mount community solar project that foregrounds equity.
- The BC is innovating on the traditional partnership-flip model to include residents as upfront investors.
- As Jonathan Welle of Cleveland Owns described in an interview, solar is a smart investment to build wealth. Tax policies like the investment tax credit make it easier for wealthy communities to invest in solar, while low-income communities like Hough must find creative ways to make investments to create intergenerational wealth in the existing biased policy environment.
- The BC intends to reinvest their returns in community building activities such as home weatherization, housing repairs, rooftop solar, education, and job creation.
- This project is hindered by the lack of a virtual net metering policy, which is crucial to the future of community solar in Ohio. The BC and Cleveland Owns are working to change that policy by building collaborative partnerships.

The People Power community celebrates the installation of the 1st cooperatively-owned solar project in California.
(Courtesy of [People Power Solar Cooperative](#))



Regulatory and Policy Barriers

State policies that enable **community solar** and **utility bill crediting** to multiple off-takers (e.g., virtual net metering) are not present in all states. Both are challenging to enact because they require leadership from state legislatures and public utility commissioners. Furthermore, once enacted, policies vary widely in regards to the value of electricity generated, fees and tariffs, and other details, such as carveouts or incentives for community-owned projects or lack thereof.

Where state-level enabling policy does not exist, community solar programs may still be present if there is voluntary utility collaboration, in particular with respect to bill crediting. While hypothetically possible, these instances are relatively rare.

The states with the most community solar are Florida, Minnesota, New York, and Massachusetts, although data does not yet exist for *community-owned* community solar rates in those states. As of December 2021, they represent 74% of the community solar market. Enabling community solar policy is usually necessary for community-owned community solar, but not sufficient on its own to create community-owned community solar.¹³ Where state-level enabling policy does exist, community-owned community solar still often faces barriers due to **program and policy design issues**. Most state policy is focused on community solar as a whole rather than community-owned community solar. In many cases, equity is not a priority, leading to issues such as:

- Programs may be confusing and hard to navigate for communities without experienced partners.
- Programs may have a capacity cap that is quickly filled by wealthier, better-resourced participants before community-run projects can get in the door.
- Programs may favor large, usually commercial, participants through their lack of carve-outs or incentives for smaller participants or community-

owned projects and/or lack of community, public, and/or non-profit input into program design. This further exacerbates structural inequities between large power sector incumbents and community organizations such as expertise and experience, capacity, and access to capital.

Community-Owned Community Solar and Securities Regulations

- Community-owned community solar may trigger state and federal securities regulations when participants get a profit from their share of the solar array. Generally, this is not an issue when utility bill crediting is used to distribute benefits, but it can quickly become an issue when financial benefits are distributed through other means, in particular cash payments.
- In general, cooperatives are less likely to trigger securities regulations than LLCs because distribution of profits from a cooperative are effectively refunds to the co-op's users.
- Regardless of ownership structure and other project details, however, all community-owned community solar project should be aware of securities laws and regulations, and how they may or may not impact the project.¹⁴

Financial Barriers

A lack of capital and access to capital are often the biggest barriers for community-owned community solar, particularly for low- to moderate-income communities. "Lack of capital" means that individuals and community institutions are not wealthy enough on their own to build a community array, whose costs include not just the physical panels and infrastructure, but also numerous associated costs, including permitting, legal, technical aid, and other costs. A lack of access to capital means that individuals and community institutions do not have access to grants, funders, loans, or other types of financing, often due to lack of credit, lack of knowledge about these options, and/or lack of relationships necessary to take advantage of them.

¹² For more on this project, see the [Block Club](#), [Cleveland Owns](#), and this [article](#).

¹³ For rankings and further study of state-level community solar, see work by the [National Renewable Energy Laboratory](#), the [Institute for Local Self-Reliance](#), and the [Coalition for Community Solar Access](#).

¹⁴ For more information on securities regulations and solar, see: in [ILSR report](#), [Lewis & Clark Law School Blog](#), [link](#)

Figure 8: Solar Financing for Local Ownership (Courtesy of Lynn Benander)

		Comes in when . . .	Repays . . .	Pays for . . .
1	Pre-Development Loan	Site is secured	Costs for securing the site	• Community Education, Planning, and Signup • Engineering Solar Design, Permits and Utility Interconnection and Incentives
2	Construction Loan	Project is ready to build	Development Loan	• Construction
3	Sponsor Equity	Community Members invest	Construction Loan	• Any project costs Note: Can also be borrowed by the community partner
4	Term Debt and Tax Equity	Project has been built	Construction Loan	• All project costs • Reserves • Start-up Operations
5	Buyout Sponsor Equity	Financing Period is over		• Final Tax Equity buyout

Paths to Ownership

Finding a path to ownership is fundamental for many community groups interested in community solar, and in many cases because of a desire for a more equitable energy system. Participating in a project through, for example, a subscription model, where the community never actually owns the project, does not always sufficiently reflect the community's values and desires nor does it allow for the benefits of ownership. Community solar projects typically involve high upfront costs, including the cost of the panels and associated infrastructure, as well as the land acquisition costs, labor costs, and more. Many community groups do not have the resources to pay these costs all at once. Therefore, they must come up with an alternative path to ownership.

Tax incentives, including in particular the federal Investment Tax Credit (ITC), have been put in place to offset the costs of project development and incentivize solar and other renewable energy. While some community groups may be able to use tax incentives to offset project costs, most community groups are unable to monetize tax incentives and take advantage of this path themselves. In some cases, community groups may partner with a third-party entity that can take advantage of tax

incentives and thereby drive down the price of the project. However, such third-party ownership by an investor may not lead to a path to ownership for the community.

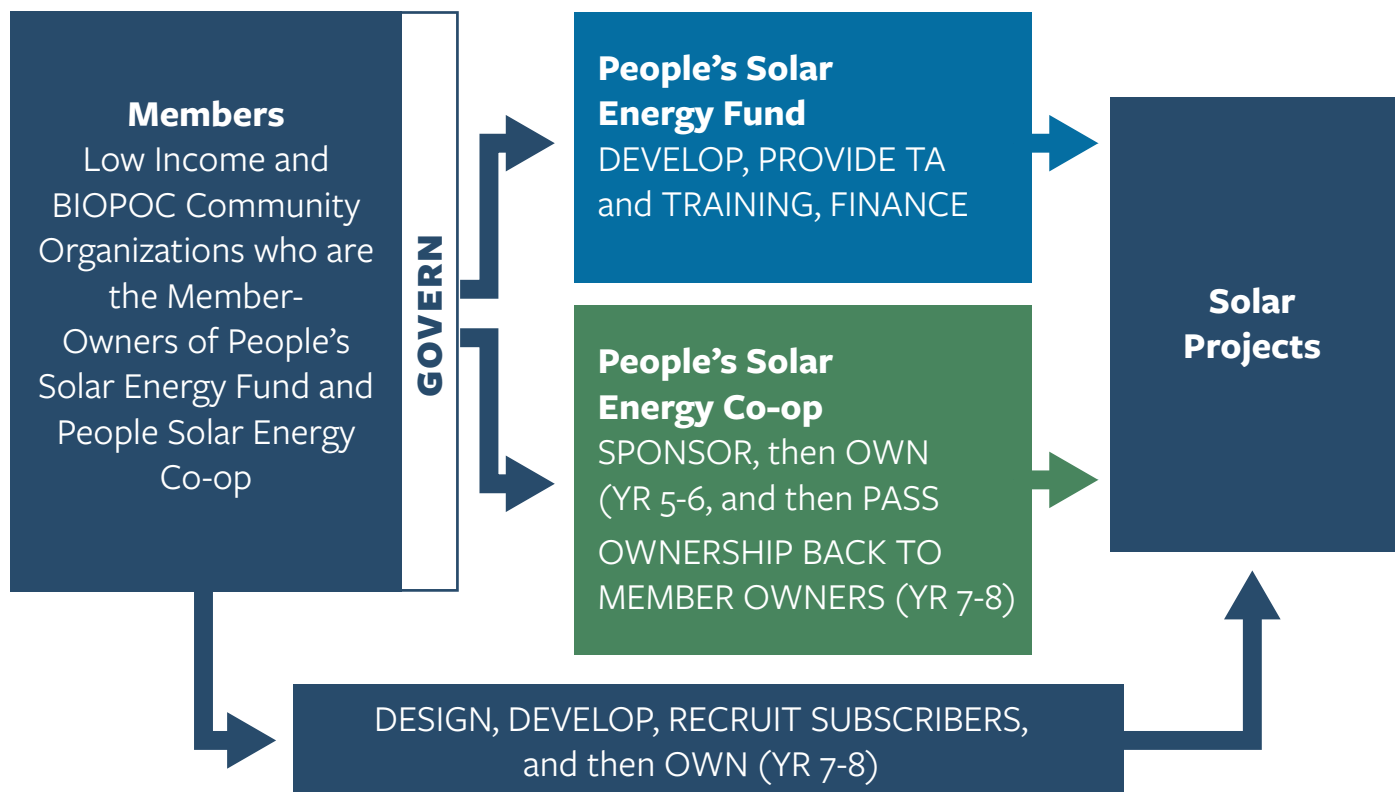
Some community-owned community solar projects overcome this barrier through a partnership flip model. Under this model, an investor initially owns the majority of a project and receives the tax benefits. After a given period of time, ownership "flips" to the community and they have the opportunity to buy out the investor.

Instead of or in addition to tax incentives and the partnership flip model, some community-owned community solar projects explore other ways to raise the capital necessary to own a community solar project, including through some combination of loans, grants, and other fundraising within and outside their community.¹⁵

Case Study 6: **The People's Solar Energy Fund**

- The People's Solar Energy Fund (PSEF) defines itself as “a tax exempt 501C3 loan fund that is structured as a cooperative of BIPOC and low income community organizations working together to build community-led, community-owned solar in their communities.”
- PSEF was founded in 2018 to address the challenges of funding community-owned community solar as well as provide community organizing and development assistance nationwide.
- Their goal is to secure tax equity partnership flip financing for a \$75M a year pipeline of solar projects with the People's Solar Energy Co-op as the Sponsor and LLC Manager.
- The figure below illustrates People's Solar Energy's model. The fund portion of the organization provides technical assistance, training, and financial knowledge while the co-op supports projects through tax equity partnership flip financing that passes ownership back to the owner members in 7-8 years.

Figure 9: The People's Solar Energy Fund Model (Courtesy of People's Solar Energy Fund)



External Factors

The early 2020s have presented numerous external factors that have inhibited community-owned solar growth. For example, the COVID-19 pandemic—which has hit frontline communities the hardest—has made the community engagement necessary for community-owned community solar more difficult, at least for some communities. Associated supply chain disruptions and increasing material costs make community-owned community solar more expensive and difficult to finance. Finally, the March 2021 Commerce Department solar panel investigation in Southeast Asia led to a decrease in solar panel availability, further increasing costs and wait times for community-owned community solar projects. Eventually the Biden administration [waived tariffs for two years](#) for these countries. While these are some of the current external factors affecting community-owned community solar, others may arise in the future, sometimes in unpredictable ways.

Community Solar & Tax Structure

One of the largest drivers of solar development in the United States is the solar Investment Tax Credit (ITC), which provides a substantial tax credit for eligible solar projects. Historically, one challenge with the ITC is that it is non-refundable. What this means is that the individual or company must have a tax burden greater than the value of the ITC to take advantage of it. The newly passed Inflation Reduction Act changes some of the rules regarding the ITC and offers additional incentives for community solar development.¹⁶ For example, credits can cover up to 50% of the costs for projects in disadvantaged communities.

Even with the passage of the Inflation Reduction Act, however, many community organizations may still not be able to take advantage of tax incentives which hobbles their ability to directly own or finance a community solar project. Projects must then use a third-party financier who is able to monetize the ITC (often in the form of partnership flip models). The benefit for the project is a sizeable equity investment, while the benefit for the investor is the ability to lower their tax burden. Third-party tax equity partners may provide the financing necessary for projects, but communities should be wary about possible diminished control and unfavorable financing terms.



What comes next?

Starting a community-owned community solar project is difficult. Communities must define themselves, take stock of their resources and capabilities, define success, and understand the regulatory and policy context they operate in before even beginning a project. Then comes choosing an ownership structure, financing the project, distributing benefits, and equity considerations. This final section lays out key questions for each of these areas that communities should ask when considering a community-owned community solar project.

Who is Your Community?

Before starting a community-owned community solar project, the first step is to determine who will own and benefit from the project. Your community could be your neighborhood, a local organization, or a group of individuals united by a common goal or identity.

- Who is your community? Is there already an organization that encapsulates it or is it necessary to form one? How is membership determined and who is eligible? What core constituency do you plan to serve?
- What are your community's strengths? What are its weaknesses?

What Does Success Mean for Your Community?

Community-owned community solar has many possible benefits which means there isn't a single metric for success. Success could mean many things, such as: 1) reduced electricity bills, 2) a healthier environment, 3) community engagement and empowerment, 4) investment opportunities and building equity, 5) workforce development, and more!

While community-owned community solar can have multiple benefits, defining what success looks like for your communities and which types of success are most important. You can design a community-owned community solar project that meets the needs and desires of your particular community. This is important since usually projects—especially financially-constrained projects—will have to make trade-offs. Therefore, clearly defining goals and metrics will help narrow the focus and assist in making difficult decisions.

- What does success mean for your community?
- What benefits are most important and why?

Who Are Your (Potential) Partners and Mentors?¹⁷

Community-owned community solar projects will often require meaningful and authentic partnerships and mentors. However, there is the potential for paternalistic, exploitative relationships that community organizations should be wary of.

- What resources does your community have (legal representation, land ownership, grant writers, access to capital)? What resources does your community have access to (grants and funding, technical assistance, capacity-building)?
- Who are potential partners and mentors that will put the community's needs and desires before their own motivations?
- How will your community differentiate between meaningful partnerships and inauthentic solutions?

¹⁷ For more on partnerships, low-income communities, and community solar in general, see this [article](#) from the World Resources Institute.

What Is the Policy and Regulatory Context In Your Locale?

The shape and structure of your community-owned community solar project will be heavily influenced by the policy and regulatory context of where you are located.

- Does your state have bill crediting? If not, do utilities offer it voluntarily? If so, does the program have capacity for further projects? What other elements of your state's or utility's community solar program could support or hinder your project?
- If there is not a policy regime to support community solar, or the current policy is insufficient somehow, can you design your project such that it can proceed despite these challenges? Does your community wish to work at the policy level to promote more enabling policies?
- How will you design your project to avoid securities issues and/or comply with any applicable securities laws?
- Which ownership structure makes the most sense for your project/organization? What are the legal and technical barriers to creating an LLC, a cooperative, or a combination of the two? Neither cooperatives nor LLCs clearly dominate as better than the other. LLCs are often simpler and more straightforward to form, especially for single projects. Cooperative laws vary between states, but one benefit is that they can make the distribution of benefits easier. Organizations may also use a combination of LLC(s) and cooperatives. All of these options have the potential for democratic governance, so you should seek what works best for your community.
- What is the tax structure associated with each?
- How will the ownership structure inhibit or support equity considerations?
- How will the ownership structure inhibit or support the distribution of benefits?

How Will Benefits be Distributed?

If bill crediting exists and electricity bill savings are the primary goal of a community-owned community solar project, distributing benefits will be relatively straightforward. Without bill crediting and/or if other benefits are the primary goal, distributing benefits may be a more complicated process. Groups interested in community-owned community solar should develop a clear understanding of what types of benefits they wish to prioritize and how best to distribute them.

- What are the benefits created by your project?
- Will benefits be distributed equally amongst participants or will there be mechanisms to distribute benefits proportionally based on different types of participants to promote equity?
- What mechanisms exist to distribute benefits? What are the barriers to distributing them?
- How will the community decide how to distribute indirect financial benefits (workforce development, home improvements, or others)?

How Will the Project Be Financed?

Community-owned community solar projects will most likely require outside investment to facilitate construction of the project. This can take the form of fundraising, grants, and/or third-party financing. External financing offers both an opportunity and a threat, in that it makes projects possible that otherwise would not be but it can reduce community control of a project.

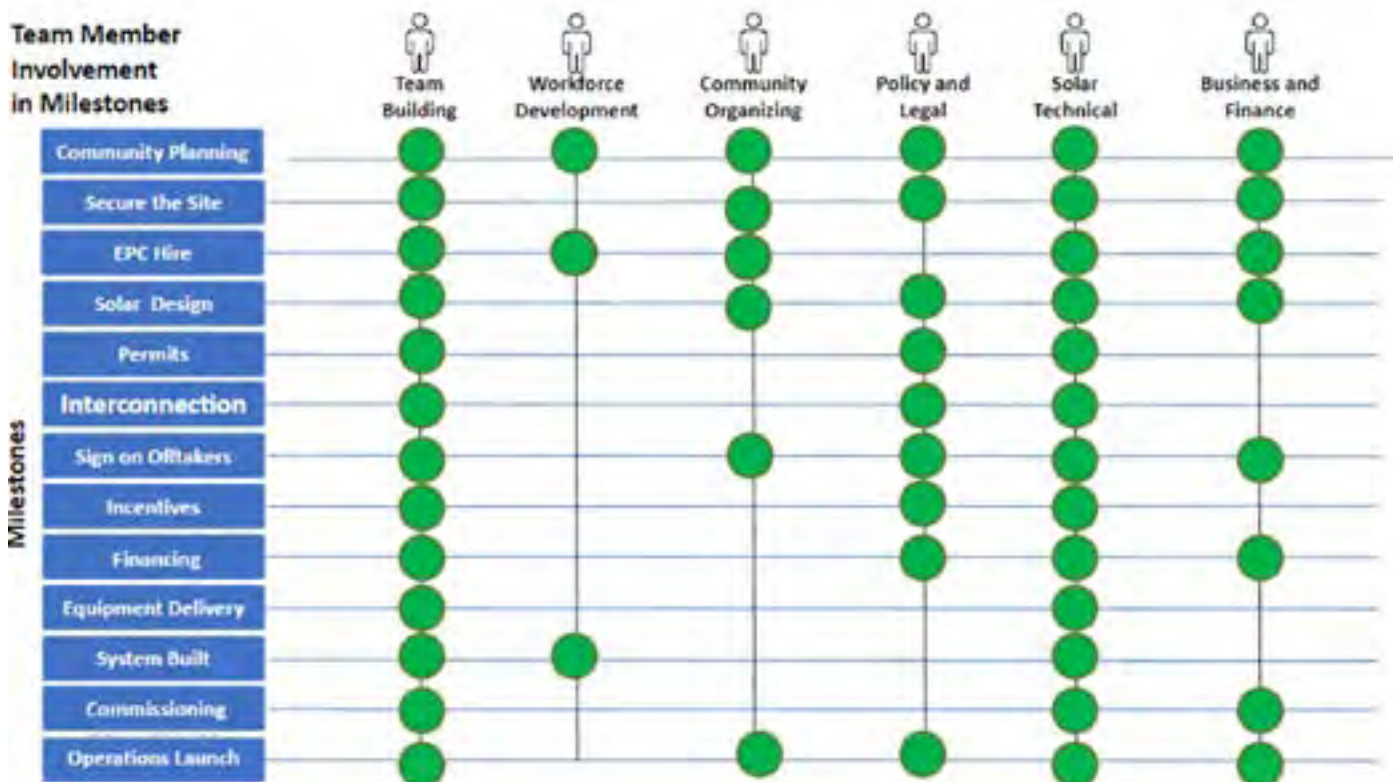
- Does your community have access to capital? Which types?
- Do you have legal representation and/or the capacity to understand complicated financial documents? If not, what resources or other groups could assist with this?
- Will your project be able to take advantage of tax incentives either directly or through a model such as a partnership flip? Are there other tax considerations for you? How does the ownership structure you have chosen enable or constrain those opportunities?

In Which Ways Will the Project Advance Equity?

Many community groups are interested in community-owned community solar in order to advance equity, but just because a community solar project is community-owned does not ensure equity.

- Is equity a goal for your project? What does your community understand equity to mean?
- Will your project focus on membership by certain groups? Who is able to buy in to the project? Are there mechanisms to support low-income potential participants?
- Will benefits target low-income and/or BIPOC members?
- Will workforce development programs target certain groups?

Figure 10: Community-Owned Community Solar Milestones (Courtesy of Lynn Benander)



Appendix A: Resources

Community-Owned Community Solar Documents

Cooperative Energy Futures Materials Organizational approach two-pager – <https://static1.squarespace.com/static/5ced3079d9360a000120337d/t/5d8fbcf5bdo27f6ecf6b2b69/1569701109445/CEF+CSG+approach.pdf>

People Power Solar Cooperative Materials

People Power Bylaws – https://drive.google.com/file/d/11qXiDId2_5RCT3ARovqhSTJnIH55q3um/view

Owner agreement – https://d3n8a8pro7vhmx.cloudfront.net/peoplepowersolar/pages/22/attachments/original/1545838445/People_Power_Owner_Agreement.pdf?1545838445

Articles of incorporation – https://d3n8a8pro7vhmx.cloudfront.net/peoplepowersolar/pages/22/attachments/original/1545838478/People_Power_Solar_Cooperative_Articles.pdf?1545838478

Privacy Policy – https://d3n8a8pro7vhmx.cloudfront.net/peoplepowersolar/pages/22/attachments/original/1552488444/3_12_19_People_Power_Privacy_Policy_PUBLISHED.pdf?1552488444

Sunset Park Solar (Co-Op Power Project) Materials

One pager – <https://static1.squarespace.com/static/581b72c32e69cfaa445932df/t/5f22dfe7cef79f13f92a2f/ad/1596121065366/Sunset+Park+Solar+Factsheet.pdf>

FAQs (English and Spanish) – <https://static1.squarespace.com/static/581b72c32e69cfaa445932df/t/5f1f4d38aae24951927/dc88c/1595886904712/FAQ%2BSheet%2BSPS%2BSpanish%2Band%2BEnglish.pdf>

How to sign up (English, Spanish, Chinese) – https://static1.squarespace.com/static/581b72c32e69cfaa445932df/t/5f17690114253704d83bc/86edcdc9365fd9a3280/1595369585909/How+To+Sign+Up+Factsheet_EN_SP_CH.pdf

Community letter – https://static1.squarespace.com/static/581b72c32e69cfaa445932df/t/5f17690114253704d83bc/2c9/1595369729589/SPS+Community+Letter_EN_SP_CH.pdf

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The Environmental Law & Policy Center is the Midwest's leading environmental legal advocacy organization. We drive transformational policy changes with national impacts. We show that environmental progress and economic development can be achieved together by putting sustainability principles into practice. We advance climate solutions effectively, by accelerating clean renewable energy alternatives to conventional power plants and advancing clean transportation solutions.

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Community Solar Basics

What is Community Solar?

The U.S. Department of Energy defines community solar as any solar project or purchasing program, within a geographic area, in which the benefits flow to multiple customers such as individuals, businesses, nonprofits, and other groups. In most cases, customers benefit from energy generated by solar panels at an off-site array.

Community solar customers typically subscribe to—or in some cases own—a portion of the energy generated by a solar array, and receive an electric bill credit for electricity generated by their share of the community solar system. Community solar can be a great option for people who are unable to install solar panels on their roofs because they are renters, can't afford solar, or because their roofs or electrical systems aren't suited to solar.

Community solar is rapidly growing across the country. The National Renewable Energy Laboratory [tracks installation data on community solar](#).

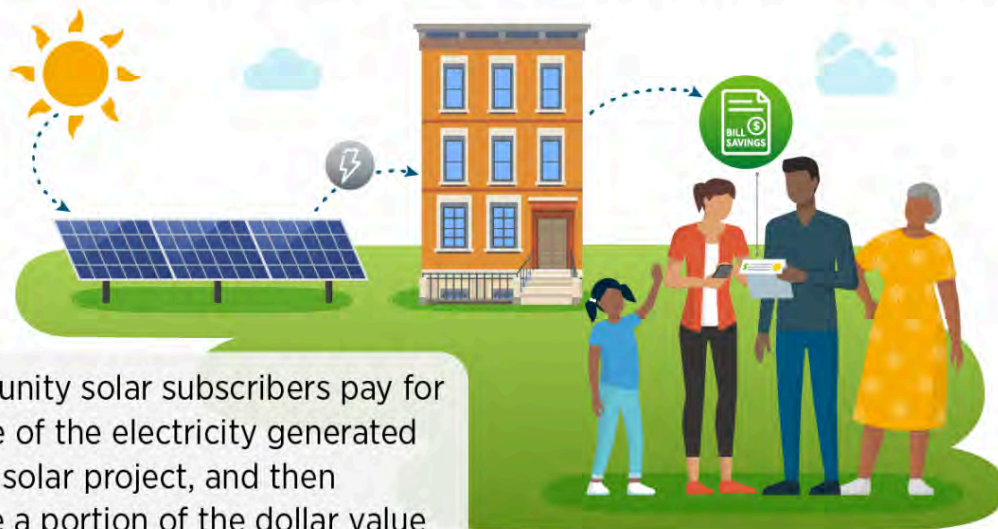
How Does Community Solar Work?

Community solar projects generate electricity from sunlight and the electricity flows through a meter to the utility grid. Community solar subscribers (i.e., households, businesses, or any other electricity customer) pay for a share of the electricity generated by the community solar project. This is typically in the form of a monthly subscription fee.

The local utility pays the community solar provider for the energy generated, and each subscriber receives a portion of the dollar value generated by their community solar subscription as a credit. Typically, this credit is applied directly to a subscriber's monthly electric bill, helping to reduce customers' electricity costs.

How does it work?

Community solar projects generate electricity from sunlight and the electricity flows to the electricity grid. Project owners can sell this power to their local utility.



Why Community Solar?

Community solar can allow all households and businesses to access the benefits of solar energy, such as lower electricity costs, regardless of whether they're able to host a system on their own roof. In addition to household savings, other benefits of community solar include resilience during blackouts or weather events, community wealth building, and local job creation. Learn more about the meaningful benefits of community solar.

According to analysis by the National Renewable Energy Laboratory, nearly 50% of households and businesses are unable to host rooftop solar systems. This may be because they don't own their homes, have roof conditions that do not support a rooftop photovoltaic (PV) system due to shading, roof size, or other factors, or due to the upfront costs of installing home PV.

Consumer Protections in Community Solar

It is important that community solar programs incorporate key consumer protections to ensure subscribers receive strong benefits. Community solar programs designed for low-income households all require subscribers to achieve energy savings and often include other key consumer protections.

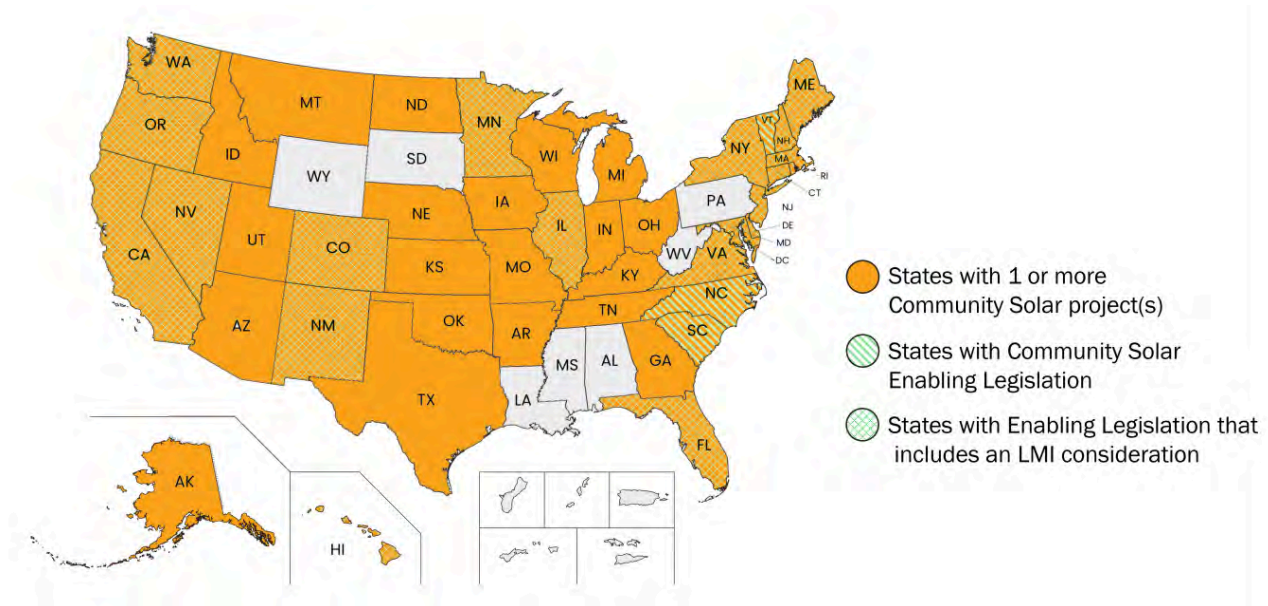
Some best practices in consumer protections for community solar include:

- Ensuring subscribers will receive a bill credit, including at least 20% household savings
- No exit fees, termination fees, sign-up fees, or other fees included in the contract
- Community solar disclosure documents are provided upfront with an overview of what will be included in the subscription, written in plain language and provided in the subscriber's primary language
- Compliance protections must be in place, where there is an accessible complaint process or mechanism for community solar subscribers

Subscribers should check their state's requirements for consumer protections in community solar programs and review their contracts when subscribing to ensure they receive strong and transparent protections.

Where Can I Find Community Solar?

Currently, there is at least one community solar project in 44 states and localities, including the District of Columbia (DC). Of those, 24 have passed "enabling legislation" that encourages or mandates community solar in their jurisdictions. States with enabling legislation typically have more projects developed and subscriptions available. Additionally, 19 states and DC have policies to address the participation of low-income households in community solar.



Resources for Finding Community Solar Projects

Consumers can contact their local electric utility or use an internet search engine to find community solar subscriptions that may be available to them in their areas. The signup process for community solar depends on your state and the programs available for enrollment.

Here are some helpful resources:

- [National Renewable Energy Lab State Policies and Programs for Community Solar](https://www.energy.gov/eere/solar/community-solar-basics) - This spreadsheet includes current community solar policies and low-income stipulations by state. If you're interested in subscribing in a community solar program, states with active programs have websites that include more information on how to subscribe.

- [Groundswell Low Income Financing and Transactions for Solar Access Everywhere Toolkit](#) - This toolkit allows you to search for community solar programs based on their designs and their low-income financing structures.

Community Solar and Multifamily Housing

In addition to the more common off-site model of community solar, owners or occupants of apartment or condominium buildings may develop solar arrays on their property or rooftop, providing residents with energy produced from the rooftop array. Affordable housing can provide benefits to residents from community solar as either direct bill discounts or as indirect benefits. [Learn more about community solar and affordable housing](#), including guidance from the U.S. Department of Housing and Urban Development on how community solar should not impact low-income utility allowances.

Investor-Owned Utilities, Municipalities, and Cooperatives

In states without community solar enabling legislation, non-regulated utilities or municipal utilities may develop their own community solar programs. [Learn more about municipally led community solar programs](#).

Because most community solar arrays are located off-site, utilities can strategically locate these systems in areas of the grid that can benefit the most. For utilities, developing community solar arrays can lead to improved relationships and engagement with customers.

Learn More About Community Solar

- [How Does Solar Work?](#)
- [Community Solar Market Trends](#)

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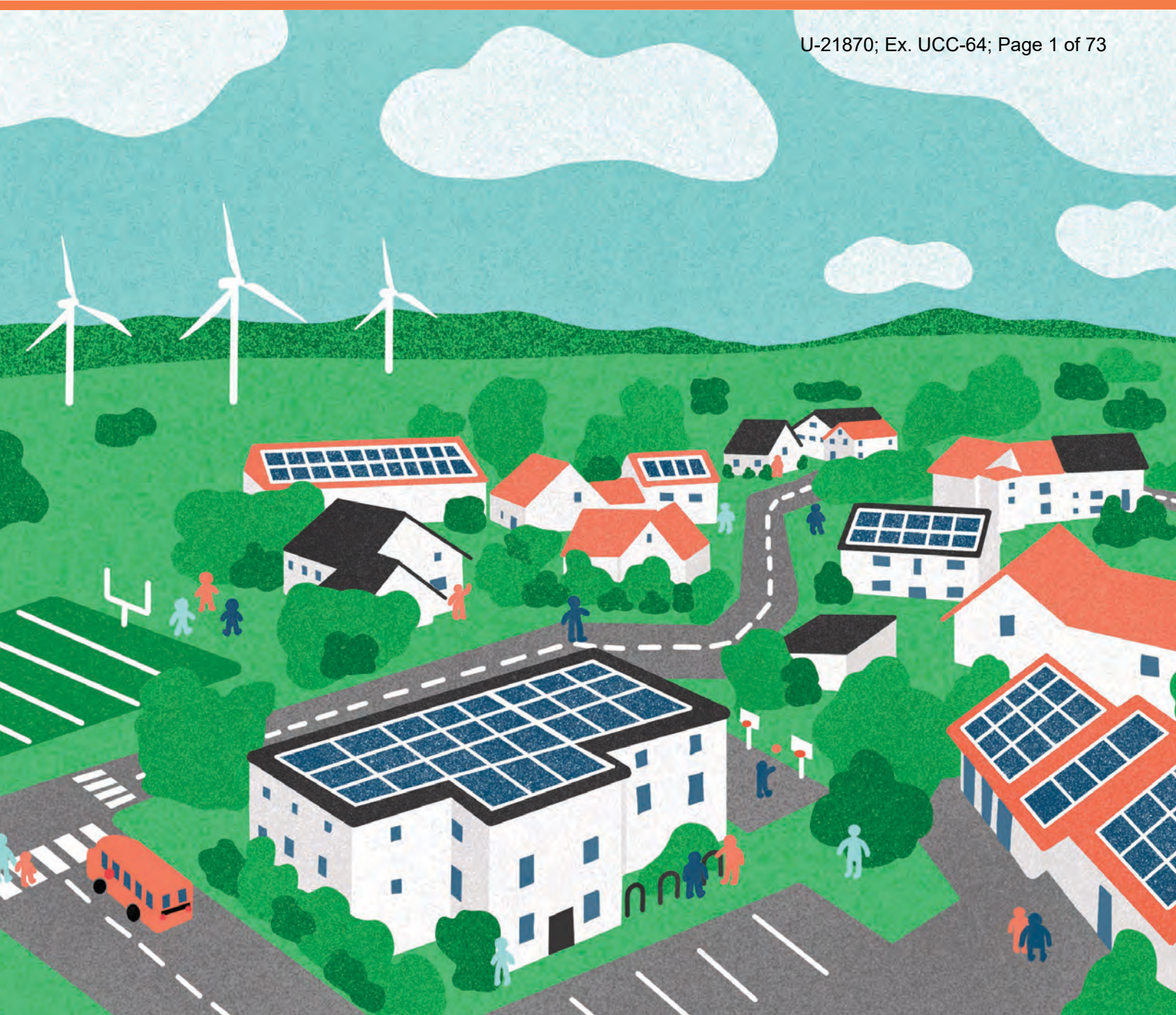
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Advantage Local:

Why Local Energy Ownership Matters

Katie Kienbaum and John Farrell, ILSR
Matthew Grimley, Independent Contractor
June 2023

ILSR INSTITUTE FOR
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About the Institute for Local Self-Reliance

The Institute for Local Self-Reliance (ILSR) is a national nonprofit research and educational organization founded in 1974. ILSR has a vision of thriving, diverse, equitable communities. To reach this vision, we build local power to fight corporate control. We believe that democracy can only thrive when economic and political power is widely dispersed. Whether it's fighting back against the outsize power of monopolies like Amazon or advocating to keep local renewable energy in the community that produced it, ILSR advocates for solutions that harness the power of citizens and communities. More at www.ILSR.org.

We would like to recognize our co-author, Matthew Grimley, for conducting the quantitative research and analysis in this report. We would also like to thank everyone who shared their thoughts with us in the initial phases of developing this project, including Lynn Benander, Glen Brand, Jessica Collingsworth, John Delurey, Haley Havens, Olivia Nedd, and Al Weinrub. Additional thanks to Timothy DenHerder-Thomas and Crystal Huang for reviewing report drafts. We are eternally grateful to our colleagues at ILSR, particularly Maria McCoy, for their support. Lastly, thank you to the people, groups, and organizations who are making local clean energy ownership a reality for themselves and their communities.

Related Work from the Energy Democracy Initiative

Fighting Monopoly Power: How States and Cities Can Beat Back Corporate Control and Build Thriving Communities

Energy Self-Reliant States 2020: Third Edition

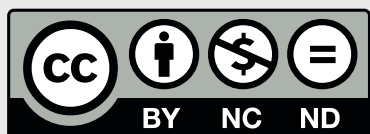
The National Impact of 30 Million Solar Homes: A Vision for an Equitable Economic Recovery Built on Climate Protection and Energy Democracy

Reverse Power Flow: How Solar+Batteries Shift Electric Grid Decision Making from Utilities to Consumers

Why Utilities in Minnesota and Other States Need to Plan for More Competition

Equitable Community Solar: Policy and Program Guidance for Community Solar Programs that Promote Racial and Economic Equity

Beyond Sharing: How Communities Can Take Ownership of Renewable Power



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What is Local Clean Energy Ownership?

It means that local people have **Meaningful Decision-Making Power** over construction operations, and distribution of benefits of clean energy projects.



This includes both individual-owned projects and community-owned or shared projects.

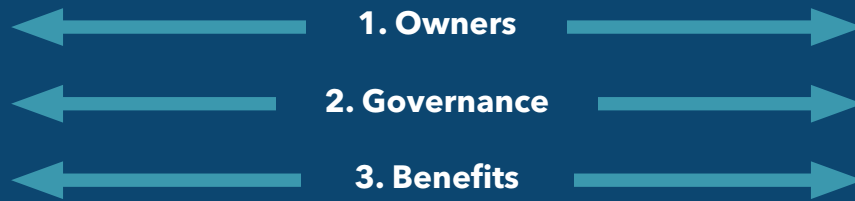


3 Dimensions of Local Clean Energy Ownership

Projects that fall mostly on the "local" side are locally owned.



Non-Local



Local

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Key Benefits of Local Ownership

Households save on **Energy Costs** and **Build Wealth.**



Owning your own rooftop solar panels = an extra **\$12,000** in lifetime savings, compared to third-party ownership.

Being a part-owner and subscriber of a community solar cooperative = an extra **\$14,000** in lifetime savings, compared to third-party ownership.

Rooftop solar increases home values **\$4,000 per kilowatt** according to a 2015 estimate!¹

Local clean energy projects are **shared community assets** that build economic resilience and stability.

Locally owned rooftop and community solar projects provide **3x the value** to local owners, energy users, local banks, landowners, and local governments.

If all small solar installed in 2021 was locally owned, it could have created almost **\$7.5 billion in extra value** for host communities, compared to outside ownership.

One study found that locally owned wind farms might create **1.1 to 3.1x** more jobs than outside-owned projects during construction.²

Communities reinvest in the **Local Economy,** create new **Local Jobs,** and build **Political Power.**



Research from several countries has found that residents prefer **local or community ownership** of wind energy and that it's associated with more positive attitudes to development.

In a 2011 case study, **45%** of residents of a German town home to community-owned wind turbines had a **positive opinion** of future local wind development, compared to only 16% in another town with a wind project owned largely by outside entities.³

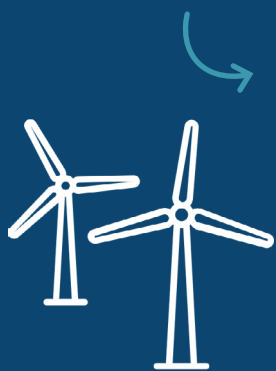
Local clean energy ownership is **essential** to create the public pressure and political will needed to **counter energy monopolies, address energy injustices, and confront the climate crisis.**

Icons by Smashicons and catkuro via Flaticon.com.

Local Ownership for All

Because of bad government policies and lobbying from big energy monopolies, local clean energy ownership isn't accessible to **All Communities** right now.

Take the
example of
rooftop solar.



Rooftop solar adopter **incomes skew high**, especially for host-owned systems. The median household income of all 2021 solar adopters was \$110,000 compared to a national median of \$63,000.

Black and Hispanic households are underrepresented among solar adopters. Residents of **disadvantaged communities** are only 11% of adopters nationally.⁴

These disparities are the result of **structural barriers** to clean energy ownership, including racial and socioeconomic gaps in homeownership, wealth, and financing, as well as **energy system-specific barriers**, like high upfront costs, inadequate government incentives and policies, and utility interference.

We Must Expand Access to individual clean energy ownership and shared community ownership, so all communities – no matter their color, income, renting status, or geography – can own part of the clean energy future.

Here's how.

- **Address high upfront costs**, including by improving clean energy tax incentives, providing direct grants and accessible financing, and reforming securities regulations.
- **Pass supportive policies**, including fair compensation for clean energy owners and shared solar programs that enable community ownership.
- **Incentivize local ownership**, including through "adders," prioritization, and carveouts for locally owned projects in clean energy programs.
- **Provide technical support** for locally owned clean energy projects.



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Introduction

With soaring energy costs for American families, electric grid-induced fires burning up the West Coast, and the looming threat of power blackouts, the need for equitable, affordable, and resilient local clean energy has never been clearer.

Clean energy — including rooftop solar panels, community solar gardens, and wind turbines — has many advantages. It eliminates carbon emissions and other pollution from dirty fossil fuels. Often, it's the cheapest source of new power, leading to more affordable and stable energy costs. It also creates jobs in the new energy economy.

Today, corporate utilities and Wall Street control much of the country's clean energy infrastructure. They prioritize profits over people, keeping many of the benefits of clean energy for themselves. But if households and communities owned more of this clean energy, we could maximize the positive local impacts while putting power back in the hands of people to meet their own energy needs. This melds neighbors into a political movement that can push to rapidly transform our extractive energy system into one based on democratic, decentralized renewable energy — an essential tool in the fight against climate change.

Big energy monopolies threaten this vision of local clean energy ownership. To maintain their power, utility monopolies often fight the growth of locally owned clean energy, as they cling to a 100-year-old business model based on centralized control and dirty fossil fuels. Even though some large, investor-owned electric utilities have pledged a transition to renewable energy, their desire to own this new energy generation limits the benefits for families and communities, as utility shareholders gobble up most of the financial returns.

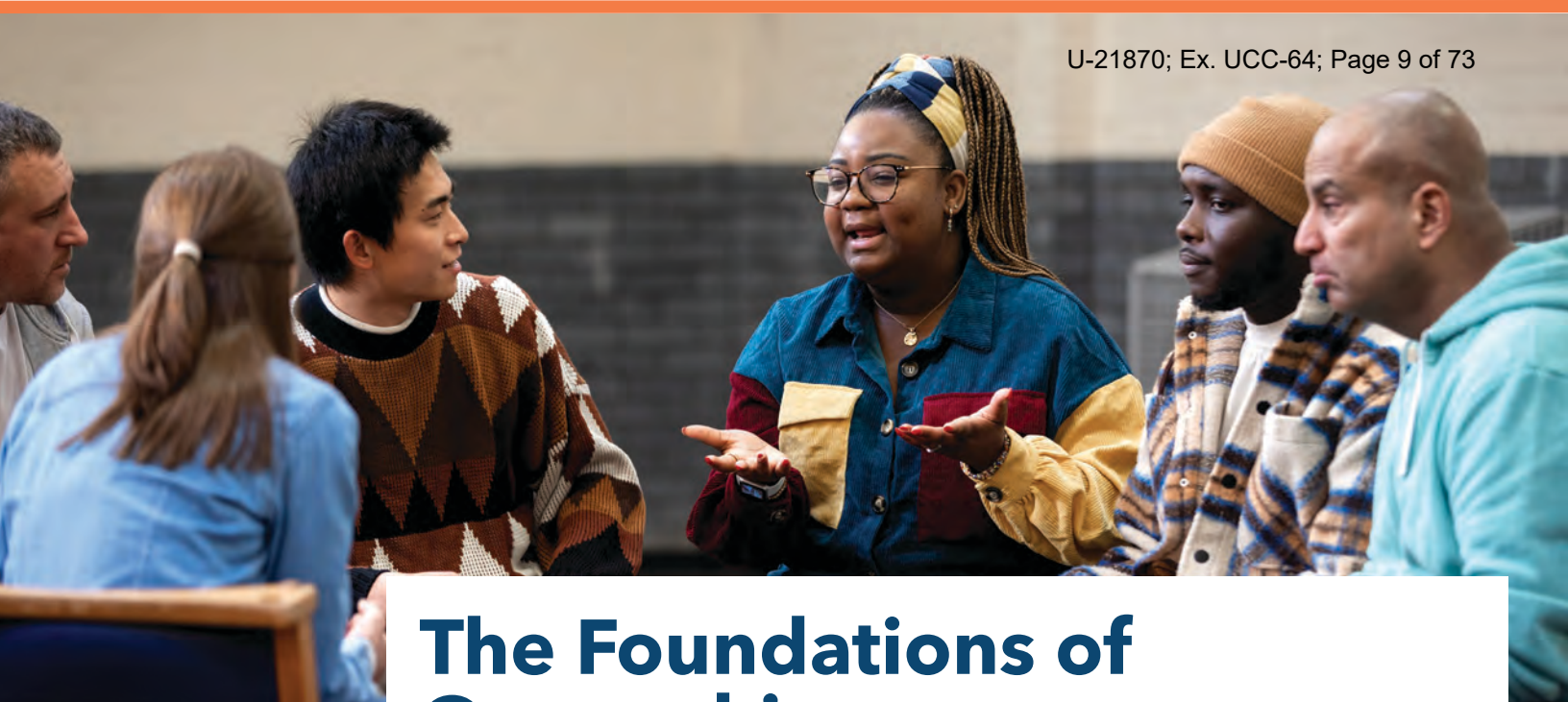
Utility monopolies aren't acting alone. Corporate special interests have pushed state and local governments to pass laws and regulations that prevent competition from locally owned clean energy.

On top of that, a range of financial barriers, systemic disparities, and policy failures unfairly keep clean energy ownership out of reach for many, particularly low-income households, renters, and Black and Brown communities. Even though renewable technologies save money over time, existing program rules and market structures still require individuals and communities to pay high upfront costs to access the benefits of clean energy ownership — unlike

electric utilities, which are allowed to socialize the costs of big fossil fuel plants across all customers. Alternatives to rooftop solar for households without a sunny roof, such as community solar, aren't available in all states. Where programs do exist, they don't always enable local ownership or equitable access for all households. New approaches are needed to break down these barriers.

In this report, we define the concept of local ownership and lay out its particular benefits, distinct from the benefits of clean energy or local siting more broadly. (See *Is Bigger Best in Renewable Energy?* for an in-depth analysis of the benefits of small-scale clean energy.)⁵ We also identify barriers to local clean energy ownership and potential policy solutions to enable ownership, particularly for low-income communities, communities of color, and other historically marginalized communities. Throughout, we share stories of how communities across the country are taking on adversarial utilities and status-quo politicians to develop creative solutions and achieve local clean energy ownership. While this report focuses largely on solar, many of the learnings could be applied to other clean energy technologies, like wind, geothermal, or energy storage.





The Foundations of Ownership

What Is Local Clean Energy Ownership?

Like the many diverse communities involved, local clean energy ownership varies. As we define it, local clean energy ownership means that local residents, groups, or other community-based entities have meaningful decision-making power over key aspects of clean energy projects, including construction, operations, and the distribution of benefits. This applies to both individual (e.g., rooftop solar panels on a home) and shared (e.g., a community solar garden) projects. Though “ownership” may commonly refer to who has legal possession or who profits from a project, the goals and functions of local ownership can take many different forms based on the type of clean energy technology, the people involved and their needs, and the relevant federal and state policies.

For a rural farming community, for instance, local energy ownership could involve residents forming a cooperative to invest in wind turbines. For a faith group, local energy ownership could mean installing solar panels on their house of worship to serve the congregation and nearby households. For communities that don’t believe in the commodification or private ownership of energy, including some

Key Definitions

Local Clean Energy Ownership -

Occurs when local residents, groups, or other community-based entities have meaningful decision-making power over key aspects of clean energy projects, including construction, operations, and the distribution of benefits.

Indigenous Peoples, local “ownership” may mean a practice of community governance and benefits that eschews common legal definitions.⁶

Because of these varying forms, it’s important for definitions and descriptions of local clean energy ownership to be flexible. Over the years, community practitioners, academics, and policymakers have identified some key features of community renewable energy and ownership that help us delineate the benefits and responsibilities of local ownership, as we’ve defined it here.⁷ For the purposes of this

report, we simplify this to three main dimensions of local clean energy ownership: who the official project owners are, how it’s governed (or how decisions are made), and who reaps the benefits. These three dimensions exist in spectrums from non-local to local, as represented in Figure 1.

High “locality” ratings in one dimension often correlate with, but don’t guarantee, high ratings in the other dimensions. For instance, a community solar project owned by a cooperative of local residents is more likely to retain local governance

Figure 1.

Three Key Dimensions of Local Clean Energy Ownership

1 Owners

Non-Local

Owners do not reside in the community or have a relationship with it.

Local

Owners reside in the community. Can be an individual or a group.

2 Governance

Non-Local

Decisions are made by people and entities outside the community.

Local

Decisions are made by people and entities in the community.

3 Benefits

Non-Local

Clean energy projects mainly benefit people and entities outside the community.

Local

Clean energy projects mainly benefit people and entities in the community.

and local benefits. On the other hand, you can imagine an out-of-town nonprofit developing a project for a community center, delivering most of the benefits to the local community and enabling community engagement in the process while still retaining legal ownership and ultimate decision-making authority.

In general, we consider local clean energy projects that fall mostly on the right side of the spectrums to be locally owned. We explore each dimension in greater detail in the following sections.

In all instances, state laws, federal tax incentives, and other practical considerations determine the possible expressions of local clean energy ownership. From the choices available, communities and individuals can choose the ownership structures that best suit their specific projects, values, and goals.

How Much Solar is Locally Owned?

Locally owned solar energy systems currently make up a modest — but growing — portion of clean energy capacity in the United States. In the case of community solar, the National Renewable Energy Laboratory reports that customer-owned projects (i.e., local direct ownership) make up less than one percent of capacity installed through 2020, and projects owned by electric cooperatives, municipal utilities, and their suppliers (i.e., local indirect ownership) account for another 10 percent.⁸ Rooftop and other on-site solar has a higher rate of local ownership; Lawrence Berkeley National Laboratory data shows that host-owned systems made up about 65 percent of residential capacity installed through the same time period and that this percentage is growing.⁹



Key Definitions

Shared Solar or Community Solar - An on- or off-site solar project that provides economic benefits, like electricity bill credits, to multiple residents, businesses, or other customers of a single electric utility. Depending on state rules, both utilities and independent entities (such as private developers and community cooperatives) can own community solar projects and offer subscriptions or shares to customers. Community solar programs can provide renters, households without a sunny roof, and others who can't install rooftop solar panels an opportunity to access local clean energy.¹⁰

Limited Liability Company (LLC) - A business entity owned by one or more members, partners, or investors. LLCs can pass through profits, and the associated tax liability, to individual owners, and owners are not held personally responsible for business debts or decisions.

Cooperative (Co-op) - A business entity that is owned by the organization's users, workers, or producers. Cooperatives typically have elected Boards of Directors and can either retain profits to reinvest or distribute them to the co-op's members based on patronage. Some cooperatives receive tax advantages and exemptions.

Solar Lease - An arrangement where a company leases solar panels to an individual or organization for an agreed-upon monthly fee. This is a common approach for households and businesses that want to install rooftop solar panels but don't have access to capital for upfront costs, don't have sufficient financial risk tolerance, or otherwise can't own the system themselves.

Solar Power Purchase Agreement (PPA) - An arrangement where an individual or organization agrees to purchase the electricity produced by solar panels owned by another party at a certain, agreed-upon rate. This is also a common option for households and businesses that want to go solar but can't buy the panels outright or that are willing to accept lower returns in order to limit their potential financial risks.

Local Owners

Our first dimension of local clean energy ownership considers the nominal owners of a project. We can categorize clean energy owners broadly as local direct, local indirect, or non-local, all falling along the spectrum of local to non-local ownership.

Individual households, for example, can directly own the solar panels on their rooftop. Those individuals can also join together to create a cooperative, a limited liability company (LLC), or another

organizational structure to develop a shared clean energy project.¹¹ Projects developed by these entities are often on a larger scale, such as a community wind farm or solar garden.

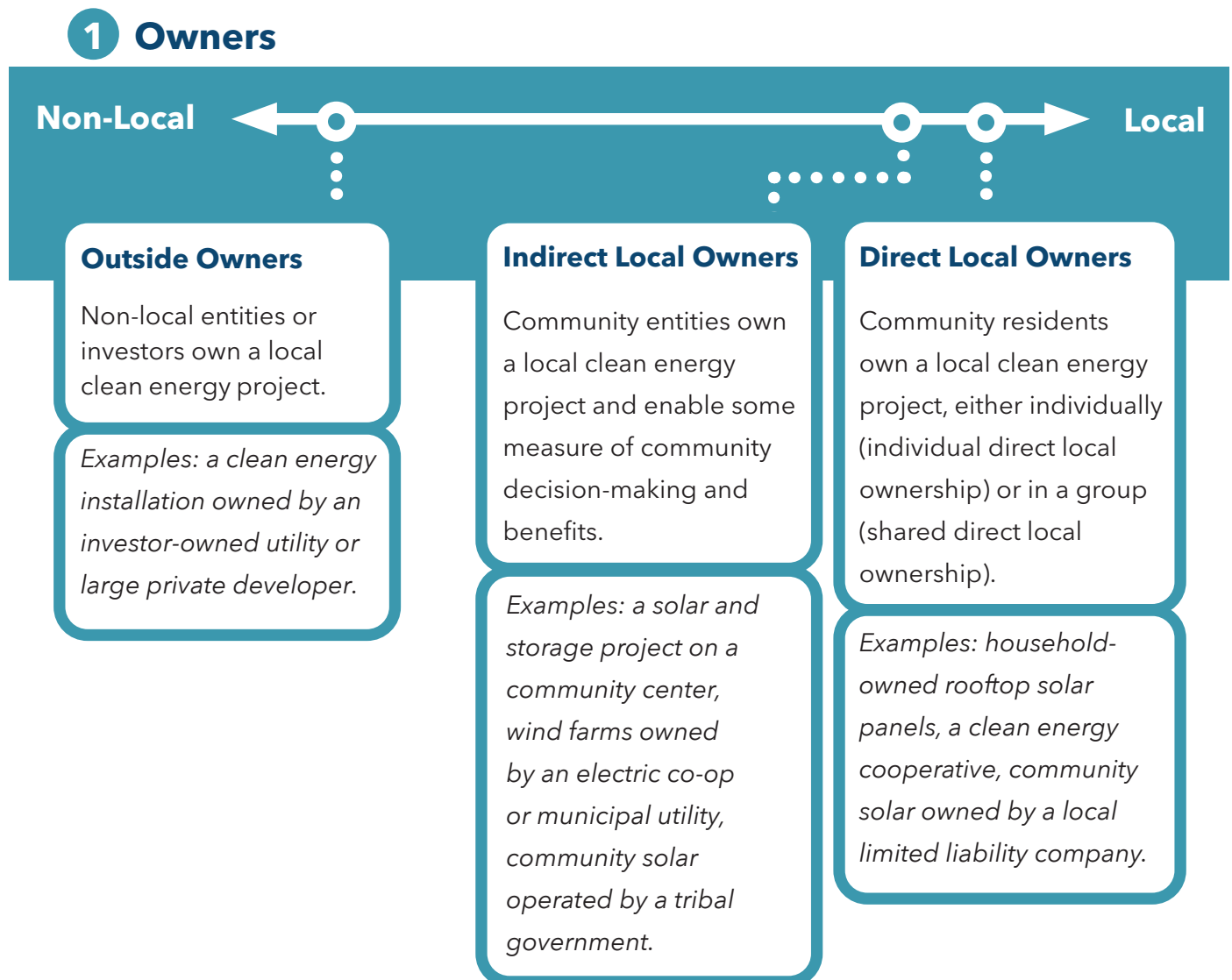
Outside of these examples of direct local energy ownership, other entities — including community nonprofits or trusts, rural electric cooperatives, community choice aggregators, and local and tribal governments — can also develop clean energy projects that allow for a level of indirect community

ownership. These entities answer to the people they serve, either explicitly in the case of governments and electric co-ops, or implicitly in the case of community-based organizations. Even if individuals don't technically own a solar farm built by a municipal electric utility, for instance, there can still be meaningful community governance and benefits if the utility enables customer participation in the decision-making process. Though this report primarily focuses on direct local ownership, many of the noted benefits also apply to indirect ownership models.

In contrast to direct and indirect local clean energy owners, non-local, absentee, or outside owners are external parties that are not accountable to or controlled by local community members. Outside owners can include investor-owned electric utilities, for-profit clean energy developers, and companies that offer solar leases or power purchase agreements. Non-local entities have a place in the clean energy landscape, but the fact that their projects are not locally owned limits the opportunity for community input and benefits.

Figure 2.

Three Key Dimensions of Local Clean Energy Ownership: Project Owners



The Sun Doesn't Set on Iñupiat Villages' Solar and Storage Project

Organization: Northwest Arctic Borough and the Native Villages of Shungnak and Kobuk

Project: Shungnak and Kobuk Independent Power Producer Solar Project

Location: Northwestern Alaska

Technology: 225 kilowatt solar array and 384 kilowatt-hour battery system.¹²



Solar on water treatment facility. Photo credit: U.S. DOE

Ownership Structure: Owned by the Native Villages of Shungnak and Kobuk (federally recognized tribes).

Financing: Included funding from the U.S. Department of Agriculture Rural Utilities Service High Energy Cost Grant Program and from a Village Improvement Fund supported by a payment in lieu of taxes agreement with a local zinc mine.¹³

Project Benefits: Household energy savings, local revenues and economic reinvestment, local jobs, resiliency, innovative community solutions.

How They Made Ownership Work: North of the Arctic Circle, the remote Iñupiat Villages of Shungnak and Kobuk used to rely on expensive, shipped- and flown-in diesel fuel for their energy needs. To cut down on costs, reduce harmful air pollution, and increase local resiliency, the Villages and the local government Northwest Arctic Borough built a solar and storage installation in 2021 in Shungnak, taking advantage of the region's long summer days. The community had already invested in solar panels for the water treatment facility to save on energy expenses. The Borough contracted with an Alaska-based, Native-owned general contractor for the project and prioritized local hiring.¹⁴ The Villages own the project and operate it as an Independent Power Producer, selling the energy generated to the Alaska Village Electric Cooperative. In 2022, the project saved the communities around \$125,000 to \$135,000, which can be invested in expanding the system and in cost-saving measures for households, like heat pumps.¹⁵ Building off the success of the Shungnak-Kobuk effort, Northwest Arctic Borough is working on another project in the village of Noatak and is planning to bring locally owned clean energy to other villages in the borough.¹⁶

In Their Own Words:

"The most important benefit is that solar energy reduces electricity bills, has low maintenance costs, (and) reduces reliance on diesel, which is a high cost and produces harmful emissions that affect the quality of air, water and soil."

- Lucy Nelson, Northwest Arctic Borough Former Mayor (via *Tribal Business News*)¹⁷

To complicate things, nominal project ownership can be split among different entities, perhaps with local residents owning a certain percentage of a project's shares and an outside investor holding the remainder. In addition, certain financing structures allow for majority ownership to shift from one entity to another during a project's lifetime. For instance, a local cooperative can make an agreement with an outside investor to "flip" ownership of a community solar project from the investor to the co-op after 10 years (in order for the investor to capture tax incentives).¹⁸ As another example, rooftop solar power purchase agreements often allow the homeowner to buy the system installed by an outside company on their roof after 25 years.¹⁹

Local Governance

The second dimension of local clean energy ownership asks how projects are governed and who makes the decisions.

At one end of the spectrum are projects where local residents or groups have full control and decision-making power over all project aspects, including siting, hiring, financing, and benefits distribution. On the other end are projects where outside entities call all of the shots with no opportunity for input from local community members (for example, a project owned by a large investor-owned utility or a national clean energy developer).

Beyond the extremes, a range of project governance models exist somewhere in the middle, with both local and non-local entities influencing the decision-making process. Outside entities that own and control a local clean energy project — such as an outside developer building a community solar installation — can engage community members and enable a degree of local input into project decisions. Community engagement can range from merely informing the local community about

a project to actively consulting local residents and groups in the design of the project to developing a Community Benefit Agreement.²⁰

Local Benefits

Our third and final dimension of local clean energy ownership tracks whether the economic and other benefits of clean energy projects stay in the local community or leave it. At one extreme are projects where the vast majority of benefits, including project revenues, new jobs, and the energy generation itself, accrue to people and groups outside of the community. At the other, these gains primarily benefit local residents and earnings recirculate in the local economy.

Most projects fall somewhere in the middle, with some benefits staying in the community, like new jobs, and other benefits leaving the local economy, like the profits shared with an outside investor.



Figure 3.

Three Key Dimensions of Local Clean Energy Ownership: Project Governance

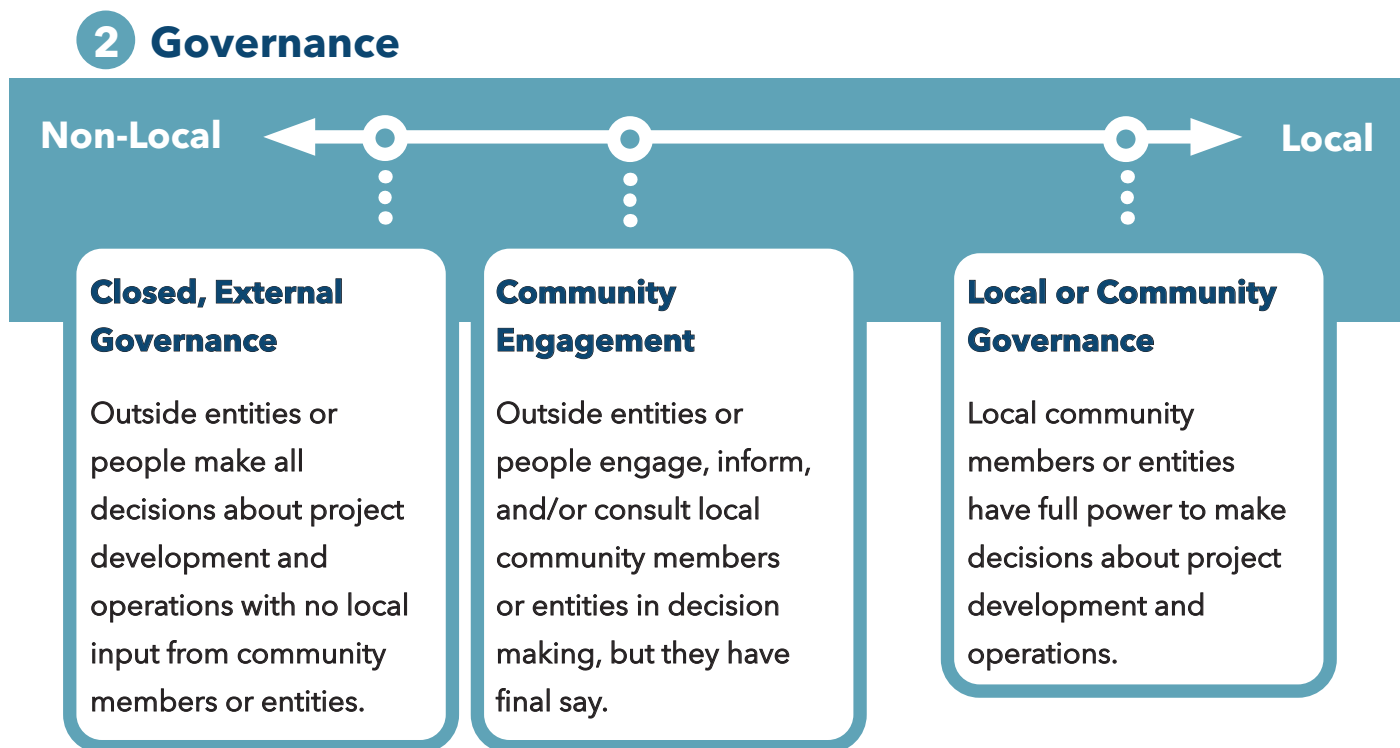
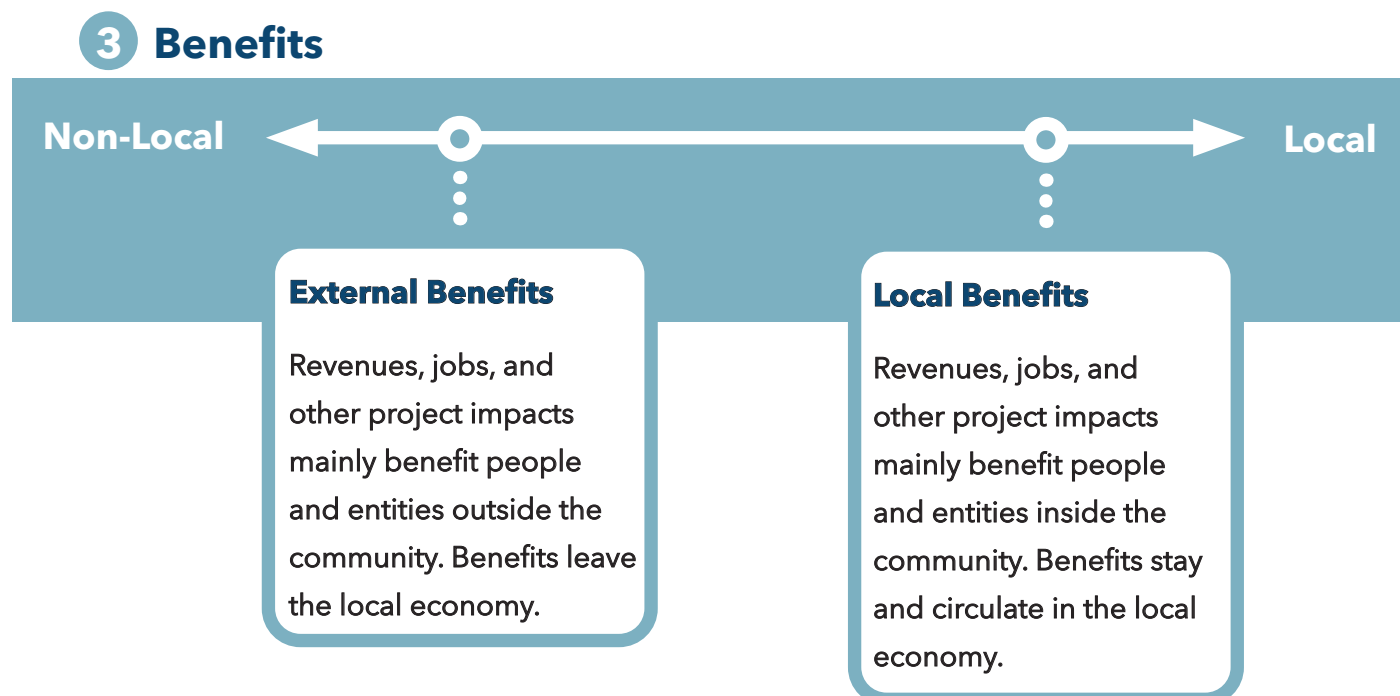


Figure 4.

Three Key Dimensions of Local Clean Energy Ownership: Project Benefits



How Small, Local Clean Energy Enables Ownership

Locally owned clean energy projects are often smaller in size and located closer to the people and communities they serve. One of the reasons for this is that, unlike electric utilities and other large businesses, individuals and community groups typically can't access the substantial capital necessary

to build, for instance, a sprawling solar farm. In addition to being easier to finance, small energy projects also lower other development hurdles for local owners, including grid capacity limitations and interconnection costs.²³ Another reason is that community-led clean energy efforts usually focus on creating local benefits and services, which they can often best achieve by building small- and medium-scale projects in their own neighborhoods.

Figure 5.

Comparing Large and Small Solar Development

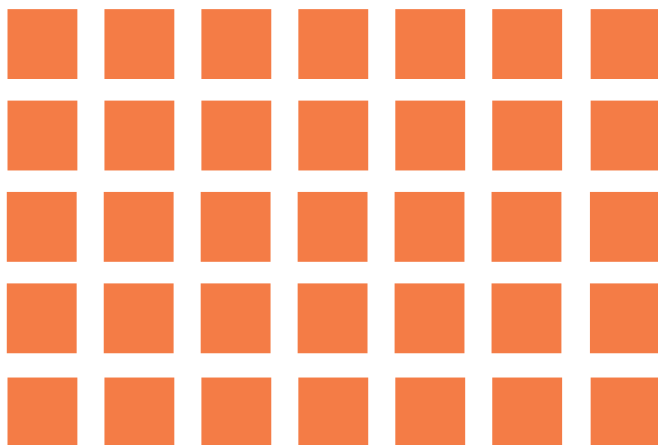
Webberville Solar Farm in Texas (35 MW)²¹



Shiloh Temple Community Solar Garden in Minnesota (204 kW)²²



Photo credit: Cooperative Energy Futures



= 1 megawatt

Small-scale, community-sited energy installations, like rooftop solar panels and shared solar gardens, can create certain benefits regardless of whether the project is locally owned. These benefits include energy cost savings and new job creation. Small clean energy projects connected to the local distribution grid also avoid the extra costs and energy losses associated with projects built at the transmission scale, far away from the end users of the energy, and they can even help make the grid more reliable.²⁴ Furthermore, local microgrids and energy storage projects can increase a community's resiliency, even if they're not locally owned.

But absentee-owned local clean energy projects, such as small wind farms owned by out-of-state investors or rooftop solar panels owned by electric utilities, fail

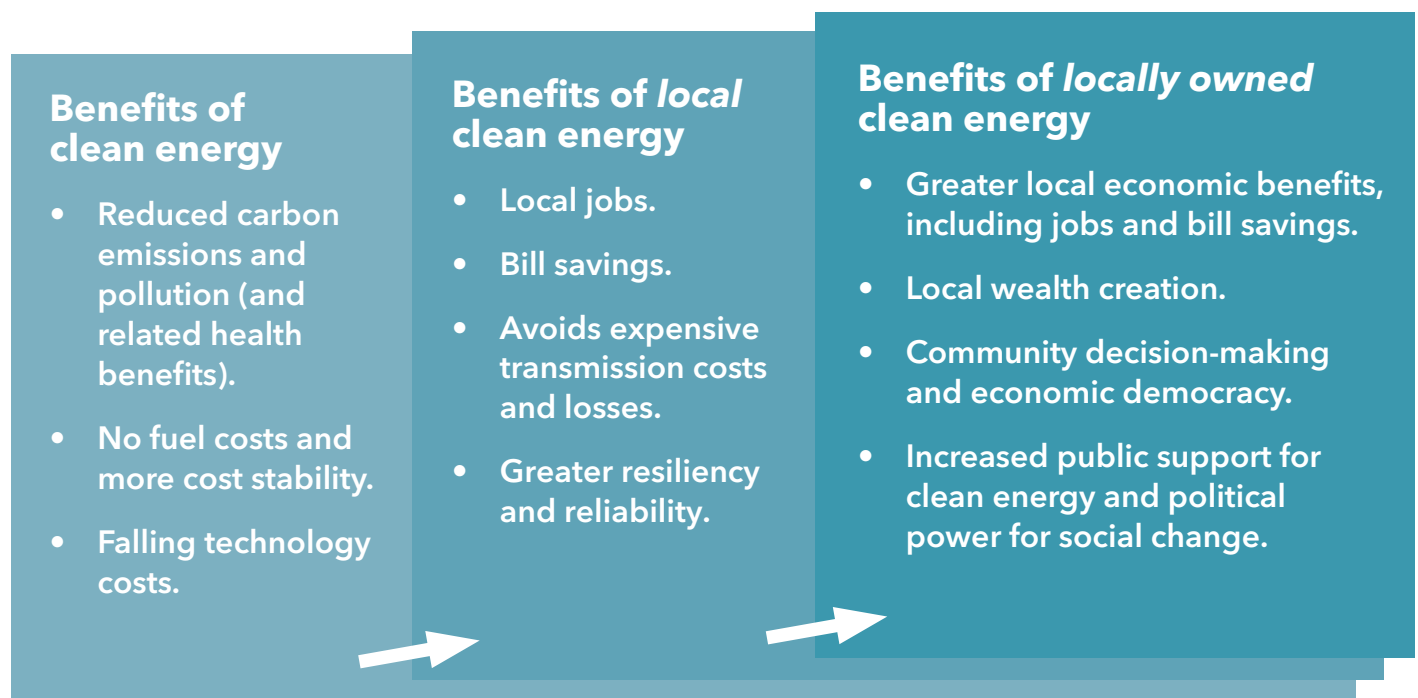
to maximize many of these benefits for residents and communities.²⁵ Plus, outside ownership of local clean energy keeps decision-making power in the grip of investor-owned utilities and distant corporations instead of putting it back in the hands of people.

Figure 6 illustrates the overlapping benefits of clean energy, local siting, and local ownership.

This report aims to separate, to the extent that it's possible, the topics of clean energy ownership and scale in order to identify the specific benefits of locally owned clean energy. See ILSR's report *Is Bigger Best in Renewable Energy?* for more on the value of small-scale and locally-sited clean energy, as opposed to local clean energy ownership in particular.²⁶

Figure 6.

Overlapping Benefits of Clean Energy, Local Siting, and Local Ownership





The Barriers to Ownership

Unequal Access and Outcomes

Systemic inequalities, policy shortcomings, and utility lobbying keep clean energy ownership out of reach for many Americans. This is especially true for low-income communities and communities of color that big energy monopolies have disproportionately excluded from the gains of clean energy and burdened with the pollution from dirty fossil fuels.

At the same time, many of these communities would benefit immensely from more local clean energy ownership. For instance, maximized electricity bill savings (as described in greater detail in the section “The Impacts of Ownership”) would be particularly impactful for households with high energy burdens, who spend higher proportions of their incomes on energy costs. The more money that families save on their electricity bills, the more they’re able to reinvest in education, healthcare, and other things to help them thrive, instead of sending their dollars to big electric utilities and polluting power plants. Reducing energy burdens through bill savings also helps families avoid harmful utility disconnections.²⁷ Research shows that Black, Latino, Native American, and low-income households, as well as older adults and renters, have disproportionately high energy burdens compared to the average household.²⁸

To illuminate these gaps in access to local clean energy ownership, we can look at existing disparities in rooftop and community solar adoption. These disparities emerge based on class, race, and homeownership status, among other factors.

Disparities in Rooftop Solar Access

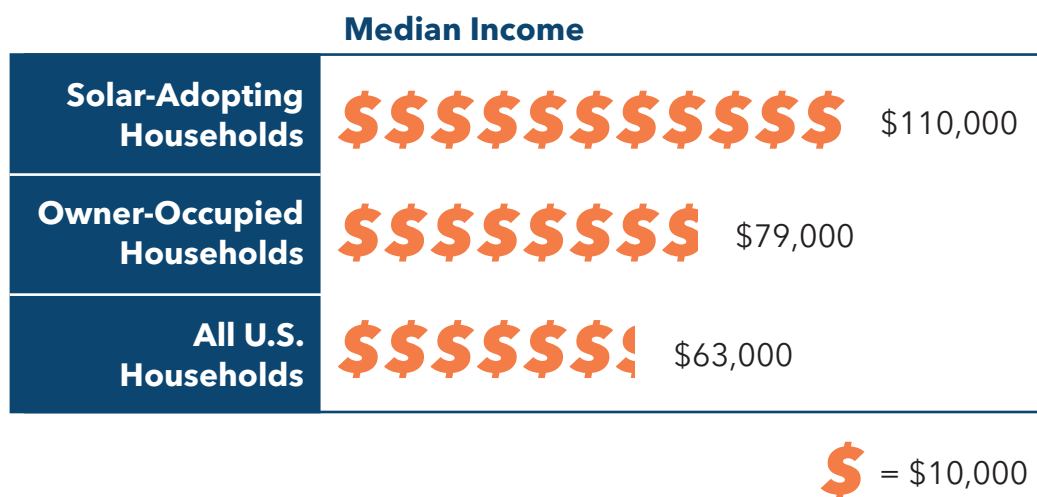
In the case of residential rooftop solar, Lawrence Berkeley National Laboratory has found that solar adopters (including households that own their solar panels as well as those with a solar lease or power purchase agreement) tend to have higher incomes than other households, even when compared only to owner-occupied households or to other households in the same census tract.²⁹ Nationally, solar adopters in 2021 had a median household income of \$110,000 — almost twice as high as the U.S. median household income of \$63,000 and still substantially higher than the median income of \$79,000 for U.S. households that own their home, as shown in Figure 7. Only 22 percent of solar adopters in 2021 had household incomes under 80 percent of Area Median Income (a common measure of low or low-to-moderate income), while just 43 percent had incomes under 120 percent of Area Median Income (a common measure of low-to-moderate and middle income). Yet, a 2018 study estimated that housing occupied by households under 120 percent of Area Median Income represented over half of the total rooftop

solar capacity potential on single family homes (both rented and owned) nationally.³⁰ Figure 8 illustrates this gap.

Solar adoption data suggest that third-party ownership options for rooftop solar, such as leases or power purchase agreements, may be more accessible for low-income households than self-ownership of rooftop solar. Though the median income of households with third-party-owned solar panels is still above the national median income, it's lower than the median income of those with self-owned systems, and research has found that third-party ownership options likely drive additional low-income rooftop solar adoption.³¹ However, as explained further in the section “The Impacts of Ownership,” typical third-party ownership models for rooftop solar, where outside companies develop and own the systems, do not maximize households’ financial returns, build wealth, or grant them decision-making authority. And at a community level, it does not create the same level of economic benefit or community power that locally owned rooftop solar does.

Figure 7.

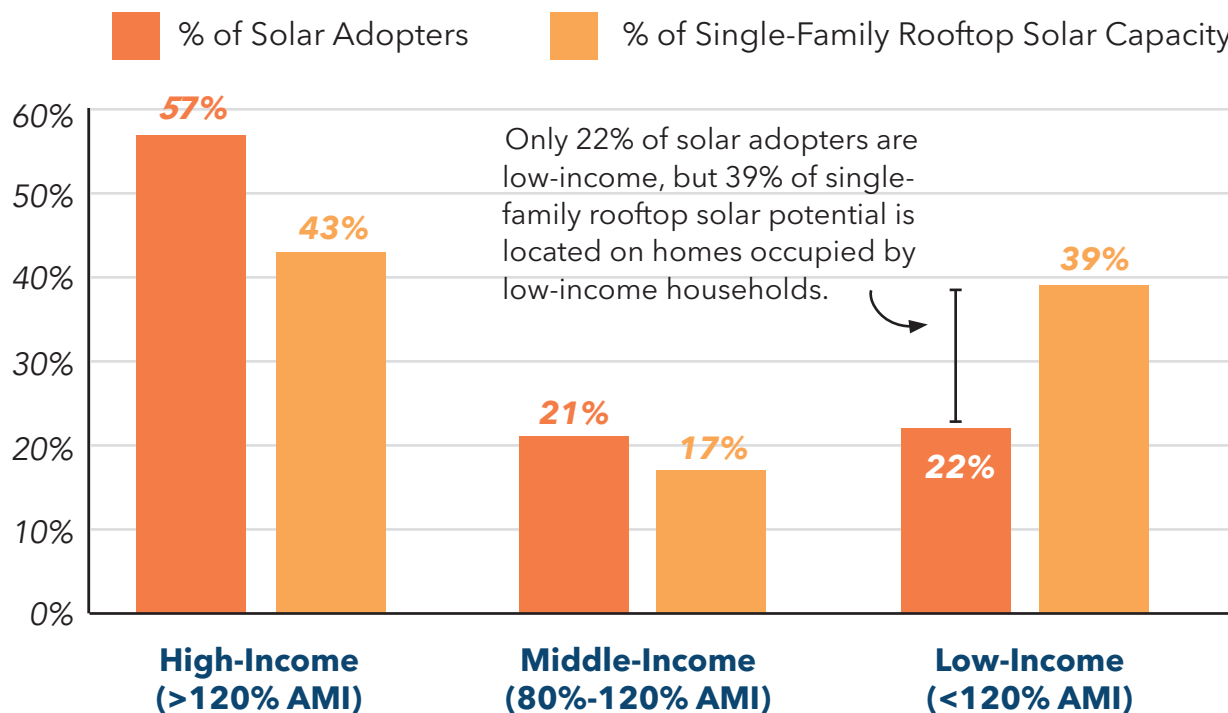
Solar Adopter Incomes Are High Compared to Other Households



Data from Lawrence Berkeley National Laboratory, Residential Solar-Adopter Income and Demographic Trends: November 2022 Update.

Figure 8.

Rooftop Solar Adoption Compared to Rooftop Solar Potential, by Income



Data from Lawrence Berkeley National Laboratory, *Residential Solar-Adopter Income and Demographic Trends: November 2022 Update*; National Renewable Energy Laboratory, *Rooftop Solar Technical Potential for Low-to-Moderate Income Households in the United States*.

In this way, the differences in household rooftop solar ownership versus third-party ownership by an outside entity can be compared to the differences between owning and renting a home. While both can give you access to certain advantages — well-funded schools, energy cost savings — only owners reap the full benefits.

Income isn't the only demographic feature associated with disparities in rooftop solar adoption. Lawrence Berkeley National Laboratory has also found that Black and Hispanic households are generally under-represented among solar adopters at the state level.³² While lower median incomes nationally for Black and Hispanic households could account for some of the differences in solar adoption, research has found that these racial disparities remain even when accounting for varying income levels. For

instance, a 2019 study found that census tracts with Black or Hispanic population majorities had on average 69 percent and 30 percent less rooftop solar deployment, respectively, when compared to census tracts with similar median household incomes but no racial majorities. White-majority tracts had on average 21 percent *more* deployment than the no-majority tracts.³³

Furthermore, Lawrence Berkeley National Laboratory's data show that only 11 percent of rooftop solar adopters live in "disadvantaged communities," as defined by the Department of Energy (based on criteria including energy, environmental, and socio-economic vulnerabilities), even though disadvantaged communities represent 18 percent of the population nationally.³⁴

Disparities in Community Solar Access

Data on access to community solar — though less robust and not specific to local ownership — suggest there may be similar disparities as with rooftop solar adoption. A 2018 survey found that fewer than half of community solar developers and program administrators reported serving *any* low- or moderate-income households at all, and only about one in 20 had more than 10 percent low- and moderate-income subscribers, as shown in Figure 9.³⁵

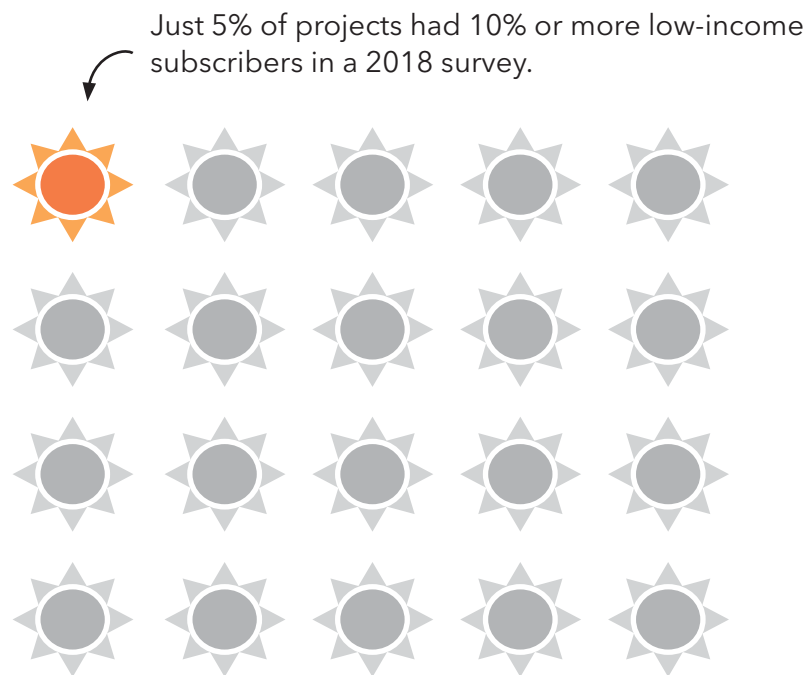
However, for households that rent and low-income households, community solar subscriptions are typically much more accessible than rooftop solar panels, and state community solar programs increasingly include substantial low-income participation requirements, such as in New Jersey's program.³⁶

Importantly, community ownership models for shared solar, such as community solar cooperatives, can increase accessibility for low-income households while still guaranteeing them the full benefits of ownership. This is because community-owned projects can access financing and capital for the initial costs without requiring individual participants to make upfront investments, similar to how a third-party owner offers a lease or power purchase agreement. If a household that owns its own solar panels is like a homeowner and a household with a solar lease is like a renter, then a member of a community solar cooperative is akin to a renter who owns their landlord alongside their neighbors — getting the perks of ownership with fewer of the barriers.³⁷

We discuss ways to enable more shared clean energy ownership in the section “Enabling Ownership for All.”

Figure 9.

Share of Community Solar Serving Low-Income Customers



Data from Smart Electric Power Alliance, *Community Solar Program Design Models*.

Cooperative Energy Futures Turns Local Investment Into Equitable Community Ownership

Organization: Cooperative Energy Futures (CEF)

Projects: Shiloh Temple Community Solar Garden and other community solar installations.

Location: Minnesota

Technology: Community solar/shared solar.

Ownership Structure: Membership cooperative.

Financing: In addition to loans and tax equity arrangements which make up the majority of project financing, CEF solicits investments from its cooperative members, who then have an opportunity to earn returns on those investments.



General Manager Timothy DenHerder-Thomas.
Photo credit: John Farrell

Project Benefits: Household energy savings and financial returns, membership equity, local jobs, political power.

How They Made Ownership Work: One of the many benefits of CEF's cooperative structure is that it's able to avoid some burdensome securities regulations by sourcing investment from its own member-owners. While designed to protect small investors, these regulatory requirements can be challenging for community organizations looking to raise local funds. Cooperative membership isn't limited to households that make these upfront investments — all who subscribe to CEF's community solar projects are members who share in project profits and have a say in the co-op's operations, making local clean energy ownership possible for more people. Equity is a priority for CEF. They have worked to make their community solar projects more accessible to low-income Minnesotans and to train and hire local workers, through projects like the Shiloh Temple Community Solar Garden, which is located on a church in a historically Black neighborhood in Minneapolis.

In Their Own Words:

"To the extent as a cooperative we can actually source our capital from our members . . . we see it as a huge opportunity to cut a lot more of the financial waste out of these projects and direct more of the benefits to the community."

-Timothy DenHerder-Thomas, CEF General Manager (via Local Energy Rules)³⁸

The Forces Blocking Local Ownership

Disparities in clean energy access and ownership aren't inevitable. They're the result of an energy system designed to privilege centralized control and top-down decision making, built upon a foundation of systemic injustices in the American economy.

Big utility monopolies work hard to uphold this system and block locally owned clean energy as a direct threat to their power and profits. Their lobbyists push back against new programs and policy changes that would enable more equitable access to local clean energy, and they press legislators and regulators to continue to prop up their outdated business models.

Making clean energy ownership possible for more people and communities is not just fair; it's essential to realize clean energy's full potential, counter utility monopoly power, and combat the climate crisis. This requires breaking down the structural barriers as well as the energy system-specific barriers to both individual and collective forms of local clean energy ownership.

Structural Barriers

Pervasive and intertwined structural disparities in housing, wealth, and financial services lay the groundwork for inequitable access to local clean energy ownership. Figure 10 illustrates these structural barriers as they impact access to rooftop solar ownership in particular, though some also apply to shared solar or other community clean energy projects.

For rooftop solar, homeownership is typically a prerequisite, as tenants are unlikely or unable to invest in modifications to a building they don't own,

and landlords usually lack incentives to invest in solar panels that reduce their tenants' energy costs. This dilemma, often referred to as the split-incentive problem, effectively shuts out most of the 44 million households who rent from the benefits of rooftop solar ownership, even though rented single- and multi-family homes make up roughly a third of all residential rooftop solar capacity potential in the United States.³⁹

Homeownership as a barrier to on-site clean energy ownership disproportionately affects communities of color, particularly Black households. A long history of government-sanctioned racist policies and practices — such as redlining, prejudicial lending, racial covenants, and other forms of housing and financial discrimination — helped entrench the racial disparities in homeownership that persist to this day.⁴⁰ In the third quarter of 2022, about 75 percent of white households owned their home, compared to only 45 percent of Black households.⁴¹ In fact, the homeownership gap between Black and white households is greater now than it was in 1960.⁴² Modern inequities in rooftop solar in part reflect these disparities in homeownership. (However, research has shown that racialized disparities in rooftop solar deployment remain when accounting for homeownership rates.)⁴³

Wealth inequality presents another systemic barrier to equitable rooftop solar ownership. Even if households own their home or otherwise have access to their roof, they may still struggle to pay for the upfront costs of installing solar, including any needed roof repairs. This can be particularly true for low-income communities and communities of color which have lower household wealth and savings, as shown in Figures 11 and 12.⁴⁴ Disparities in homeownership rates and home values are significant contributors to wealth gaps by income and race.⁴⁵

Low-income households and people of color who turn to banks to finance rooftop solar installations, instead of dipping into savings, experience similar systemic inequities in the financial sector. For instance, Black, Hispanic, and low-income households are more likely to be unbanked, to use high-cost check cashing services, to have low or no credit scores, and can encounter outright discrimination, limiting their access to loans and other financial services.⁴⁶ (Credit score requirements can even prevent households from signing up for community solar subscriptions.)⁴⁷ Minority-owned businesses

face difficulties accessing credit — to finance rooftop solar, among other uses — as well.⁴⁸

On a broader scale, limited access to capital, through either generational wealth or the financial sector, doesn't only impact a particular person's or household's ability to afford rooftop solar panels. These individual inequities combine to constrain whole communities' abilities to invest in neighborhood-scale clean energy projects, like shared solar installations.

Figure 10.

The Interlocking Structural Barriers to Rooftop Solar Ownership

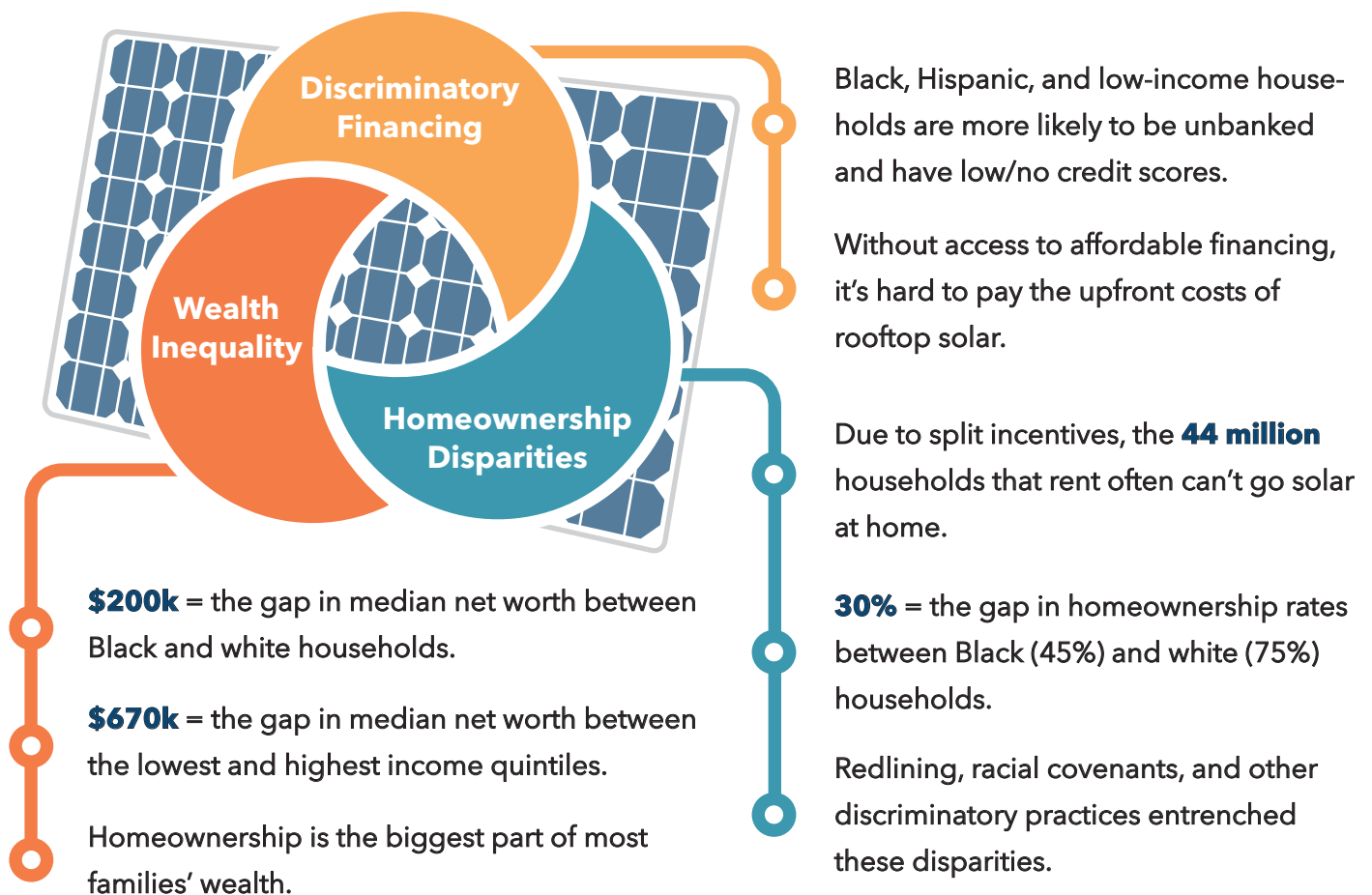
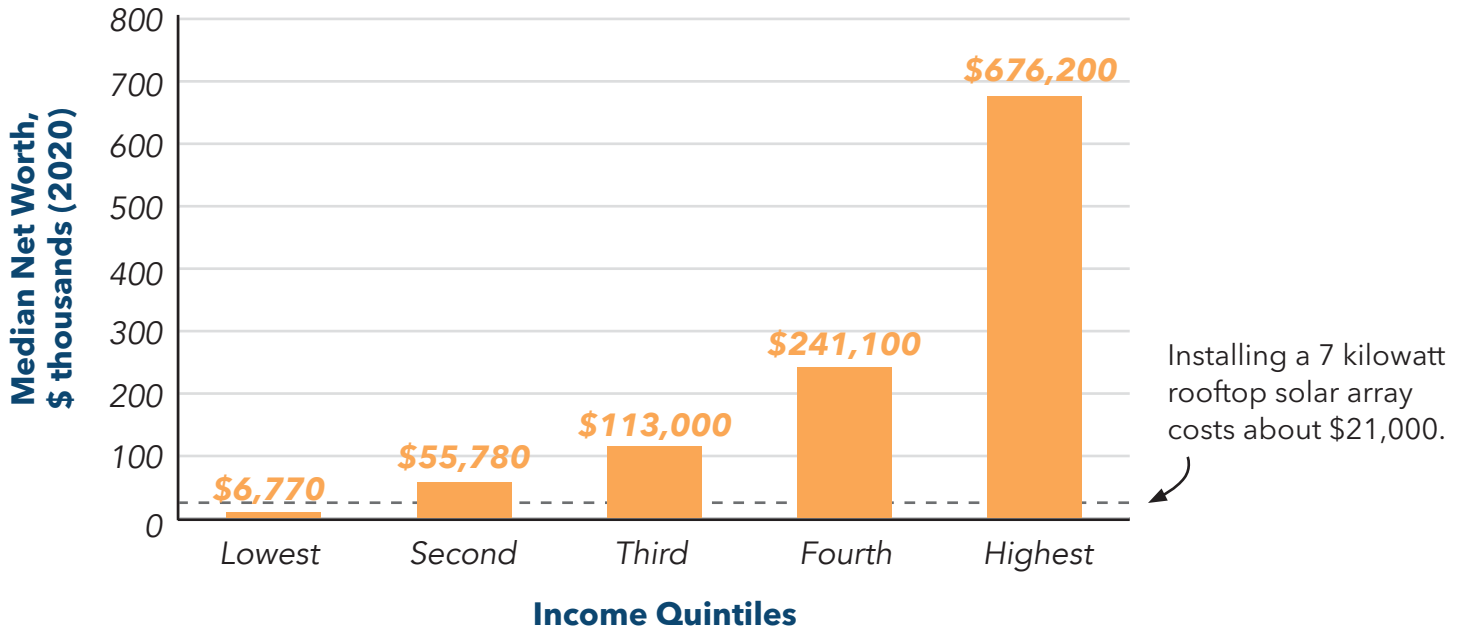


Figure 11.

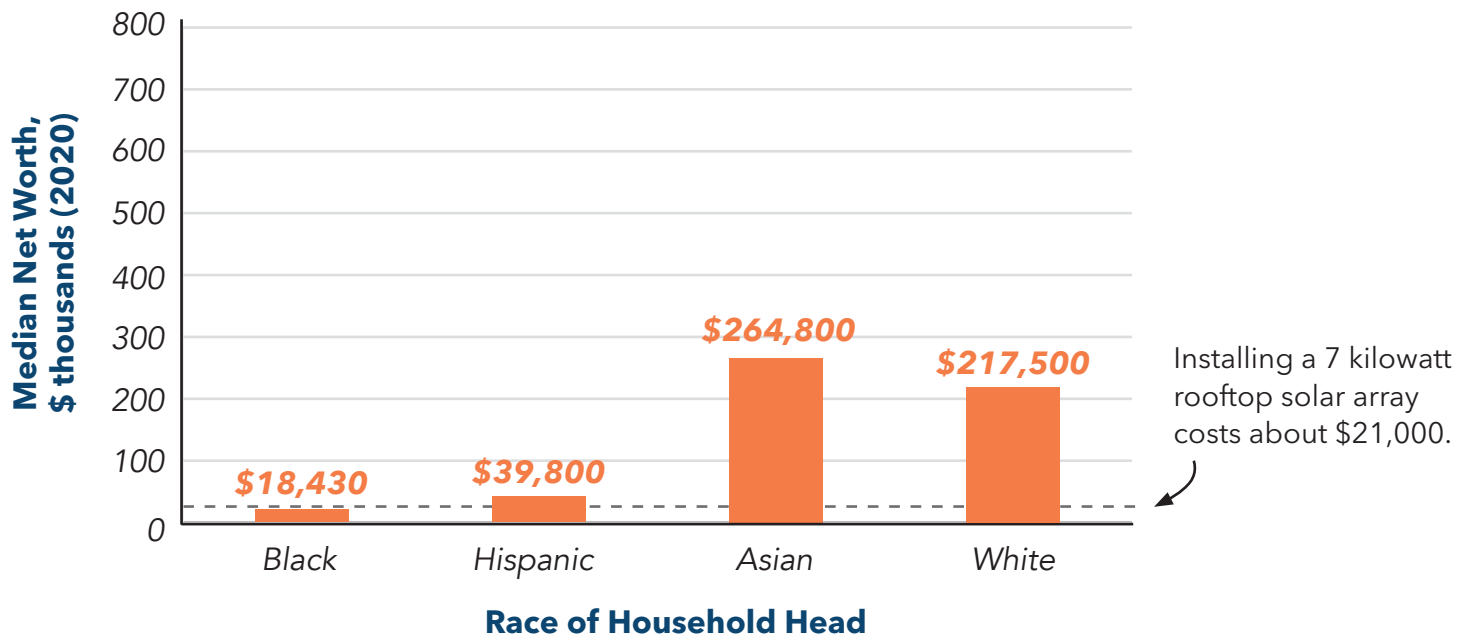
Disparities in Net Worth, by Income



Data from United States Census Bureau, Survey of Income and Program Participation, Survey Year 2021; Lawrence Berkeley National Laboratory, Tracking the Sun Tool.

Figure 12.

Disparities in Net Worth, by Race



Data from United States Census Bureau, Survey of Income and Program Participation, Survey Year 2021; Lawrence Berkeley National Laboratory, Tracking the Sun Tool.

Energy System Barriers

On top of these underlying structural disparities, there are barriers to local clean energy ownership specific to the energy system.

In today's energy system, large corporate utilities that prioritize profits over people generally get to decide which projects are built, who owns them, and to whom the benefits (or burdens) accrue. This model of centralized control views households, small businesses, and community organizations solely as users of energy and not as producers. As a result, the legal and regulatory structures that policymakers have developed over decades often privilege outside ownership of energy resources over local ownership.

Before individuals and communities can even consider building their own clean energy projects, states and utilities must first implement policies that allow these projects to connect to the electric grid and sell power. This includes policies that guarantee sufficient compensation for energy generation, such as net metering requirements for rooftop solar, as well as policies that enable shared clean energy projects, such as community solar programs and virtual net energy metering. Currently, fewer than half of all states have shared renewables rules in place.⁴⁹ Monopoly utilities commonly target these policies, especially net metering, with well-funded (and at times, blatantly misleading) lobbying efforts meant to prevent competition from locally owned clean energy.⁵⁰ These utility attacks can particularly impact low-income households and people of color by keeping increasingly affordable clean energy from taking root in their communities. Without these legislative and regulatory supports in place, it can be unprofitable or even impossible for households and communities to become local clean energy owners.

If state enabling policies already exist, hopeful project owners must then figure out how to pay for the

upfront costs of clean energy. Unlike investor-owned utilities, which can spread the costs of energy projects across all ratepayers and earn guaranteed returns, local owners must independently finance these start-up costs. While all non-utility projects must contend with this to some extent, high upfront expenses are especially challenging for individual households, community cooperatives and other local project owners, who typically have less access to capital than outside investors and may face additional costs for necessary work like roof repairs. This is particularly true for low-income communities and communities of color, as a result of the structural barriers noted above. Even with financing available, higher interest rates and other costs eat into the economic benefits of clean energy projects for local owners.⁵¹

One of the many challenges that locally owned clean energy projects, specifically community-scale projects, face in accessing capital is the difficulty of complying with federal and state securities regulations. These regulations are intended to protect small investors, but they can be an expensive and complex barrier for community-based clean energy projects that are seeking investments from local residents. (However, locally owned clean energy projects operating only within one state are able to avoid some of the more burdensome federal securities regulations.)⁵²

Existing federal incentives don't do enough to help with these initial costs and make clean energy ownership accessible to all households and communities. Notably, clean energy tax credits — one of the federal government's main policy approaches to growing clean energy — fail to adequately address the upfront costs of clean energy ownership and barriers to capital. For one, the tax credits are only issued after taxpayers install the solar panels or other clean energy technology in the form of reductions in taxes owed; they aren't available for

Olympia Community Solar Finds a Creative Solution to Policy Shortcomings

Organization: Olympia Community Solar

Projects: Hummingbird Community Solar and other community solar installations.

Location: Olympia, Washington

Technology: Community solar/shared solar.

Ownership Structure: Olympia Solar, a 501(c)3 nonprofit, owns the project.

Financing: Included solar “units” sold to community members (allowing them to claim the Residential Clean Energy Tax Credit) and grants.

Project Benefits: Household energy savings, local revenues and economic reinvestment, innovative community solutions, political power.



The Hands On Children's Museum. Photo credit: Jason Taellius (CC BY-SA 2.0)

How They Made Ownership Work: Unlike states such as Minnesota or Colorado, Washington doesn't currently have a community solar program that enables non-utility developers to deploy projects and provide subscribers with bill credits through virtual net metering. Without that framework, Olympia Community Solar had to get creative when designing their first project, Hummingbird Community Solar, a 117 kilowatt installation on a local children's museum. The nonprofit offered \$300 solar “units” to community members, who could subscribe for themselves or for a local nonprofit, and will make payments to the unit-holders from the revenues that the system generates.⁵³ Olympia Community Solar has since developed further community solar projects, including on a farmers market, a middle school, and an affordable housing development.⁵⁴ Additionally, the group has organized a rooftop solar purchasing group, provided education on community solar, and advocated for low-income-accessible community solar policy.

In Their Own Words:

“Each solar unit represents about half of one of the solar panels, and then community members could purchase a solar unit for themselves, in which case they are basically subscribing to get the energy benefits of that half of a solar panel for about 20 years, or they could donate a unit to a local nonprofit. We had 14 nonprofits sign up to be participants, and they actually received a lot of donations.”

- Mason Rolph, Olympia Community Solar President (via Local Energy Rules)⁵⁵

initial project expenditures. Plus, they only cover a portion of expenses (currently 30 percent of project costs for households and between 6 and 70 percent for commercial projects), leaving households, small businesses, and community groups to cover the remainder.⁵⁶

For households, the applicable federal tax credit, the Residential Clean Energy Credit, is not refundable to the taxpayer, so those that owe little or no federal taxes are unable to benefit fully from the credit if they invest in self-owned clean energy technologies like solar panels.⁵⁷ The nonprofit organization RMI has found that as many as seven in ten households would be unable to take the full value of the credit in the first year after installing solar panels.⁵⁸

The design differences between the residential and commercial tax credits can further discourage local ownership of residential rooftop solar — individual households aren't eligible for the larger tax incentives that the recent Inflation Reduction Act made available to commercial projects that meet certain requirements, like locating in a low-income community. While a business could potentially get a tax credit worth up to 70 percent of project costs for installing solar panels on a family's home and offering them a lease or power purchase agreement for the energy, the family would only be eligible for a credit worth 30 percent of project costs if they purchased or financed the panels themselves.⁵⁹

Community-scale projects, such as locally owned community solar and wind farms, have also historically faced difficulties accessing the federal Investment and Production Tax Credits for commercial clean energy projects because of the owners' low tax liability or tax-exempt status. Many community-owned projects must partner with tax equity financiers to capture the full value of the clean energy tax credit (plus accelerated depreciation).

Typically in these “partnership flip” arrangements, the tax equity partner maintains a majority share of legal ownership for a period of years before ownership “flips” back to the local project developer, often at the loss of some of the credit value and local ownership share — though the local developer can maintain certain decision-making abilities throughout.⁶⁰ (Thanks to the Inflation Reduction Act, new alternatives are on the horizon. The section “Enabling Ownership for All” explains more.)

For both household and community projects, an inability to access federal clean energy tax credits can make it nearly impossible for local ownership to pencil out, pushing people to instead turn to third-party ownership, even if it dilutes the local benefits.

Lastly, in many cases there isn't enough institutional and organizational support (such as trainings, technical assistance, and other resources) available for individuals and groups interested in local clean energy ownership models, especially community ownership models. Governments and nonprofits that provide educational resources for community groups deploying clean energy projects, like community solar projects, don't always include robust information on local ownership options, if any. While initiatives like the Department of Energy's National Community Solar Partnership play an essential role in expanding access to community solar across the country, their main focus isn't on local clean energy ownership. Locally owned clean energy projects often require specific technical advice, financial guidance, and legal help that either isn't widely available or isn't tailored to their specific needs. Without this institutional capacity-building support, many communities can find the process of attempting local clean energy projects too difficult or disempowering, and successful projects may be limited to communities that already have substantial knowledge and resources.⁶¹

Maine Electric Co-op Flips the Switch on a Local Wind Farm

Organization: Fox Islands Electric Cooperative (FIEC)

Project: Fox Islands Wind

Location: Coastal Maine

Technology: 4.5 megawatt wind farm (3 turbines).

Ownership Structure: Owned by a nonprofit subsidiary of the local electric cooperative.

Financing: Included tax equity financing using a partnership flip model and a loan from the U.S. Department of Agriculture's Rural Utilities Service.



Fox Islands Electric Cooperative Wind Farm on Vinalhaven Island.

Project Benefits: Household energy savings, local revenues, resiliency.

How They Made Ownership Work: FIEC serves less than 2,000 member-owners on two islands in Southern Maine. In 2006, cooperative members voted (383-5) to build a local wind farm, to help lower and stabilize the islands' high energy costs. To take advantage of federal tax credits for wind energy (which FIEC itself wasn't eligible for), the co-op formed a for-profit subsidiary and also partnered with a tax equity investor, an international media company headquartered in Maine. The organizations used a partnership flip model, where the tax equity partner provided an upfront capital investment and in return received the value of the federal tax credit and 99 percent ownership interest for the five years following project construction in 2009. FIEC bought out the tax equity investor in 2014 and converted its subsidiary to a nonprofit. The wind farm continues to reduce the amount of wholesale energy that the co-op must buy from the mainland, but changes in Maine's energy market and wholesale costs have lowered the project's financial savings. However, the wind farm promises stability and resiliency to the island communities, and FIEC is considering adding energy storage to boost the project's impact.⁶²

In Their Own Words:

"Energy decisions should be made locally, allowing customers to decide how to invest their dollars. They're the ones taking the financial risk from a rate perspective, and they're the ones that will experience the beneficial or negative consequences of such risk."

- Amy Watson, FIEC CEO (via National Rural Electric Cooperative Association)⁶³



The Impacts of Ownership

Benefits to Individuals

Households can benefit in a number of ways from clean energy ownership, whether it's through rooftop solar panels, a community solar share, or another local clean energy source. Ownership maximizes the financial benefits of renewable energy, helping families save more money on their electricity bills, reap project returns, and build greater wealth.

Bill Savings

Many families make the decision to invest in local clean energy based solely on their pocketbooks. Because of plummeting prices for renewable energy technologies (and the absence of fuel costs), households that put solar panels on their home or subscribe to a community solar project are typically able to slash their electricity bills and save money in the long run, even after accounting for any upfront installation costs or subscription fees.⁶⁴

A household that directly owns its rooftop solar panels, for instance, maximizes these bill savings over the life of the project. When compared to leasing the solar panels or signing up for a power purchase agreement, our calculations show that it can make a difference of as much as \$12,000. This is because more of the value of the energy produced by the project flows back to the household in the form of electric bill credits, instead of padding the bottom line of an outside project owner.

Consider a homeowner who wants to put a 7 kilowatt solar installation on their roof. In our analysis, if the homeowner finances and owns the solar panels themselves,

they could earn an estimated cumulative return of about \$20,000, through savings on their electric bill.⁶⁵ If instead the homeowner signed up for a power purchase agreement with a solar company for the same rooftop system, they could avoid having to finance the upfront costs but would only reap about \$7,500 in total net returns. Figure 13 shows the cumulative cash flows over 30 years for the hypothetical homeowner in each of these scenarios.⁶⁶

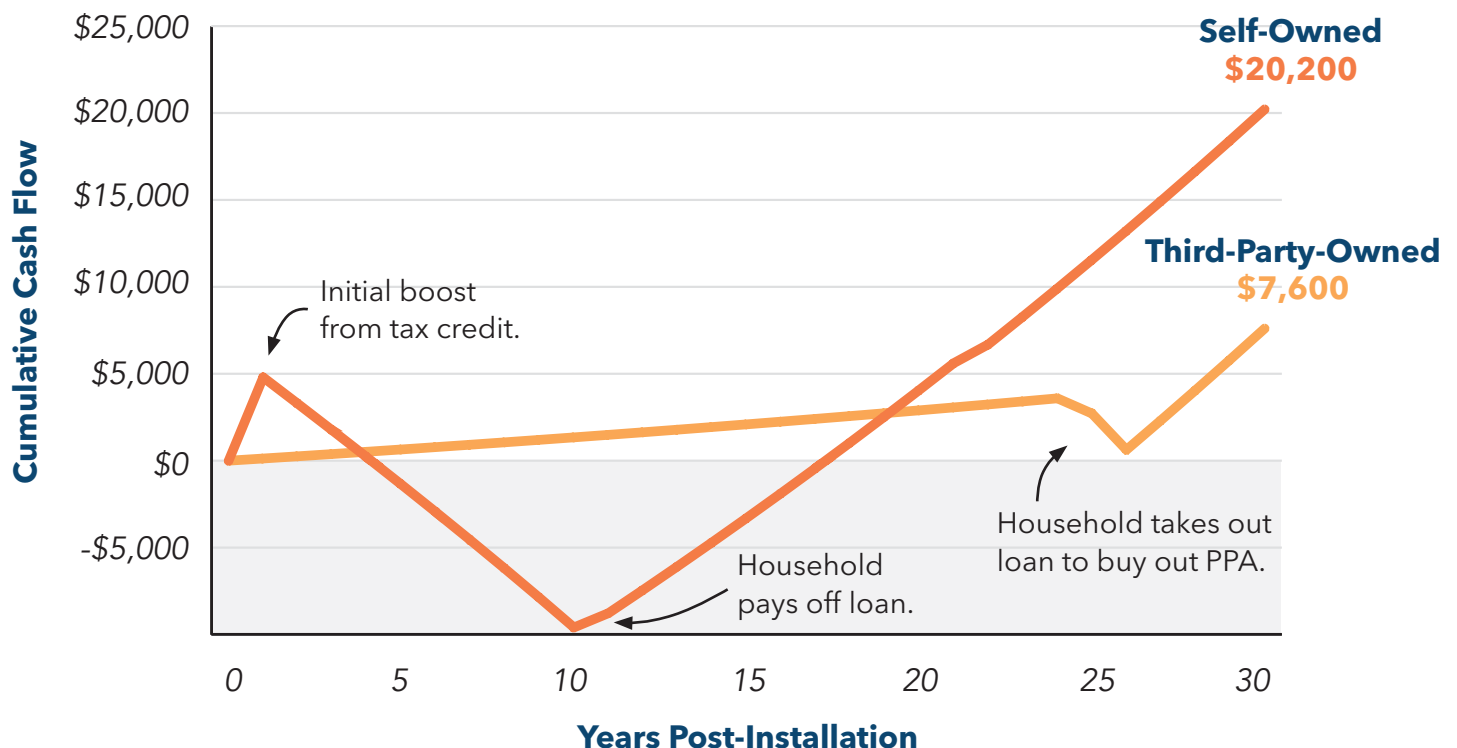
Likewise, our calculations of the net present value for the household for the two project options suggest that owning the solar panels directly would still be a better financial decision for the homeowner, even after accounting for the time value of the initial project costs. However, this advantage is relatively small in our analysis. This is because we assume the homeowner must take out an initial loan to pay for

the rooftop solar panels, so more financial benefits accrue in later project years, when the household has paid off the loan but is still receiving bill credits. (The section “The Barriers to Ownership” further discusses this challenge of upfront costs.) See Figure 14 for a comparison of the net present value that both project types offer to the homeowner in our example.⁶⁷

As with rooftop solar, locally owned community solar projects also have the opportunity to increase household energy cost savings by allocating a greater portion of electricity production revenues to subscriber bill credits as opposed to returns for investors. In instances where the owners are also subscribers, such as a member-owned community solar cooperative, local project owners are especially incentivized to maximize subscribers’ electricity bill credits.

Figure 13.

Household Earnings from Rooftop Solar, Self-Owned vs. Third-Party-Owned



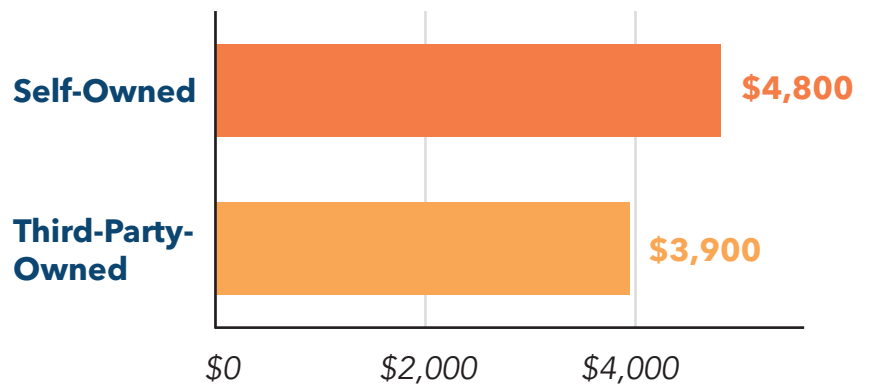
See Appendix for detailed information on the assumptions for this analysis.

Key Definitions

Net Present Value - This is a method of measuring the expected profits of a project or investment by calculating the difference between project costs and the current, or “present,” value of anticipated project earnings. Under the assumption that a certain amount of money today is worth more than that same amount of money in the future (i.e., the time value of money), anticipated earnings are discounted using a chosen interest rate or rate of return. Net present value is often used to compare different investment options.

Figure 14.

Net Present Value of Rooftop Solar for Household, Self-Owned vs. Third-Party-Owned



See Appendix for detailed information on the assumptions for this analysis.

Profit Sharing

In addition to electricity bill savings, local clean energy project owners can reap other financial returns, namely the profits that would have accrued to outside investors if projects were not locally owned.

This benefit of local ownership is easily seen when comparing individual household returns from a locally owned community solar cooperative to the value of a third-party community solar subscription. Our analysis shows that in the case of a 1.3 megawatt community solar garden owned by a local cooperative using a partnership flip model, a household that is a member-owner of the co-op and subscribes to a 7 kilowatt share would earn a cumulative return of about \$19,000 over 30 years, in the form of electricity bill credits and profit sharing, with no upfront investment required. In comparison, a household that simply subscribes to a similar third-party-owned community solar project would reap less than a total of \$5,000 over the life of the project from bill credits alone and

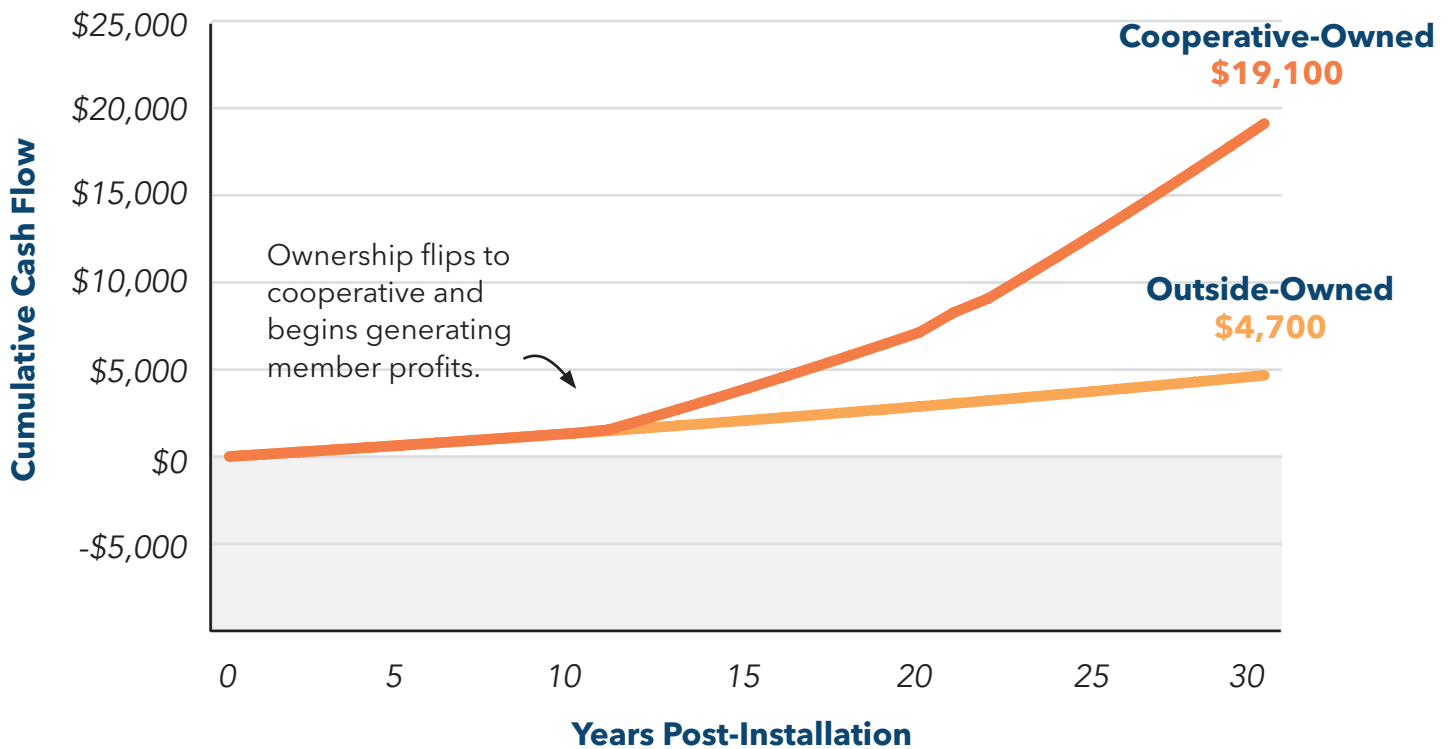
would have no opportunity to share in profits. Figure 15 shows the cumulative cash flows over 30 years for these scenarios.⁶⁸

Similarly, the net present values for the hypothetical household of the two community solar project models show that the financial benefits of local ownership are significantly greater than those of third-party ownership, even after discounting future returns. Figure 16 shows this comparison.⁶⁹

Like solar, local ownership of wind energy also maximizes revenues for local project owners. A 2004 analysis from the U.S. Government Accountability Office found that landowners who own wind turbines directly instead of leasing their land for wind energy development to outside investors could potentially double or triple their earnings per turbine.⁷⁰ (However, limited access to up-front financing and other barriers can restrict the number of turbines that landowners are able to install without working with third-party owners, and thus could limit landowners' total earnings.)

Figure 15

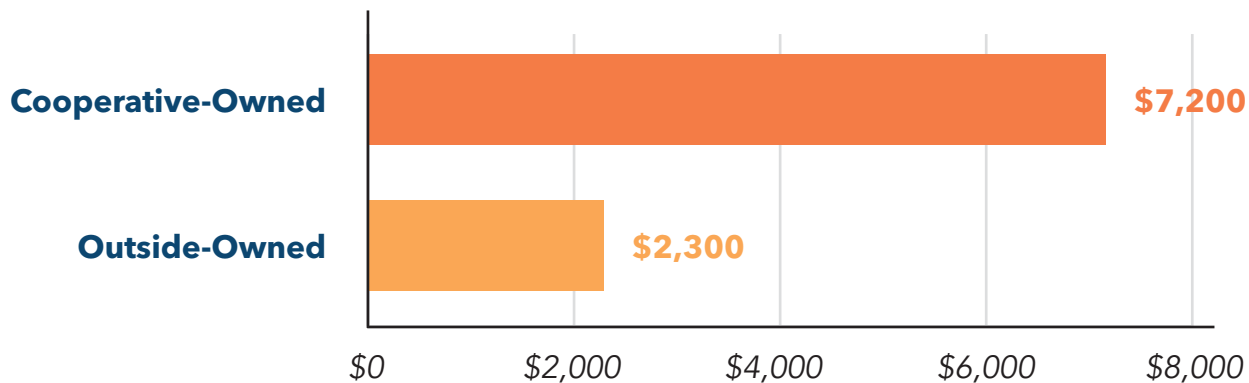
Household Earnings from Community Solar Share, Cooperative-Owned vs. Outside-Owned



See Appendix for detailed information on the assumptions for this analysis.

Figure 16.

Net Present Value of Community Solar Share for Household, Cooperative-Owned vs. Outside-Owned



See Appendix for detailed information on the assumptions for this analysis.



Wealth Creation

Beyond immediate project revenues and savings on energy costs, clean energy ownership is also a wealth-building opportunity for households.

For instance, installing rooftop solar panels can increase a home's value, which is the largest — or *only* — component of many home-owning families' wealth, especially low- and moderate-income and low- and moderate-wealth households.⁷¹ In 2015, Lawrence Berkeley National Laboratory estimated that home buyers were willing to pay roughly a \$4 per watt premium on average for houses with resident-owned rooftop solar (which was roughly equivalent to the net cost of rooftop solar panels at the time) translating to an increase in home value of about \$28,000 for a seven kilowatt system.⁷² The median value of owner-occupied homes in 2015 was \$194,500, so that would have represented a 14

percent increase in value for the median home.⁷³ The research did not analyze price premiums for houses with leased rooftop solar panels, but they would likely have less of an impact on home sale values since they would offer lower revenues compared to a resident-owned system and would not grant immediate ownership to the future resident. Plus, anecdotal evidence suggests that sellers can face difficulties attracting buyers for homes with leased solar panels.⁷⁴

As with rooftop solar, member-owners of a locally owned solar project, such as a community solar cooperative, have a chance to grow their wealth too. Unlike subscribers to a third-party-owned community solar garden, cooperative members can build equity (part ownership) in the business through their energy purchases, in addition to reaping the electricity bill savings and profits associated with their share of the solar project.

Making the Decision

Households consider a number of different factors when deciding to become clean energy owners. These factors can vary based on whether ownership is individual (e.g., home rooftop solar) or shared (e.g., cooperative solar gardens).

One of these considerations is the financial impact of clean energy ownership. In instances where a household is buying an asset (like solar panels) or making an upfront investment (such as in a local wind farm), they will weigh the financial benefits of ownership against the possible costs and risks, just as they might with a car, home, or any other large purchasing or investing decision.

For households that individually purchase a clean energy system, issues with unexpected maintenance costs or predatory loans could impact their budget and overall energy savings. As an example, some poorly designed residential PACE (property assessed clean energy) programs without sufficient consumer protections have even put some participants at risk of losing their homes after missing payments.⁷⁵ And as with home mortgages, lenders may be more likely to offer loans with poorer terms or decline to lend to equally qualified borrowers of color.⁷⁶

Individual clean energy ownership, however, can help households avoid other possible financial risks. For example, rooftop solar leasing companies can take advantage of information asymmetry to steer households into long-term agreements that benefit the business more than their customer, and some have used aggressive tactics to make sales.⁷⁷ Plus, when households own their own solar panels or other clean energy technology, they still have an asset they could potentially sell if they are faced with budget shortfalls.



Shared ownership of clean energy projects, like a community solar cooperative, can offer households even greater protection against financial risks while providing the same benefits as individual clean energy ownership. Cooperative members can share in the project's profits without necessarily investing money upfront or exposing themselves to personal liability for project costs.

In addition, many households value the non-financial benefits of clean energy ownership — such as helping the environment or being part of something bigger than oneself — and will consider those alongside the monetary factors.

Solar United Neighbors Pools Panel Purchases for Local Power

Organization: Solar United Neighbors (SUN)

Projects: Solar Bulk Purchasing Groups

Location: National

Technology: Residential rooftop solar panels.

Ownership Structure: Individual households either directly own their panels or choose a solar lease or power purchase agreement (PPA).

Financing: Group purchasing reduces upfront installation costs; households can pay the remaining costs out of pocket, take out a loan, or instead opt for a solar lease or PPA, where allowed. Households that opt for direct ownership can also take the 30 percent Residential Clean Energy Credit.



Photo credit: John Farrell

Project Benefits: Household energy savings, political power.

How They Made Ownership Work: As of 2022, SUN has helped more than 7,500 families go solar by pooling the purchasing power of many households in a community to get a discount on installation costs.⁷⁸ Participants receive a lower cost solar installation plus the expertise and guidance of SUN along the way, which helps reduce the cost and knowledge barriers to local ownership. Since its first solar group purchase in the Mount Pleasant neighborhood of Washington, D.C., SUN has leveraged the engagement of its members to successfully advocate for pro-solar policies that have helped bring clean energy to a broader range of communities. SUN has also worked with the District of Columbia on its Solar for All program, which provides no-cost solar systems to low-income households.⁷⁹

In Their Own Words:

“While rooftop solar has broad appeal, the challenge for many in making the dream a reality is knowing where to start. That’s where our solar co-ops come into play: we provide installer-neutral know-how, so folks can feel confident that they’re getting a good deal and the right system for their home or business.”

-Bobby King, SUN Minnesota Program Director (via *Cook County News Herald*)⁸⁰

Benefits to Communities

Local clean energy ownership also has a positive impact on the broader community beyond the individual clean energy owners. It maximizes local economic benefits and jobs, enables innovative solutions to community needs, builds public support for clean energy, and strengthens communities' political power.

Economic Reinvestment

Local ownership multiplies the beneficial impacts of clean energy on the local economy, through direct, indirect, and induced economic effects.

One of the ways that clean energy owners can boost economic impacts is by choosing local small businesses for financing, installation, and other necessary services, resulting in direct benefits in the local economy. By then hiring and buying from other local companies, these businesses can create additional indirect economic impact. Researchers and advocates have repeatedly found that independent

businesses create more local economic activity than national chains, both in direct as well as indirect and induced effects.⁸¹ However, the impacts of choosing local inputs may be limited by availability of the labor, capital, and services necessary for clean energy projects.

Local ownership also maximizes the direct returns (bill savings and shared profits) that households receive from a clean energy project, as described in the previous section, "Benefits to Individuals." When households spend these increased earnings at local businesses like grocery stores and mechanics, the dollars stay and recirculate in the local economy instead of leaving to line the pockets of outside investors, leading to even greater induced economic impacts.

Furthermore, collectively owned clean energy projects, such as through a cooperative, municipal utility, or community organization, have the opportunity to intentionally reinvest project revenues into other local economic development efforts.

Key Definitions

Direct Economic Effects - These are the local economic impacts caused when an entity pays for goods or services or pays its employees, e.g., when a community solar cooperative hires a local solar installation company or pays its own staff members. This can also describe direct job effects.

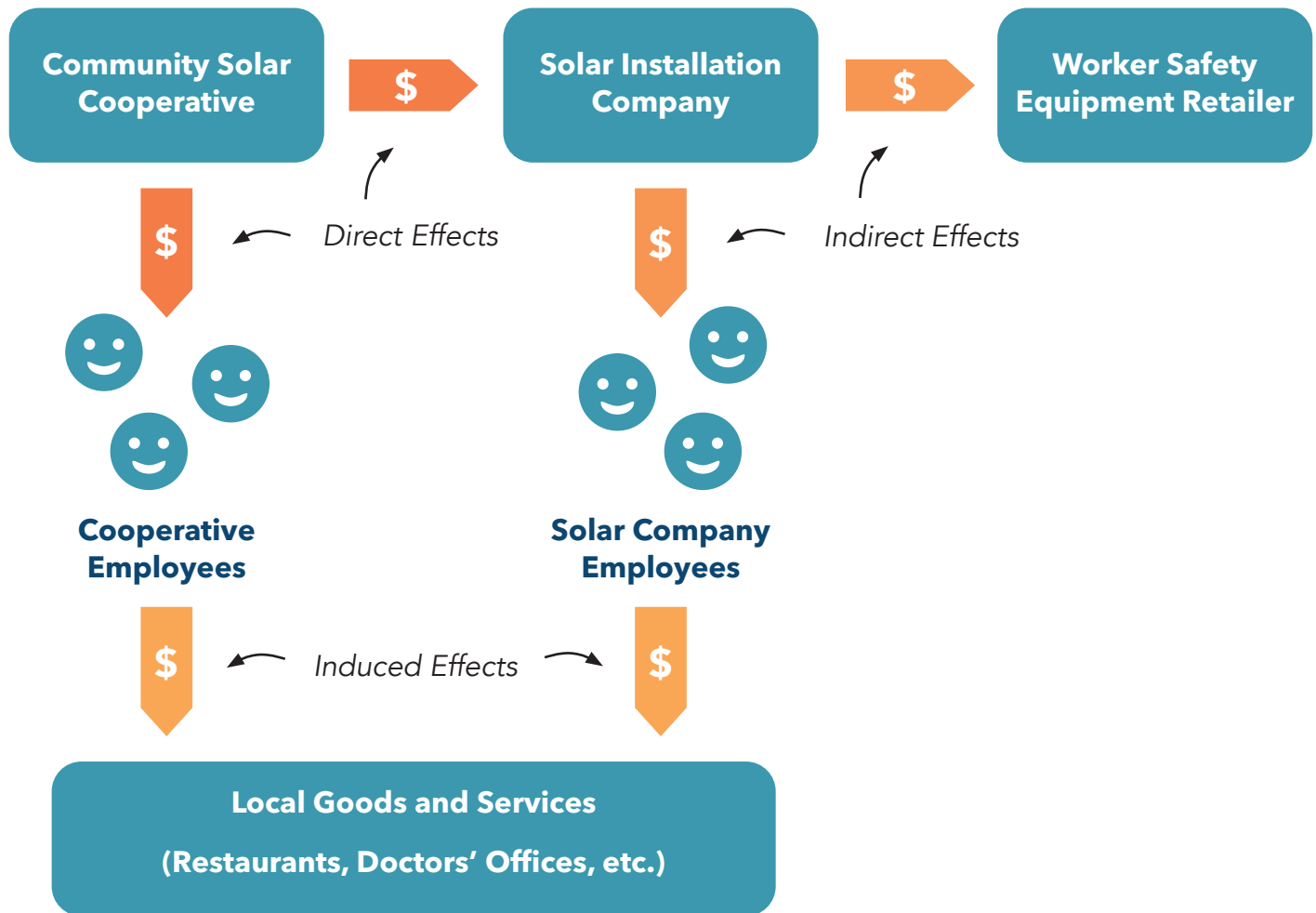
Indirect Economic Effects - These are the local economic impacts caused when that entity's suppliers pay for goods and services or pay their employees, e.g., when the solar installation company pays its workers or purchases safety equipment from a local retailer. This can also describe indirect job effects.

Induced Economic Effects - These are the local economic impacts caused when the employees of an entity and its suppliers then purchase goods and services, e.g., when the workers at the community solar cooperative or the solar installation company spend their earnings at local restaurants, stores, and other locations. This can also describe induced job effects.

See Figure 17 for an example illustration of direct, indirect, and induced economic impacts.

Figure 17.

Example Direct, Indirect, and Induced Local Economic Impacts of a Community Solar Cooperative



To illustrate these broader local economic impacts, we can consider again the example of a homeowner who either purchases their own 7 kilowatt rooftop solar project or signs a power purchase agreement with an outside company. The previous section, "Benefits to Individuals," outlined the net present value provided to the household under each model. We can expand this analysis to include the net present value offered to other local and non-local entities — namely the lenders and outside owner in this example — to represent some of the other direct economic effects. We estimate that the self-

owned solar panels would directly provide more than \$12,000 in net present value to the local economy over the life of the installation. On the other hand, solar panels installed through a power purchase agreement would offer less than \$4,000 in net present value to the local economy, since the solar company keeps some value for itself and solicits financial services from a non-local lender. Figure 18 compares the amounts of net present value provided to selected local and non-local entities in each project example. (Note that this analysis is illustrative and only captures a portion of the direct economic

effects. It does not include the net present value offered to labor including solar installers, as it's difficult to generalize the share of local vs. non-local labor, or to other providers of goods and services.)⁸²

Larger locally owned clean energy projects benefit the local economy as well. Our analysis shows that a 1.3 megawatt community solar project owned by a local cooperative using a partnership flip model could provide almost \$1.6 million in net present value to select local entities, including the cooperative's member-owners, a local lender, the relevant landowner, and the local government (via payments in lieu of taxes). Meanwhile, an outside-owned 1.3 megawatt community solar project would only offer about \$550,000 in net present value to those local entities, through land lease payments, payments in lieu of taxes, and customer subscriptions. Figure 19 shows the net present value provided to local and non-local entities for each type of community solar project. (Again, this analysis is illustrative, and it does not capture all direct economic effects or any indirect or induced economic effects.)⁸³

To compare the economic impacts across all of the different ownership models for rooftop and community solar, we can look at the amount of net present value *per watt* that each model offers to select local and non-local entities. This again highlights the increased community benefits of local ownership. Figure 20 breaks down the shares of net present value for the rooftop and community solar example projects as shown in Figures 18 and 19 into shares of net present value per watt for each model.

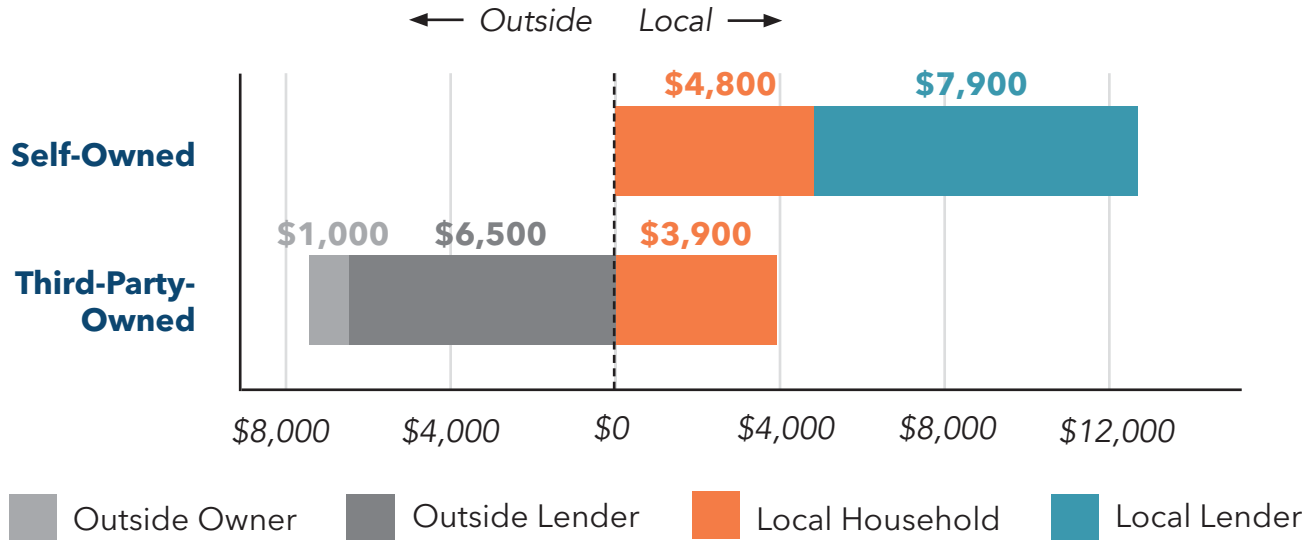
To put these comparisons into perspective, the United States installed about 6.9 gigawatts of non-utility-scale solar — i.e., residential, commercial, and community solar — in 2021.⁸⁴ If all of that small solar capacity had been locally owned, we estimate that it could have directly created about \$11 billion in net present value for the communities hosting the solar projects, through the local entities included in our analysis. Alternatively, if that capacity was all owned by outside entities, we estimate that it would have only offered a little over \$3.5 billion in direct net present value for local communities. Figure 21 shows this comparison.⁸⁵

Photo credit: PSNH (CC BY-ND 2.0)



Figure 18.

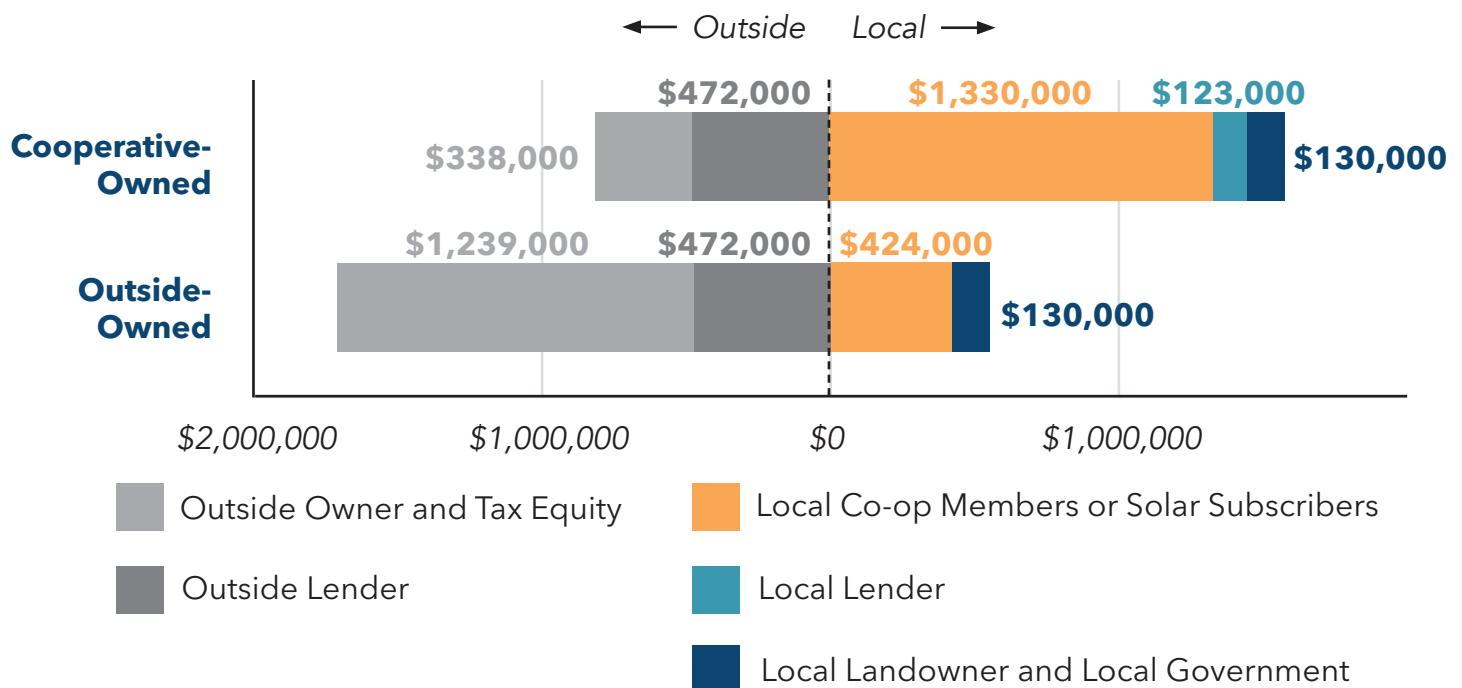
Net Present Value of Rooftop Solar for Local and Outside Entities, Self-Owned vs. Third-Party-Owned



See Appendix for detailed information on the assumptions for this analysis.

Figure 19.

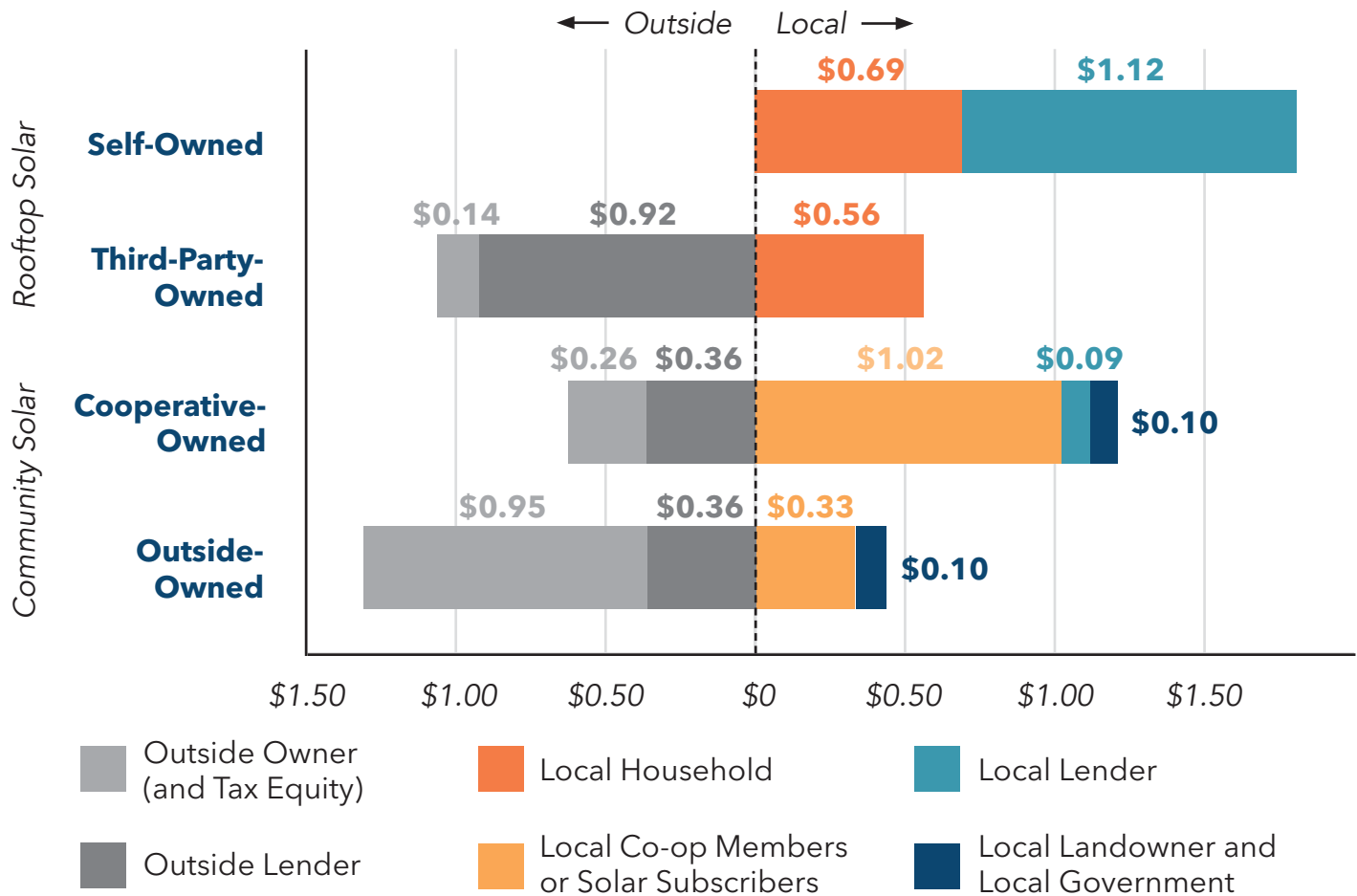
Net Present Value of Community Solar for Local and Outside Entities, Cooperative-Owned vs. Outside-Owned



See Appendix for detailed information on the assumptions for this analysis.

Figure 20.

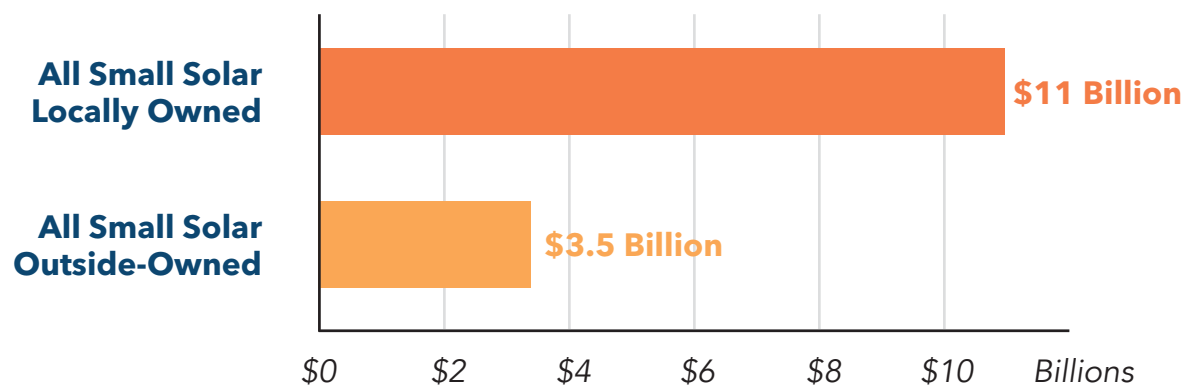
Net Present Value per Watt of Rooftop and Community Solar Ownership Models



See Appendix for detailed information on the assumptions for this analysis.

Figure 21.

Hypothetical Net Present Value for Local Communities of Small Solar Installed in 2021, Under Different Ownership Models



See Appendix for detailed information on the assumptions for this analysis.

Local Jobs

Compared to absentee ownership, local clean energy ownership can create more jobs locally. This includes direct positions involved in the construction and maintenance of clean energy projects as well as direct and indirect roles in project development, supplies and retail, legal services, accounting, and financing to support clean energy projects. It also includes induced jobs at a wide range of local businesses, such as restaurants, bookstores, and doctors' offices.

An analysis of community wind projects in Massachusetts, Minnesota, and Texas by the National Renewable Energy Laboratory in 2009 found that local ownership was associated with greater local employment impact (including direct, indirect, and induced jobs) than absentee ownership.⁸⁶ The study concluded that the studied locally owned wind farms created 1.1 to 1.3 times more jobs per megawatt than hypothetical absentee-owned wind farms during the projects' construction phases and 1.1 to 2.8 times more jobs per megawatt during the operations phases, in line with findings from prior studies. The paper authors also compared the impacts of these locally owned wind projects to the impacts of the first 1,000 megawatts of wind power installed in Colorado and Iowa (instead of hypothetical absentee-owned projects). The community wind farms resulted in 2.3 to 3.1 times more jobs per megawatt during the construction phase and 1.5 to 1.8 times more jobs per megawatt during the operations phase than was measured in Colorado and Iowa. The report authors determined that greater local ownership was associated with increased local economic impact (as was the use of local labor and materials, to a lesser extent) and that policies that promote local ownership could increase community economic impacts, such as local employment.

One reason why locally owned clean energy projects can create more local jobs than absentee-owned projects is because local owners may be more likely to employ local workers and businesses, whether because of their existing relationships or their goals for community development. Local clean energy ownership also gives communities the opportunity to prioritize hiring from underrepresented groups, like people of color, women, and veterans.

Photo credit: Kristelle Batucal/U.S. DOE



Community Solutions

Importantly, local ownership empowers the development of creative, community-based solutions that can meet diverse local needs and broaden the impacts of clean energy projects. Some locally owned clean energy efforts may decide to prioritize local hiring, job training, and/or materials sourcing in an effort to support a just transition.⁸⁷ Others may focus on increasing accessibility for low-income families and other underserved communities. Yet others may

work to combine clean energy projects with resiliency hubs, to help provide essential services to their neighbors in emergencies and affordable energy to community institutions in normal times.

Shared models of local ownership in particular enable a larger swath of community members to take part in and benefit from clean energy projects. With a community solar cooperative or another collective energy effort, renters, working class homeowners, and even unhoused people can have a say in our clean energy future.

Local ownership can also boost the quality and success rates of clean energy projects. This is because community residents often have a better understanding of the local context — like community preferences for project siting and what the community's unique assets and greatest needs are — than outsiders.

Furthermore, successful clean energy efforts put communities in the position to better tackle other neighborhood projects and to more effectively advocate for themselves in the long run.⁸⁸ Like exercising a muscle, local energy initiatives help build the ability of a community to cooperate and solve difficult problems. A 2017 review of research into the impacts of community renewable energy found evidence that community energy projects can help develop local competency in a variety of topic areas (particularly for leaders and other active participants) and that some community organizations have built off prior success with additional efforts.⁸⁹

Public Support

On a national scale, local ownership of clean energy is essential to help cut through public opposition to project development and build political support to rapidly address the climate crisis.

Local ownership can help stem the restrictive laws and public backlash that have plagued some clean energy projects, especially large-scale solar and wind installations.⁹⁰ A relatively robust collection of research on locally owned wind energy (including studies from Canada, Germany, Poland, and the United Kingdom) has found that area residents often favor local and/or community ownership and that it is associated with more positive attitudes toward clean energy development.⁹¹

For instance, a 2022 study that presented large agricultural landowners in Alberta, Canada, with hypothetical wind energy projects found that survey respondents viewed a potential wind farm owned by their municipality or a local cooperative as more acceptable than one owned by a private utility company.⁹²

Even partial community ownership has benefits. In Germany, a comparative case study from 2011 surveyed residents of two towns — Zschadrass, home to a wind turbine co-owned by a community foundation, a local club, and a nearby company; and Nossen, home to wind turbines owned largely by outside investors and operated by a large, international corporation based in the state capital — and found that the residents of Zschadrass had generally more favorable attitudes toward wind energy, both in general and in the specific context of their local community.⁹³ Nearly two thirds of study participants in Zschadrass had a positive opinion of the local wind project, compared to only a quarter of the participants in Nossen. Plus, 45 percent of the participating residents in Zschadrass had a positive attitude toward future local wind development, compared to just 16 percent in Nossen. Though the researchers only surveyed community members after project construction, they argued that the towns' similar characteristics and the high proportions of respondents in both who indicated concern for the

Washington Nonprofit Harnesses the Wind for Community Programs

Organization: Coastal Community Action Program (CCAP)

Project: Coastal Energy Project

Location: Western Washington State

Technology: 6 megawatt wind farm (4 turbines).

Ownership Structure: Owned by a local community action agency, a nonprofit which receives state and federal funds to provide community services like weatherization.



Coastal Energy Project wind turbines.

Financing: Included a state grant, a commercial loan, government tax incentives (New Markets Tax Credits and Investment Tax Credits), tax credit investors, and equity investment by CCAP.

Project Benefits: Local revenues, economic reinvestment.

How They Made Ownership Work: Originally, CCAP explored deploying small wind turbines at the homes of low-income families in the region to reduce energy costs before landing on their final plan for a larger wind installation, which completed construction in 2010. CCAP worked with two community development entities and tax credit investors to access government tax incentives, and the project financing benefited from a provision in the American Recovery and Reinvestment Act that allowed entities to receive a grant in lieu of certain clean energy tax credits for a short period. The project uses an inverted lease structure for the tax equity investors, where CCAP leases to the tax equity investors, passing through the tax credits, and will retain ownership at the end of the lease period. CCAP sells the energy that the turbines generate to its local electric utility, using the earnings (estimated to be around \$450,000 annually in 2011) as an unrestricted source of funds for its housing, energy assistance, health, and other programs that serve the local community.⁹⁴

In Their Own Words:

“CCAP is all about helping people. We see it as a social service project that just happens to use renewable energy.”

- Craig Dublanko, CCAP CFO, now CEO (via Strategic Development Solutions)⁹⁵

environment provide evidence that community co-ownership influenced the opinions of Zschadrass residents.

Some of the reasons why local ownership may boost community acceptance and support for clean energy include the larger economic impacts and the increased tangibility of projects' local benefits, as well as greater trust in fellow community members rather than outside entities. Low-income communities and communities of color in particular may distrust the energy industry because of past (and ongoing) harms and exclusionary practices.⁹⁶

Moreover, local ownership can bolster community perceptions of a fair development process — another important factor in public acceptance of clean energy projects, like wind energy farms.⁹⁷ In the 2011 comparative study of the two German towns mentioned above, researchers found that 53 percent of participating residents in Zschadrass, where the community co-owned a local wind turbine, agreed that the planning process was transparent, compared to only 9 percent in Nossen, where mostly non-local residents owned the wind turbines.⁹⁸ (However, local ownership alone doesn't guarantee public perceptions of fairness or process involvement.)⁹⁹

Political Power

Beyond reducing community opposition to clean energy development, widespread local ownership can help create a broad-based political constituency of clean energy owners and practitioners. As direct beneficiaries, owners have greater incentives to lobby their elected representatives for pro-clean energy laws and have potentially more clout with lawmakers, creating positive feedback loops that can strengthen policy supports. Research suggests that broad, dispersed ownership of renewable energy has helped clean energy policies endure in places like Germany.

This is especially true when there's the involvement of organized, collective entities like cooperatives, community groups, or municipal governments, which are easier to mobilize for political ends.¹⁰⁰

Local ownership can also help build a more democratic energy system, as well as a cleaner one. One way is through indirect community ownership of clean energy projects via local governments and rural electric cooperatives, which enable a degree of public governance. Other forms of local ownership, including different types of membership cooperatives, also allow for democratic decision making. In some cases, empowered clean energy owners and organized community members may push to further democratize their energy systems, such as through a municipal takeover of their local investor-owned electric utility. Or they may work to advance social and political change in other areas.

This community-level political power is essential to confront challenges to local clean energy from utility monopolies threatened by the transition away from centralized fossil fuels — including deceptive practices like fake “citizen” groups and manipulative charitable donations.¹⁰¹ More democratic control of energy systems and an expanded base of local clean energy proponents are key to defeating these efforts to subvert the political process.

There is an ever-narrowing window of opportunity to avoid the most catastrophic climate outcomes.¹⁰² At the same time, growing economic inequality is threatening the financial futures of many families.¹⁰³ Local clean energy ownership is a key part of building the political will necessary to take bold, equitable climate action and to bring the economic benefits of clean energy to communities of all incomes, colors, and zip codes.

People Power Solar Co-op Makes Rooftop Solar a Community Effort

Organization: People Power Solar Cooperative

Project: Cooperatively owned solar panels installed on single family homes.

Location: Oakland, California

Technology: 7 kilowatt residential rooftop community solar project.

Ownership Structure: Multi-stakeholder membership cooperative.

Financing: Community members purchased \$100 shares (up to 10 shares each).¹⁰⁴



People Power's first project. Photo credit: People Power Solar Cooperative with photography by Survival Media Agency

Project Benefits: Household energy savings, local revenues, innovative community solutions.

How They Made Ownership Work: While California does technically have a community solar program, the complex rules have made it difficult to create successful projects. Instead, People Power Solar Cooperative takes advantage of cooperative law to pool funds from community members to collectively own rooftop solar installations, including a 7 kilowatt system on a home in Oakland. The project receives net metering credits, which allows People Power Solar Co-op to establish a Site Host Agreement (similar to a power purchase agreement) and provide returns to its share-buying members. Notably, unlike other cooperative-owned solar projects and community solar gardens in the country, the project is much smaller in scale and installed on residential duplex, not on a larger multifamily or commercial building or in a field.¹⁰⁵ This scale allows everyday people to organize shared solar projects that provide financial returns and are visible assets in the community. Furthermore, the solar cooperative effort has enabled People Power members to explore other innovative, community-scale solutions to provide climate resilience, including a mutual-aid battery network that allows members to share power during shutoffs and outages.¹⁰⁶

In Their Own Words:

"One of the gaps we saw was not just there was these policy barriers, but there was really a barrier for folks to get involved in something to really feel like they were empowered and able to be agents of change in the future that they wanted to see."

- Subin DeVar, Initiative for Energy Justice Executive Director and People Power Solar Cooperative Co-Founder (via Local Energy Rules)¹⁰⁷



Enabling Ownership for All

Breaking Barriers

In some instances — as highlighted in the case studies throughout the report — people have found creative ways around barriers to local clean energy ownership. However, new policies and programs could push locally owned clean energy to the next level, reducing inequities, maximizing the benefits, and building the political power we need to fight polluting energy monopolies.

Policy solutions fall into a few buckets of general approaches:

- Passing state policies that enable locally owned clean energy projects.
- Addressing upfront costs through improved incentives and funding.
- Incentivizing local ownership through new and existing clean energy programs.
- Providing technical support for locally owned clean energy projects.

While some of the identified policy solutions are not particular to local ownership, overcoming these barriers has the potential to disproportionately benefit locally owned projects.

Photo credit: People Power Solar Cooperative with photography by Survival Media Agency

Pass Enabling Policies

There are a number of key policies that legislators and regulators, especially at the state level, must adopt to make many locally owned clean energy projects feasible in the first place.

In the case of community solar, policymakers typically must pass enabling legislation that makes it possible to share the output of a shared solar garden among many customers via virtual net metering. Crucially, community-owned projects must be allowed to participate, not only utility-owned or privately owned systems. Though this provision can benefit outside owners as well, it's still an essential piece of policy support for locally owned clean energy — especially since shared solar makes clean energy ownership much more accessible for low-income households and renters. A flexible ownership structure that allows for non-utility owners is one of ILSR's four principles of successful community solar projects and programs. The other principles include: tangible benefits for participants, additionality to other clean energy policies, and access for all.¹⁰⁸ See the report, *Equitable Community Solar: Policy and Program Guidance for Community Solar Programs that Promote Racial and Economic Equity*, for more on designing community solar programs.¹⁰⁹

Another key set of supportive state policies ensure adequate and fair compensation for the energy that locally owned projects produce.

Robust net metering rules can help guarantee stable compensation for rooftop solar owners. A majority of states have net metering requirements, which typically apply to large, investor-owned electric utilities.¹¹⁰ For more detail on net metering policies, see ILSR's Community Power Scorecard, which has an assessment of state policies.¹¹¹ Virtual net metering plays a similar role for subscribers to community solar projects.

Feed-in tariffs are another method of compensating local energy producers by providing payment for renewable energy at clear, set rates over the course of a long-term contract. Unlike net metering, feed-in tariffs can be used to set rates that account for the many benefits that locally owned clean energy provides, including increased resiliency, lower emissions, greater local economic impacts, and better air quality. Though not as common in the United States, feed-in tariffs played a key role in growing Germany's clean energy capacity, nearly half of which consisted of locally owned projects by 2012.¹¹² For examples in the United States, look to Minnesota's value of solar policy or the Solar Massachusetts Renewable Target (SMART) program.¹¹³

Address Upfront Costs

Federal, state, and local governments can help communities afford the upfront costs of local clean energy ownership in a variety of ways, including through improved tax incentives, direct grants, accessible financing, and reformed securities regulations.

At the federal level, reforming the currently available clean energy tax credits — including the Residential Clean Energy Credit under Section 25D, the Investment Tax Credit for commercial property under Section 48, and the Clean Electricity Investment Credit under Section 48D — could make it easier for households and communities to take advantage of the tax credits for locally owned projects.

We've already seen some progress on this front. The Inflation Reduction Act, passed in August 2022, made a number of changes to the two clean energy Investment Tax Credits for commercial property that should help level the playing field for locally owned projects.¹¹⁴ Most notably, a direct pay option for tax-exempt entities, like nonprofit organizations and rural electric cooperatives, should allow them to directly

access these credits for the first time. There's also a new transferability mechanism that will allow projects to transfer credits to other entities in exchange for a cash payment instead of pursuing more complex tax equity financing options, though this is still likely to reduce the tax credit value that's passed on to local owners. In the past, a temporary cash grant option for the Investment Tax Credit (which the federal government enacted after the 2008 financial crisis under Section 1603) delivered more value to clean energy developers and enabled greater local ownership.¹¹⁵

instituted for commercial clean energy projects could further encourage and reward local ownership.¹¹⁶

An even more efficient and equitable approach is to create direct grants in place of or in addition to the tax incentive regime, particularly for small, locally owned clean energy projects. (In theory, this is similar to the tax credit direct pay option, but implementation details and the timing of funds may vary.) The federal government already has some modest grant programs available for locally owned clean energy projects, such as the Rural Energy for America Program at the U.S. Department of Agriculture, but significantly expanding grant funding to replace or supplement clean energy tax credits would have an even greater impact. State and local governments could create grant programs as well and prioritize or restrict the funding for locally owned clean energy projects in their jurisdictions.

Creating more accessible financing options for locally owned clean energy projects is another part of the puzzle. This could encompass a wide range of public and private sector approaches, including utility inclusive financing programs, low- or no-interest government loans, green bank programs, and clean energy loan funds, specifically targeted for locally owned clean energy projects. As

one example, the U.S. Department of Agriculture could provide low-interest loans to community cooperatives building wind, solar, and other clean energy technologies in rural areas, as it already does for rural electric cooperatives. New federal programs in the Inflation Reduction Act, like the Greenhouse Gas Reduction Fund, can provide additional support for state and local efforts to expand financing for locally owned clean energy projects, like individual rooftop solar projects and shared solar gardens.¹¹⁷



Photo credit: Dennis Schroeder/NREL (CC BY-NC-ND 2.0)

Unfortunately, these changes do not apply to the Residential Clean Energy Credit available to households that install rooftop solar panels or other renewable technologies. Allowing households with low or no tax liability to take the credit as direct pay or making it refundable to taxpayers would greatly expand access, particularly for many low-income families. Expanding eligibility to households for new bonus credits that the Inflation Reduction Act

In addition to actual project deployment — putting wind turbines in the ground and solar panels up on roofs — locally owned clean energy projects often need funds to address other barriers, like roof repairs, interconnection costs, and project pre-development expenses. This is another place where federal, state, and local governments can provide financing and grants to help close the gaps between local clean energy owners and outside investors.

Finally, reassessing state and federal securities regulations for locally-owned clean energy projects could enable greater local investment in — and local returns from — these projects.

Incentivize Local Ownership

Policymakers can encourage local ownership by incorporating adders, prioritization, or carveouts for locally owned projects into the design of new and existing clean energy programs and policies.

“Adders,” or bonuses, for locally owned projects in clean energy compensation rates and other incentive programs could provide increased funds to projects that meet local ownership targets. This would make locally-owned projects more financially feasible and encourage their development. For example, Ontario’s feed-in-tariff program paid increased rates for the clean energy generated by projects that had certain levels of local community ownership.¹¹⁸

Decision-makers can also choose to prioritize locally owned clean energy projects for funding opportunities and capacity-limited incentive programs. This could be done through a points system that awards extra points to projects with local ownership (among other beneficial project features) when evaluating applications for a competitive grant or otherwise capped program. Similarly, locally owned clean energy projects could be prioritized

during other essential project development activities, including in interconnection queues.

To further ensure that locally owned projects are able to access competitive clean energy incentives and grants, policy makers can reserve certain amounts of program capacity for these projects via carveouts. As an example, Illinois’s wide-ranging Climate and Equitable Jobs Act, passed in 2021, required that the state’s solar procurement program must reserve at least five percent of program capacity for “community-driven” community solar projects.¹¹⁹

Provide Technical Support

Policy isn’t always the main barrier to clean energy ownership. In those instances, governments, legislators, and nonprofit organizations can explore how connecting interested people and groups with technical assistance, training, and other resources can empower more projects across a broader range of communities.

This institutional support for locally owned projects could take a variety of forms. Private and public entities could incorporate a greater focus on developing locally owned clean energy projects into existing technical assistance programs, such as the Department of Energy’s National Community Solar Partnership. Alternatively, entities could establish and fund new training or accelerator programs, helping communities develop locally owned projects by providing education on clean energy technologies, organizational structures, financing options, legal considerations, public engagement processes, and more.

One example of an organization that’s already providing this type of technical support is the People’s Solar Energy Fund. More information on their efforts is provided in the following case study.

People's Solar Energy Fund Supports Community Ownership

Organization: People's Solar Energy Fund (PSEF)

Location: National

Technology: Community solar/shared solar.

Ownership Structure: PSEF members develop community-led and community-owned projects.

How They Made Ownership Work: PSEF is a national network of community-based and cooperative solar developers, such as Cooperative Energy Futures, People Power Solar Cooperative, and Co-op Power, that are owned by and serve low-income and BIPOC (Black, Indigenous, and People of Color) communities. To help its members successfully develop locally owned community solar projects, the nonprofit organization provides a variety of technical support, training, and knowledge sharing opportunities targeted to the needs of community-owned projects. The organization also helps members finance their projects, offering forgivable pre-development loans and as well as connections to tax equity partners and other financiers.¹²⁰ By pooling together multiple smaller community-owned projects, PSEF can reach the scale that's necessary to attract investors and access better borrowing terms.¹²¹

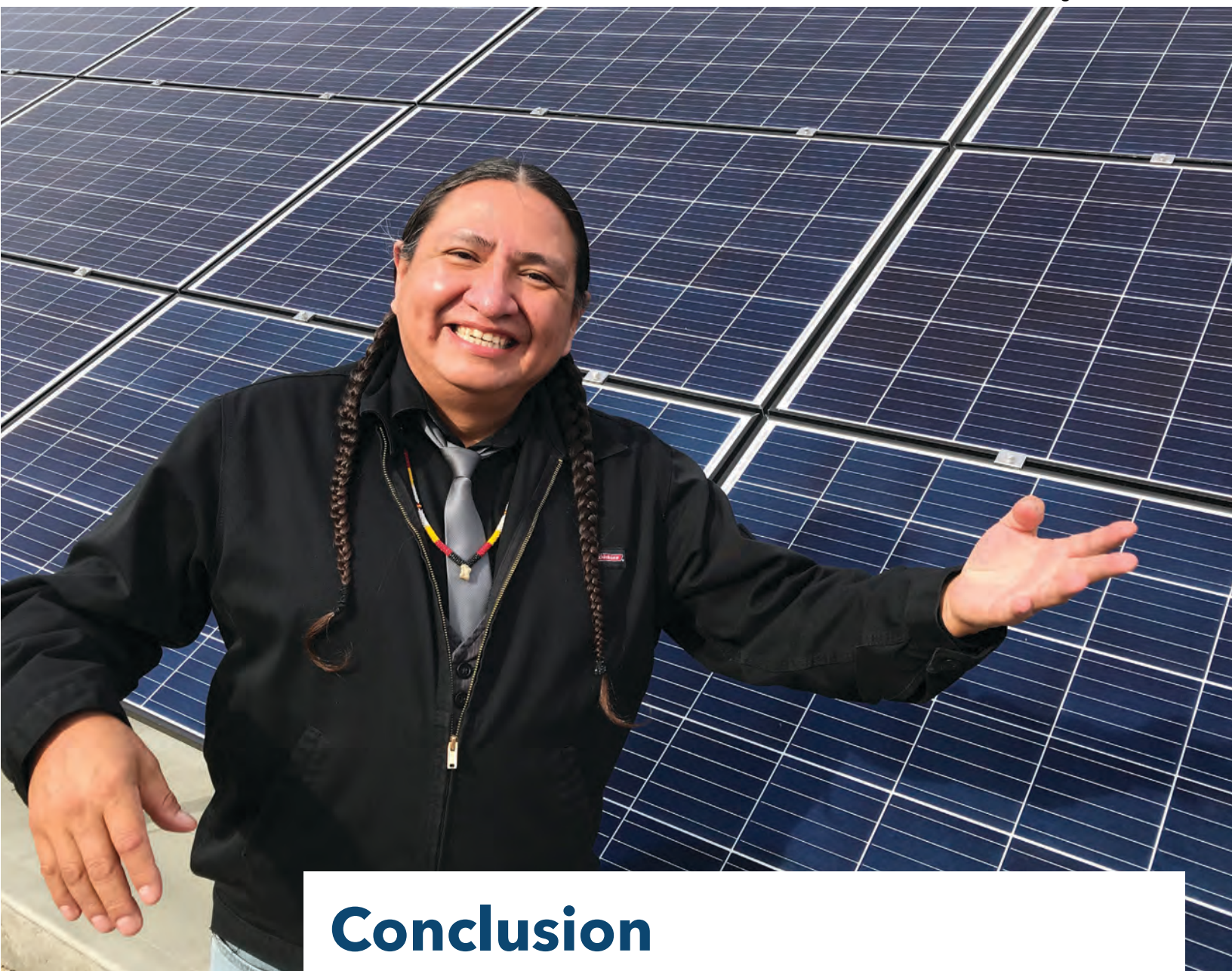
In Their Own Words:

"What we've done by forming the People's Solar Energy Fund is effectively created an alliance of all of these local groups around the country who can, number one, pool their projects... It allows us to have kind of a much stronger negotiating position."

- Timothy DenHerder-Thomas, Cooperative Energy Futures General Manager (via Local Energy Rules)¹²²

Photo credit: Werner Slocum/NREL (CC BY-NC-ND 2.0)





Conclusion

Equitable, local ownership of clean energy creates many benefits at the individual and community levels. It allows households to maximize personal financial benefits, no matter their color, wealth, or zip code. It enables communities to grow economic opportunities and develop innovative solutions to meet local needs. And perhaps most importantly, it puts power back in the hands of people, empowering them to fight the polluting big utilities and to advocate for a fairer clean energy future.

To fully realize those benefits, policymakers, organizations, and local advocates need to make sure all communities have equitable access to clean energy ownership. We won't be able to fight climate change, eliminate energy poverty, or build the world we want to see without it.

Appendix: Methodology and Assumptions

To provide a quantitative example of the economic benefits of local clean energy ownership, we estimated the potential cash flows of two sample solar projects, a 7 kilowatt-DC rooftop solar project and a 1.3 kilowatt-DC community solar project, under different ownership conditions. For this analysis, co-author Matthew Grimley adapted a tool created by the Clean Energy Extension at the University of Massachusetts Amherst Center for Agriculture, Food, and the Environment called the “Solar Financing and Ownership Options: Cash Flow Model” to evaluate the distribution of cash flows, in 2021 dollars, to select local and outside entities under different models.¹²³ The entities include: the initial project owner [local or outside], the “flip” owner [local, if applicable], project offtakers (i.e., energy users) [local, if applicable], lenders (i.e., banks) [local or outside], and payment-in-lieu-of-taxes (PILOT) taxors (i.e., local governments) and land lessors (i.e., landowners) [local, if applicable]. Notably, this analysis does not attempt to capture all entities that would benefit financially from a solar project, excluding for instance both labor and equipment manufacturers, in part because of the difficulty in generalizing the effect of project ownership on the percentage of local vs. outside labor or manufacturing.

We’ve listed the various assumptions made and tool inputs used in the analysis below.

7 Kilowatt Rooftop Solar Installation, Self-Owned and PPA

Model Inputs

* Variable added to original tool.

- **Initial Owner Location:** Self-owned in local economy, PPA in outside economy.
- **Tax Status:** Assumed each was taxable and had enough tax liability to use (and met requirements for) a 30% solar Investment Tax Credit (ITC) or Residential Clean Energy Credit, but with only the owner of the PPA example able to take advantage of both accelerated depreciation and the ITC, since accelerated depreciation is a business-only incentive in our model.¹²⁴

- **Size:** Assumed 7 kilowatt-DC, the median taken from Lawrence Berkeley National Laboratory's Tracking the Sun data for 2021.¹²⁵
- **Price:** Assumed \$3.00/Watt-DC in 2021 dollars for both cases, as Lawrence Berkeley National Laboratory's Tracking the Sun cost data shows both host-owned and third party-owned arrays feature similar pricing. To show a reasonable long-term assumption for photovoltaic pricing, we used 20th percentile data for installations sized between 7 and 8 kilowatt-DC taken from Lawrence Berkeley National Laboratory's Tracking the Sun cost data.¹²⁶
- **Federal ITC:** Assumed 30%, in line with new tax policy advanced by the Inflation Reduction Act.¹²⁷
- **Electricity Avoided Retail Rate:** Assumed \$0.127/kilowatt-hour. The calculation is from the U.S. Energy Information Administration data for 2021, for bundled investor-owned utilities with more than 10,000 residential customers. Once each utility's average rates subtracted a \$10/month fixed charge, the median rate was taken from the group of utilities.¹²⁸
- **Electricity Retail Annual Escalation Rate:** Assumed 2%. Although the U.S. Energy Information Administration predicted electricity rates to increase by about 10% from 2021 to 2022 and by 2.5% from 2022 to 2023, we assumed that on the long run, electricity rates will increase by less than that, on average.¹²⁹
- **Solar Tariff and Renewable Energy Certificate (REC) Prices:** Assumed no solar tariffs or REC prices.
- **Electric/Net-Metering Off-Taker Discount:** Assumed 0% for self-owned model, since solar production is assumed to offset electricity usage. Assumed 10% for PPA model, a standard savings for solar PPAs from anecdotal data.
- **Percent of Offtakers in Local Economy:** Assumed 100% for both cases.
- **Payment in Lieu of Taxes (PILOT) Agreement:** Assumed no property tax.
- **Land Lease Payment Agreement:** Assumed no land lease.
- **Percent Project Cost Financed with Equity and Loan Conditions:** Assumed 0% for self-owned and 50% for PPA, since a solar loan could cover all of the cash needed for a homeowner with self-owned panels, while a corporate owner in the PPA example would be funded by a mix of debt and equity. The homeowner in the first example receives a 7.5% home loan for 10 years (following some examples in Minnesota, Iowa, and nationally) and the solar developer in the second is funded by general corporate debt at

6% for 25 years.¹³⁰ At 25 years of a PPA (in line with Sunrun's length of PPAs at 20 or 25 years), the rooftop solar array is flipped to the offtaker for the remaining 5 years of the analysis.¹³¹ We assume the flip comes at a small cost to the offtaker (5% of original project cost, purchased outright with cash), as the fair market value of the array has been nearly fully depreciated.

- **Project Lender Location:** Local for self-owned and outside for initial owner in PPA. We assume that cash flows to a local lender represent local economic impact, but the actual local economic impact of a project using a local lender would depend on how the financial institution sources capital and reinvests funds. For instance, a locally located bank that largely sources capital and reinvests funds outside of the community would still have local economic impact through, e.g., employee salaries, but it would create as much local economic value as an institution focused on community benefits, such as a Community Development Financial Institution, or CDFI.
- ***Energy Revenue Taxable for Initial Owner:** We assumed no for self-owned (since energy savings on-bill aren't taxable) and yes for PPA.
- ***Energy Revenue Taxable for Post-Flip Owner:** We assumed no for PPA, where ownership flips to the residential owner at year 25.
- ***Operations and Maintenance Taxable for Initial Owner:** We assumed no for self-owned (since it isn't a business expense) and yes for PPA.
- ***Operations and Maintenance Taxable for Post-Flip Owner:** We assumed no for PPA, where ownership flips to the residential owner at year 25.
- ***Post-Flip Offtaker Discount:** We assumed 0% for PPA because ownership flips to the residential owner at year 25 and energy is used for self-usage at that point.
- **Capacity Factor:** Assumed 16.1%. Data drawn from assumptions from the National Renewable Energy Laboratory's Annual Technology Baseline.¹³²
- **Degradation:** Assumed 0.5%, in line with National Renewable Energy Laboratory assumptions.¹³³
- **Life Span:** Assumed 30 years, in line with the National Renewable Energy Laboratory's Annual Technology Baseline.¹³⁴
- **Annual Operations and Maintenance Cost Factor:** Assumed \$20/kW-year, remaining flat over time. Data taken from \$0 to \$40 range given by the National Renewable Energy Laboratory's Annual Technology Baseline. Assumed decommissioning funds are included in operations and maintenance.¹³⁵

- **Inverter Replacement:** Assumed a cost of \$7/kilowatt-year. Data interpreted from National Renewable Energy Laboratory assumptions.¹³⁶ Assumed 11 year replacement horizon, in line with industry expectations.
- **Tax Rates:** Assumed 21% and 7% for federal and state taxes, respectively. Both tax rates are assumed to stand-in, roughly, for personal and corporate tax levels.
- **Discount Rates:** Assumed 5% for all cash flow recipients. A discount rate is used to account for the time value of money in order to estimate the current value of expected future cash flows. The discount rate is often estimated as the rate of return that an investor expects or the interest on debt, but it can also incorporate other factors. Here we estimate the same number for all parties as a means to present comparable cash flows between parties.

1.3 Megawatt Community Solar Installation, Community-Flipped and Third Party-Owned

Model Inputs

* Variable added to original tool.

- **Initial Owner Location:** For community-flipped, the initial owner is an outside, third-party investor, and then the project ownership is flipped to a cooperative in the local economy. For simplicity, the model assumes that in the community-flipped example the outside party owns 100% of the project and receives all revenues for the initial 10-year period. For third party-owned, the owner is solely in the outside economy.
- **Tax Status:** Assumed each was taxable, as a simplification. The third party owner is able to take depreciation and monetize the ITC. As a co-op, we assume the community owner is taxable but lacks enough tax liability to take depreciation and monetize the ITC, so it works with a third party tax equity partner under the partnership flip model. For simplicity, the model shows that any revenue is taxed at the cooperative level, but there may be some discrepancy in how the co-op and members are taxed in an actual project, depending on the timing of the patronage disbursement and the incorporation status of the co-op. Since the cooperative (and member households) would likely not owe taxes on any profits shared with members, this simplification results in a notably conservative estimate of member financial benefits.
- **Size:** Assumed 1,300 kilowatt-DC.

- **Price:** Assumed \$1.50/Watt-DC in 2021 dollars. To show a reasonable long-term assumption for photovoltaic pricing, we used 20th percentile data for installations sized between 500 and 1,000 kW-DC taken from Lawrence Berkeley National Laboratory's Tracking the Sun cost data.¹³⁷ This also assumes that a 1.3 MW-DC array's price would be on the lower end of the 500 to 1,000 kW-DC pricing spectrum. We added in \$0.1/Watt-DC, in line with customer acquisition assumptions from GTMResearch and VoteSolar, for a final cost of \$1.60/Watt-DC.¹³⁸
- **Federal ITC:** Assumed 30%, in line with new tax policy advanced by the Inflation Reduction Act.¹³⁹ We do not assume the project is eligible for any new bonus credits created by the Inflation Reduction Act.
- **Electricity Avoided Retail Rate:** Assumed \$0.127/kilowatt-hour. The calculation is from the U.S. Energy Information Administration data for 2021, for bundled investor-owned utilities with more than 10,000 residential customers. Once each utility's average rates subtracted a \$10/month fixed charge, the median rate was taken from the group of utilities.¹⁴⁰
- **Electricity Retail Annual Escalation Rate:** Assumed 2%. Although the U.S. Energy Information Administration predicted electricity rates to increase by about 10% from 2021 to 2022 and by 2.5% from 2022 to 2023, we assumed that on the long run, electricity rates will increase by less than that, on average.¹⁴¹
- **Solar Tariff and Renewable Energy Certificate (REC) Prices:** Assumed no solar tariffs or REC prices.
- **Electric/Net-Metering Off-Taker Discount:** Assumed 10% for both cases.
- **Percent of Offtakers in Local Economy:** Assumed 100% for both cases.
- **Payment in Lieu of Taxes (PILOT) Payment Agreement:** Property tax regimes for solar farms vary across the United States. Minnesota taxes \$1.20/megawatt-hour on arrays larger than 1 megawatt-AC.¹⁴² North Carolina multiplies the undepreciated cost of a solar farm, after first multiplying the cost by 20%.¹⁴³ Using the cost and capacity factors from the assumptions, the property tax averages from Minnesota and North Carolina came out to \$1,650/megawatt-DC and \$1,200/megawatt-DC. An estimate of \$1,500/megawatt-DC was used for all cases.
- **Land Lease Payment Agreement:** Assumed \$5,000/megawatt-DC. This assumes that a 1,300 megawatt-DC array takes up 5 acres (on the lower end of estimates from the National Renewable Energy Laboratory), reimbursing a landowner at \$1,000/acre (in line with research from Penn State University), more than three times the highest rates in the nation for renting cropland.¹⁴⁴

- **Percent Project Cost Financed w/Equity and Loan Conditions:** Assumed 45% of costs, in line with estimates with the National Renewable Energy Laboratory and anecdotes from reviewers of this report, since both are assumed to be financed on a project and non-corporate basis, but with varying interest rates and loan terms.¹⁴⁵ The initial owner is assumed to include both tax and sponsor equity. Both arrays are assumed to have an initial loan at a 6% interest rate for 15 years. The community-flipped array is flipped to a community owner at Year 10 for 30% of the original project cost, but the initial owner continues paying the last 5 years of the initial loan, giving the original outside owner an internal rate of return roughly the same as the third party-owned array. In the community-flipped array at the time of the buyout, the community owner is assumed to take out a loan at 6.5% for 10 years that would cover 100% of the buyout amount.
- **Project Lender Location:** Outside for third party-owned and the initial owner in the community-flipped example, and local for the cooperative owner in the community-flipped example. We assume that cash flows to a local lender represent local economic impact, but the actual local economic impact of a project using a local lender would depend on how the financial institution sources capital and reinvests funds. For instance, a locally located bank that largely sources capital and reinvests funds outside of the community would still have local economic impact through, e.g., employee salaries, but it would create as much local economic value as an institution focused on community benefits, such as a Community Development Financial Institution, or CDFI.
- ***Energy Revenue Taxable for Initial Owner:** We assumed yes for both.
- ***Energy Revenue Taxable for Post-Flip Owner:** We assumed yes for community-flipped, where ownership flips to the cooperative owner at year 10.
- ***Operations and Maintenance Taxable for Initial Owner:** We assumed yes for both.
- ***Operations and Maintenance Taxable for Post-Flip Owner:** We assumed yes for community-flipped, where ownership flips to the cooperative owner at year 10.
- ***Post-Flip Offtaker Discount:** We assumed 10% for community-flipped.
- **Capacity Factor:** Assumed 16.1%. Data drawn from assumptions from the National Renewable Energy Laboratory's Annual Technology Baseline.¹⁴⁶
- **Degradation:** Assumed 0.5%, in line with National Renewable Energy Laboratory assumptions.¹⁴⁷

- **Annual Operations and Maintenance Cost Factor:** Assumed \$10/kilowatt-year, remaining flat over time. Added in \$10/kilowatt-year for customer management for subscription, billing, acquisition, and outreach. Data taken from \$0 to \$40 range given by the National Renewable Energy Laboratory's Annual Technology Baseline, and customer acquisition estimates given by GTMResearch and VoteSolar, along with anecdotal reviewer data.¹⁴⁸ Assumed decommissioning funds are included in operations and maintenance.
- **Life Span:** Assumed 30 years, in line with the National Renewable Energy Laboratory's Annual Technology Baseline.¹⁴⁹
- **Inverter Replacement:** Assumed a cost of \$7/kW-year. Data interpreted from National Renewable Energy Laboratory assumptions.¹⁵⁰ Assumed 11 year replacement horizon.
- **Tax Rates:** Assumed 21% and 7% for federal and state taxes, respectively.
- **Discount Rates:** Assumed 5% for all cash flow recipients. A discount rate is used to account for the time value of money in order to estimate the current value of expected future cash flows. The discount rate is often estimated as the rate of return that an investor expects or the interest on debt, but it can also incorporate other factors. Here we estimate the same number for all parties as a means to present comparable cash flows between parties.

Other Model Assumptions

- **Individual Owner/Subscriber Share:** We assumed a household would own or subscribe to a 7 kilowatt-DC share for both.
- **Owner Profit Distribution and Taxation:** For the community-flipped example, we assumed cooperative member-owners would receive 100% of project profits distributed as cash on an annual basis. In an actual project, timing and scale of profit distribution to members may vary based on their share types and could include a mix of cash payments and equity in the cooperative. In addition, as noted above, the incorporation status of the cooperative and timing of the profit distribution will affect what the cooperative is taxed for and when. For simplicity, we assumed that all profits are taxed at the cooperative level (a significantly conservative assumption), and any profit is distributed to the members.

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67. The total NPV of the self-owned example is not equal to that of the third-party-owned example because of varying assumptions for each model, such as different borrowing rates and equity amounts for the local household and the outside owner. See the Appendix for detailed information on the assumptions for this analysis.
68. The locally owned community solar project model assumes the household does not need to provide an upfront investment to become a cooperative member and that project profits, when generated, are distributed to members on an annual basis; in an actual project, timing and scale of profit distribution to members may vary based on their share types and could include equity shares. It also assumes that the cooperative-owned community solar project uses a partnership flip model to access the value of the solar Investment Tax Credit, where ownership flips to the cooperative after 10 years. Both the locally owned and outside-owned models are assumed to provide identically valued bill credits to the subscribers, but only the locally owned model provides profit sharing. Because of model assumptions on tax timing and status, this estimate likely understates the actual financial benefits for a cooperative member. See the Appendix for more information on the assumptions for this analysis.
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83. The total NPV of the locally owned example is not equal to that of the third-party-owned example because of varying assumptions for each model, such as different borrowing rates and equity amounts. We assume that the NPV provided to a local lender represents local economic impact, but the actual impact would depend on how the financial institution sources capital and reinvests funds. See the Appendix for detailed information on the assumptions for this analysis.
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The difference between Community Engagement and Marketing

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Posted by Lee Samelson on February 16, 2016

[Community engagement](#) is a process where an organization (or coalition or organizations) acting for community benefit (such as saving energy in multiple buildings) works to build lasting relationships in order to apply a collective vision that benefits the community. Community engagement is a much more active method of implementing change than the more static method of standard [marketing](#) techniques. [Marketing](#) is when a company (or group of companies) communicates to a (perhaps targeted) consumer audience with the intent of inducing a behavior change on a short-term or permanent basis. Non-profits and governments often use marketing to deliver an ethos or social purpose message about what services their organization could offer to an applicable audience.

Marketing often (but not always) has a sole purpose of money making in mind whereas honest relationship building is an irreducible minimum for community engagement. That is why a telemarketer calling on behalf of an energy efficiency program offer tends not to illicit as much trust and positive reaction as direct contact with an organization which makes it clear it has the interests and the needs of the community factored in.

In the case of energy efficiency, there is just enough overlap between marketing and community engagement to where the two terms are often confused and used interchangeably. Sometimes community engagement programs for energy efficiency programs are mistitled as "[Marketing Strategies](#)", while other times they are correctly titled as "[Community-Based Outreach](#)".

Outreach is one word that lies in between the dichotomy of marketing and community engagement. The utility companies may conceive community engagement as of tabling at events about their energy efficiency programs or speaking at an event about rebates they offer. But that is actually outreach. While community engagement indeed starts with an initial outreach, a lot of outreach we see is actually closer to marketing rather than community engagement. The word outreach implies that whoever is being reached out to are outsiders with the outreach in the center. Outreach is done for the outreachers' organization to extend its reach. Meanwhile community engagement is done with the community for relationship building.

Real community outreach takes capacity and effort. For organizations unaccustomed to community outreach, putting so much emphasis on cultivating 2-way relationships sounds very time-consuming and cumbersome of a process given that we as individuals have a limited capacity to keep track of all the connections they make. However, community engagement works rather than collapses when you have a coalition of many people and organizations collaboratively sharing the work load. Community engagement pays off in the long term, particularly in the case of energy efficiency.

WHAT IS THE FRAMEWORK FOR COMMUNITY ENGAGEMENT IN THE MINNEAPOLIS CLEAN ENERGY PARTNERSHIP?

The Clean Energy Partnership work plan already contains overall goals that provide a necessary starting point for community engagement. In addition, the partnership has also approved a set of metrics that are an essential way to monitor the progress toward meeting those goals. A next step for the Partnership is to figure out which community to do a pilot project in and who should carry it out. By its own definition, those who are doing community engagement will develop community engagement strategies as they go along and find out directly from the community what their needs are. Then at a later time, those who were



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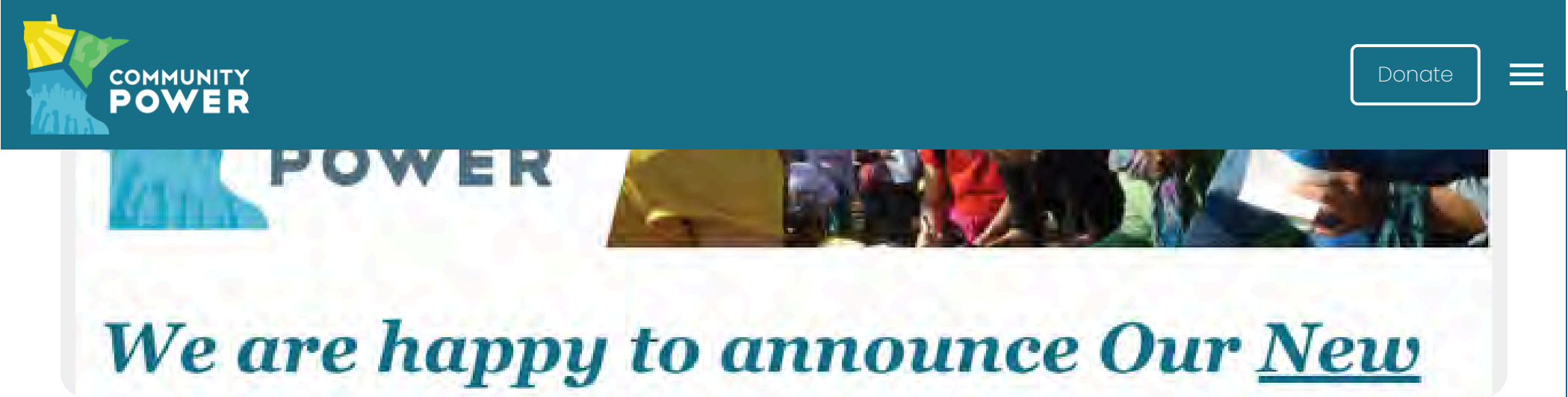
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Resilient societies and liveability

LaTorria Sims, Edidiong Obot, Courtney Taylor

September 17, 2024

Community engagement: A cornerstone of environmental justice

Increasingly, meaningful community engagement is becoming a requirement for environmental permitting processes. But how do you ensure your communication is inclusive and meaningful? In this article, our experts discuss the differences between outreach and engagement and how to overcome obstacles to meaningful community involvement in project-planning and decision-making processes.





Historically, communities have been excluded from planning and decision-making processes for projects that directly impact them. In an effort to address this challenge and to foster meaningful involvement from communities, states like California, Washington, New Jersey, Colorado, and Massachusetts have incorporated community engagement into their environmental permitting processes. Recent updates to the National Environmental Protection Act (NEPA) have also [expanded requirements related to meaningful community engagement](#).

Effective two-way engagement gives communities an opportunity to actively participate in project planning and often leads to improved outcomes that may benefit both project planners and surrounding communities. Proactive community outreach and early engagement can mitigate project delays during the permit approval process and help projects gain social licensing, an essential step towards smoothly getting projects off the ground. Therefore, it shouldn't be surprising that community engagement is increasingly recognized as a critical component of decision-making processes and key to achieving environmental justice priorities.

Community engagement best practices center on meaningful, two-way engagement as early in the process as practicable. Early engagement gives community members the opportunity to participate and provide input while project plans are still in the development stage. It also provides project planners the opportunity to collect and use community input throughout the process, not just at the end, after decisions have already been made. Without meaningful engagement, organizations risk running into issues such as permit denial, project moratoriums, lawsuits, shareholder scrutiny, loss of federal and private funding, backlash from media, and community-based organizations challenging the social license to operate.

So, what are the essential components for effective outreach and meaningful engagement? Our experts recommend the following steps to help develop customized, community-centric outreach and engagement plans.

- Identify potential community stakeholders
- Conduct a thorough environmental justice assessment
- Understand the community history
- Develop a data-driven outreach and engagement plan
- Conduct inclusive, community-centric outreach
- Meaningfully engage with communities
- Incorporate community feedback into project plans and decisions
- Track and measure community engagement
- Use information to document and report outcomes of meaningful engagement

Start early with community engagement

When developing a data-driven community outreach and engagement strategy, it's important to start by identifying which communities may be impacted by your project – this includes underrepresented communities (or disadvantaged communities as defined by the US DOE), Tribal Nations, and Indigenous communities, among other types of community stakeholders. After identifying potential community stakeholders, it's a great idea to start early in researching and gathering as much information about the potential stakeholders as possible. We recommend doing research to better

understand the history, dynamics, demographics, surrounding industry, and burdens already faced by the community.

We recommend using the publicly available environmental justice (EJ) mapping tools offered by federal agencies such as USEPA's EJScreen and the Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST) to gather data. When applicable, it is advisable to use the screening tools offered by state agencies such as California's CalEnviroScreen or New Jersey's Environmental Justice Mapping, Assessment, and Protection (EJMAP). Each community is different, so the approach to gathering relevant information varies and may consist of going beyond a desktop review. While collecting data by desktop is a great way to start, it is encouraged to begin speaking directly with key members of the community. Community members not only offer unique insights, but these interactions give project planners the opportunity to get to know the community and start building relationships.

The information provided by desktop research and from conversations with the community is necessary to develop a data-driven, community centric outreach and engagement plan. The plan should be comprehensive and answer questions related to who, what, when, where, and how to conduct outreach and engagement. A well-prepared outreach and engagement plan acts as a guidebook that contains clearly defined goals and objectives, specific outreach and engagement methods to be used, frequency of outreach and planned engagement to support the goals, and establish metrics and milestones for measuring success. In best practice, the plan should be reviewed and updated periodically, as lessons are learned throughout the process.

Outreach vs. engagement – what's the difference?

Concepts like community outreach and engagement may sound like synonyms for each other, but there's key differences between the two.

Community outreach is one-way communication to inform the community about upcoming engagements, project plans, project updates, and other information that is relevant from a project planning prospective. Effective community outreach delivers information to the community using channels and language that is inclusive and accessible for the entire community. These can include posters, messaging boards, local news outlets, social media, mailers, and word of mouth. It is also essential to understand the needs and barriers that the community may face in receiving information (i.e., lack of access to the internet or linguistic isolation). Without effective community outreach, it can be hard to achieve meaningful community engagement. Community members are unable to attend events that they are unaware of or if it isn't clear how what the purpose of the meeting is and how it might affect them in the future.

Meaningful engagement requires dialogue, referred to as two-way communication, between communities and project planners such as community meetings, town halls, and focus groups. We recommend engaging early and often and providing accessible information and updates to establish trust with the community. Meaningful engagement occurs when project planners work collaboratively with communities, which leads to community members becoming active participants in the decision-making process.

Hindrances to meaningful community engagement

If you've determined that your outreach was effective, and you've developed a solid plan for building authentic two-way engagement with community members, but you're still running into issues, we encourage re-assessment of the engagement strategy to identify and mitigate potential barriers to participation.

We've found that there are three main challenges that can hinder meaningful engagement.

1. **Assess inclusivity of engagement methods.**

Historically, only a small sub-set of community members have routinely attended community engagement events. Frequently, the sub-set of community members attending engagement events doesn't represent the diverse groups that form the community. This can be especially true in underrepresented and marginalized communities. This is why it is especially important to identify barriers community members might face in participating in engagement activities. When considering how to encourage participation in engagement events, project planners may want to consider offering tailored incentives based on identified barriers such as refreshments, childcare, transportation, and compensation for time. It's also important to identify times and locations that are convenient for most participants and don't interfere with other events or commitments. This helps to demonstrate to communities that you appreciate their time and understand the barriers they face to attending events.

2. **Create meeting formats that foster two-way**

dialogue. Commonly public meeting formats entail delivering a message to the community, and project planning continues as usual after the meeting. Meetings may not leave room for two-way feedback or are delivering information after major decisions have been made. This is a prime example of where community outreach is mistaken for community engagement. Community engagement necessitates two-way communication methods, where communities discuss projects with planners before major decisions are made.

3. **Close the loop.** If you've allowed for early, meaningful, two-way engagement prior to major decision-making, it's important to use that input in a way that's consequential in the project planning and decision-making processes. As part of the community engagement process, we suggest tracking the decisions made from community input and periodically meet with community members to confirm that decisions are consistent with the community's intended input. Afterwards, we recommend sharing comprehensive information on the decisions made as a result of community input. This demonstrates to community members that they were not only heard, but that they played a meaningful part in the conversation. It also gives them an opportunity to provide additional feedback and speaks to your respect for their time and efforts while closing the feedback loop.

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Understanding user engagement and needs in energy communities

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Abstract— This paper aims to advance the initiation, expansion, and continuity of Energy Communities (ECs) by providing a framework and methodology tailored to enhance citizen and consumer engagement and facilitate the design of value-based propositions within ECs. Engaging EC members and stakeholders is crucial for establishing resilient ECs. Drawing from existing literature and research on Energy Communities, alongside established frameworks and best practices, this paper presents a framework for citizen engagement and value-based proposition design. Workshops and a social innovation template were developed based on these insights, forming the basis for exploratory dialogues with COMMUNITAS pilots. The methods and significant findings regarding consumer and citizen engagement and value-based design, derived from these pilot explorations, are discussed. Synthesizing the insights from the research and social explorations, implications for the COMMUNITAS project are outlined, particularly concerning the COMMUNITAS Knowledge Base and innovative models. Additionally, a framework for the value-based design of pilot activities and services, alongside citizen engagement, has been crafted. This framework aims to support Energy Communities in developing inclusive services and activities, positioning EC members at the forefront of energy markets. It serves as a foundational pillar for ongoing research within COMMUNITAS, evolving into a refined methodology over time.

Keywords—Energy Community, citizen engagement, energy consumer

I. INTRODUCTION

In recent years, the pressing need for sustainable energy practices has gathered increasing attention in response to escalating environmental concerns and the quest for energy independence. This shift has spurred the emergence of energy communities (EC), where individuals, businesses, and organizations collectively engage in the production, consumption, and management of energy resources. Central to the effectiveness of these ECs is the concept of consumer engagement, which denotes the active involvement of end-users in the decision-making processes and operational dynamics of energy systems.

Consumer engagement strategies within ECs encompass a diverse range of initiatives aimed at fostering informed participation, enhancing energy literacy, and promoting behavioural changes that support energy efficiency and sustainability. The efficacy of these strategies hinges upon

their capacity to facilitate meaningful interactions between consumers and energy stakeholders, empower individuals to make informed choices regarding their energy consumption patterns, and cultivate a sense of ownership and accountability within the community.

This paper aims to elucidate the multifaceted landscape of consumer engagement strategies within ECs, exploring their theoretical underpinnings, practical applications, and potential impact on energy consumption behaviours and societal outcomes. Drawing upon empirical evidence, theoretical frameworks, and industry best practices, this paper seeks to identify key insights and recommendations for optimizing consumer engagement strategies within the context of ECs.

II. EXISTING FRAMEWORKS FOR CONSUMER ENGAGEMENT

Nowadays, there is a growing recognition [1] of the importance of enabling active participation from 'prosumers' within an open energy market. Thus, it becomes imperative to formulate strategies that motivate and engage citizens in shaping the future of the electricity system. This entails identifying triggers [2] that foster sustainable community involvement and understanding the researcher's role [3] within engagement frameworks for energy communities. Additionally, it involves examining the impact of user-building interaction on energy performance and the psychological factors influencing willingness to participate in energy communities [4]. Various studies delve into how project managers, communities, and local stakeholders operate during different engagement stages, aiming to elucidate crucial process features and local value perceptions [5]. Furthermore, researchers explore different community engagement strategies and the challenges encountered in research and development projects [6]. Looking towards a fair and successful energy transition, considerations are raised regarding targets, methods, and rationales for engagement in decentralized energy systems, such as Smart Local Energy Systems [7], initiated by central governments. Finally, there's a call for a participatory approach [8] applicable across all phases of EC setup and for diverse purposes.

Regarding selected and applied framework, a myriad of strategies is applied. For instance, in [1], it is highlighted the

importance of enhancing energy efficiency, particularly in the power system domain, by integrating renewable energy technologies and encouraging the active involvement of 'prosumers' in an open market framework. It suggests leveraging Information and Communication Technologies (ICT) to reduce energy intensity and promote sustainable economic growth. Additionally, smart grid initiatives and digital tools enable utilities to enhance customer engagement and transition towards becoming comprehensive energy service advisors. The approach underscores the significance of technological advancements, customer-centric strategies, and proactive engagement frameworks in achieving energy efficiency goals and fostering a sustainable energy future. In [2], a gap in assuming passive citizen adaptation to smart city changes is identified, and it is emphasized the need for innovative business models to sustain citizen engagement. The introduction of the Public Engagement Network (PEN) model suggests a framework for stakeholder involvement, underlining the pivotal role of citizens in driving sustainable energy transitions. Additionally, the text advocates for the development of a business model for citizen engagement to ensure sustained community participation, with a focus on technology selection. Educational tools are the focus of the study conducted in [3], aimed to improve the quality of human-subjects research within energy-affected communities. Tools name are "Understanding and Addressing Research Fatigue in Rural Communities" and "Engaging in Energy Communities: The Role of the Researcher". The framework revolves around providing guidance on accessing these tools, with a particular focus on graduate students and early-career researchers. By completing these materials, users can effectively address research fatigue and develop strategies for meaningful stakeholder engagement, thereby enhancing the quality of their research projects. Assessing user-building interaction scenarios and psychological factors influencing willingness toward NZE community adoption, [4] employs dynamic simulation and an extended Technology Acceptance Model (TAM) through extensive surveys.

Community-related energy projects are also a topic in which engagement of citizens is important. In this sense, the primary objective in [5] is to elucidate the process features crucial for Community Energy Enterprises' (CEE) development and how these factors contribute to perceived local value by the investor community. The analysis reveals that the success of CEEs hinges on local preconditions such as competences, assets, and capabilities necessary to mobilize community engagement. Territorial endowments, including local administrations' capabilities and established social infrastructures, play a pivotal role in facilitating CEE initiatives. Such energy projects offer promise in supporting the path to a low-carbon economy by redistributing control of energy resources to citizens, fostering sustainable energy behaviours, and potentially enhancing energy justice and democracy [6]. However, understanding the effectiveness of engagement strategies employed in such projects is crucial. The investigation of 28 EU-funded projects made in [6] reveals a mix of shorter-term participation and longer-term behaviour change strategies, with a tendency towards

feedback and rewards for behaviour change. While participatory approaches are prevalent, fully co-creative methods are less common, suggesting a need for greater citizen involvement in decision-making processes. On a broader spectre, the energy transitions need engagement with users, local communities, and broader publics to ensure fairness, acceptability, and success. Focusing on the development of decentralised energy systems instigated by central government, particularly Smart Local Energy Systems (SLES) in the UK, [7] conducted interviews with partner organisations from 12 SLES projects to investigate engagement targets, methods, and rationales. Decisions on engagement emerge from project-specific contexts, with some partners conducting purposive mapping of relevant actors. Communication emerges as a key engagement category across all projects, with consultation featuring in some and participation in a few. Project partners rationalise engagement practices based on specific constructions of user roles and their potential involvement in SLES projects. Lastly, Energy Communities, as a collective energy project, emerges as key instruments facilitating collective and citizen-driven clean energy exchange [8]. While existing stakeholder engagement research for ECs often focuses on specific aspects, such as awareness raising or deployment acceptance, a comprehensive participatory approach spanning all phases of EC setup has been lacking. In [8] it was introduced the Multi-Actor Multi-Criteria Analysis (MAMCA) methodology as an engagement tool for this purpose, offering a practical framework for stakeholder engagement throughout the establishment of new ECs. By aligning engagement goals with corresponding MAMCA steps and linking them to relevant tools and techniques, the proposed framework enables EC initiators to tailor solutions that better meet stakeholder needs, thereby facilitating smoother deployment and increasing the prevalence of ECs within the broader energy system.

III. SOCIAL INNOVATION IN ENERGY COMMUNITIES

Within the scope of the COMMUNITAS Project, various frameworks for engagement in energy communities have been assessed that both concern the formation and operation of ECs [9]. In general, this analysis reveals that the process of engagement is typically portrayed as three phases that cover the recruitment and informing of community members (1), their actual participation in community activities (2) and efforts to make their participation persist (3) [10] [11] [12]. Similarly, many of the frameworks share steps of the more general design thinking approach that is commonly applied to the development of services and value propositions [13]. Characteristic to this process is a non-linear approach to the implementation of these steps and the central position of a customer, in this case the community members. This is where these approaches rely heavily on the simultaneous development of strong engagement in the community. To harvest this synergy, some of the most recent frameworks aim to combine both steps of engagement, as well as service development in a process of co-creation with citizens [10] [14] [15]. Fig. 2 illustrates which processes are related. **Error! Reference source not found.** indicates moreover that the process of individual members is related to the process of EC coordinators and the community.

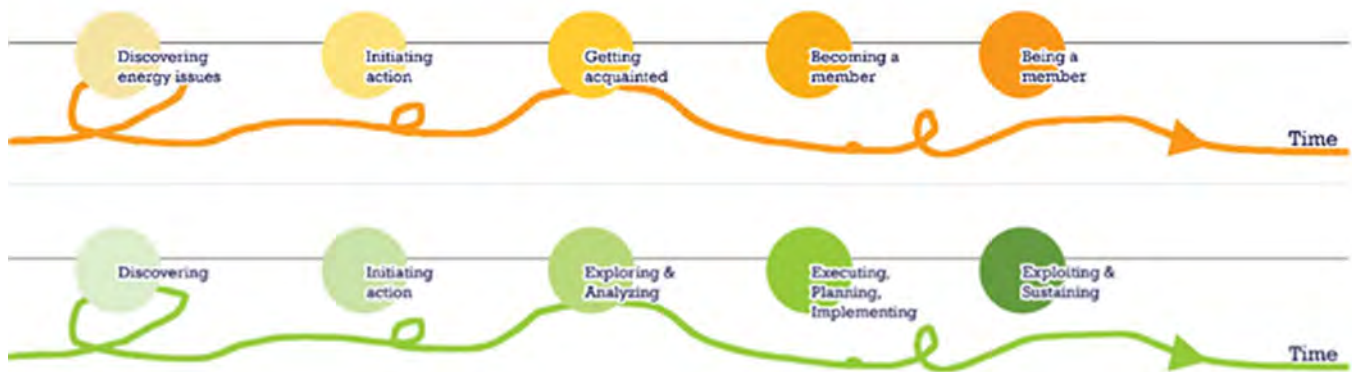


Fig. 1. Timeline for energy community members (top) and coordinators (bottom).

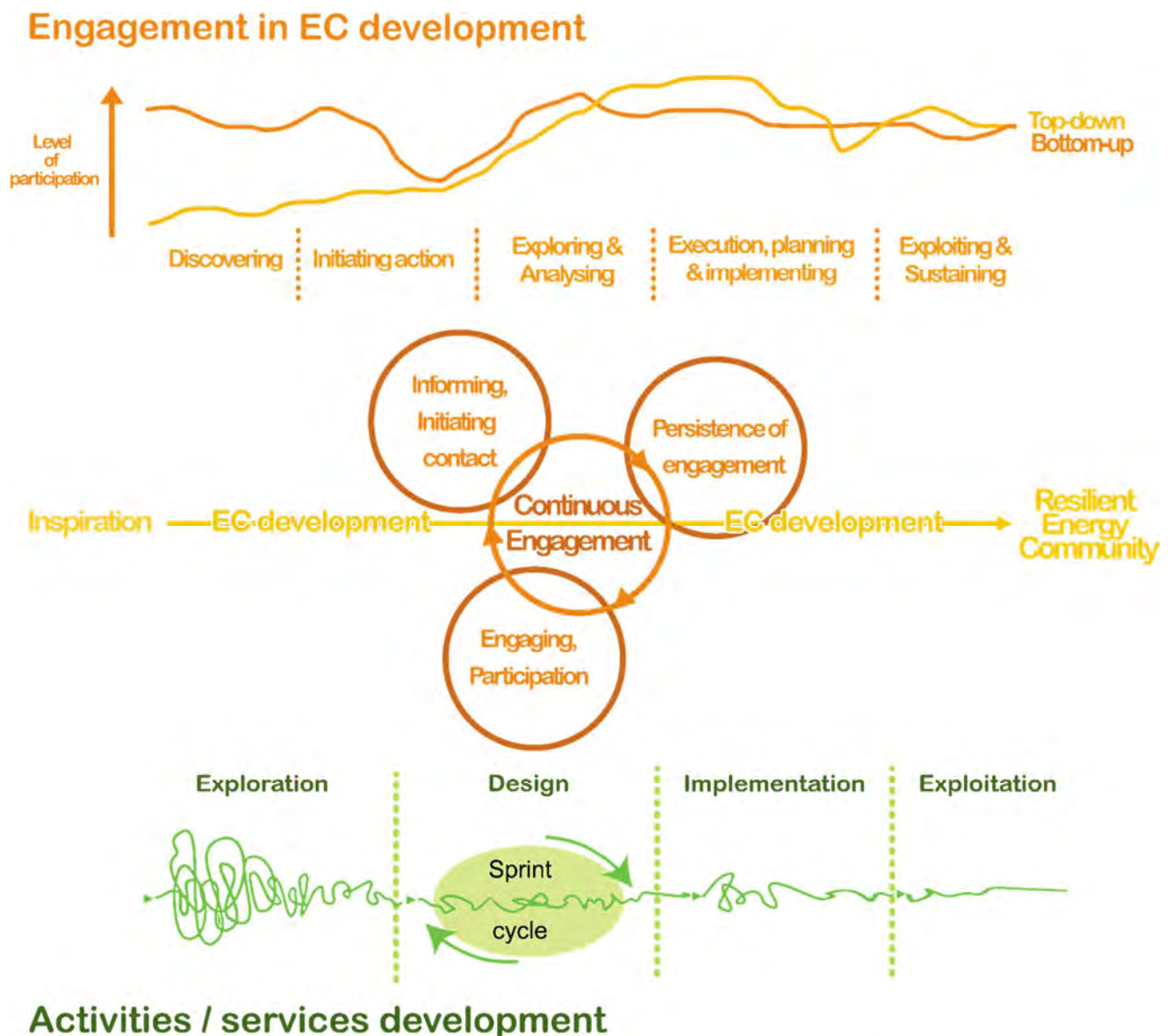


Fig. 2. The relation between engagement, EC development and service design.

In an effort to successfully apply these frameworks within the COMMUNITAS project, additional research into best practices and guidelines for co-creation processes integrating engagement, product, and service development theory,

demanded the formulation of assessment criteria [9]. However, not all previous projects employ a predefined set of criteria for evaluating their engagement or service development efforts. Some projects offer concrete lists of

important aspects, but these lists vary widely in the topics they cover, ranging from ethical guidelines to quantitative measures of effectiveness.

For instance, the LIGHTNESS project prioritizes creating a 'just' form of engaging EC (EC) members, utilizing the Voicer model [16]. This approach encompasses recognizing community member needs, ensuring the participation of all groups, fair distribution of benefits and costs, considering EC members' capabilities to actualize value, assigning an agreed-upon amount of responsibility, and fostering continuous learning [17]. Conversely, the SENDER project focuses on specific Key Performance Indicators (KPIs) for the number of end users engaging with their demand response service [18], while the REScoop PLUS project incorporates economic and regulatory criteria into their best practices report [19].

These assessment criteria largely align with theories for evaluating product and service design commonly applied in practice. Typically, product and service designs are assessed based on three main types of criteria: viability, feasibility, and desirability. While viability and feasibility are adequately addressed by existing criteria, desirability is not as well represented. The criteria outlined in the 'just engagement' model may influence EC member interest but are framed primarily from a moral standpoint, overlooking factors like fun, interest, or affordability.

Given the shared commonalities between engagement activities and product/service design within the context of co-creation, it is logical that the assessment criteria for these processes are quite similar. Criteria such as the participation of EC members are vital when co-creating services, and those from service design theory (e.g., feasibility) are also relevant as EC members must be available to participate. However, many ECs struggle with these interdependencies, often approaching the two processes separately. Best practices from previous projects offered invaluable insights into effective strategies for Energy Communities (ECs), literacy in the subject, interest in participating in energy management frameworks, and energy services' development [20]. By analysing experiences and activities from various European projects, including insights from the BRIGHT Project and the DATA CELLAR Project, it is possible to derive comprehensive guidelines for success. Let's explore these best practices in greater detail across key areas:

A. Social Dynamics: Organization of the Community and its stakeholders

Establishing a well-organized community forms the foundation for offering products and services within an EC. Community development significantly influences engagement levels later on, emphasizing the importance of governance structures and transparent decision-making processes. Effective community organization involves leveraging existing social structures, facilitating open discussions, and formulating Key Performance Indicators (KPIs) that reflect community interests. Additionally, ensuring the community's composition includes diverse expertise and resources is crucial for successful execution.

B. Social Dynamics: Communication

Transparent and inclusive communication strategies are essential for fostering community engagement. Communication efforts should cater to the diverse needs and

literacy levels of community members while maintaining transparency, especially in interactions involving commercial interests. Developing a communication strategy aligned with engagement goals and target group characteristics is vital. Offering accessible helpdesk support further enhances communication channels and encourages community involvement.

C. Technical: Product and Service Development

Adopting a design thinking approach facilitates the development of energy products and services that resonate with community needs and values. Central to this approach is respecting users' autonomy and providing them with relevant information to make informed decisions. Products and services should prioritize user experience, incorporating elements like gamification to enhance engagement while moderating user effort. Additionally, scalability and business model viability are key considerations for ensuring long-term success and market relevance.

D. Administration

Adhering to GDPR guidelines for data handling ensures responsible management of information associated with EC activities. Clear protocols for data access, consent, control, and anonymization should be established, in compliance with national interpretations of European standards. Efficient administrative practices, including cost tracking and billing, should be implemented early on, with considerations for outsourcing administrative tasks if necessary. Providing transparent cost overviews and savings projections to community members fosters trust and accountability.

E. Economic Viability: Sustainability and Growth

Sustainability and growth are central to the long-term success of ECs. Economic viability ensures that energy products and services remain accessible and beneficial to both the community and stakeholders. Strategies for achieving economic viability include identifying opportunities for revenue generation, optimizing resource allocation, and fostering collaboration with commercial partners. Moreover, cultivating a supportive regulatory environment and leveraging economies of scale contribute to the sustainability and growth of EC initiatives.

F. Environmental Impact: Promoting Renewable Energy Adoption

Promoting renewable energy adoption is a core objective of ECs, aiming to reduce carbon emissions and mitigate climate change. Best practices in this area include deploying innovative technologies, such as smart grids and energy storage systems, to optimize energy generation, distribution, and consumption. Additionally, fostering community engagement and education programs raise awareness about the environmental benefits of renewable energy and encourage sustainable behaviours.

G. Social Equity: Ensuring Inclusive and Equitable Participation

Ensuring inclusive and equitable participation is fundamental to the social equity goals of ECs. Best practices involve actively engaging marginalized or underrepresented groups within the community, ensuring their voices are heard in decision-making processes. Moreover, implementing policies and programs that prioritize affordability and accessibility of energy services promote social equity and

empower all community members to benefit from EC initiatives.

IV. ORGANIZATION FRAMEWORK IN CASE STUDIES

A. Motivation

Engagement in ECs is driven by various motivations, each contributing to the shared goal of reducing energy costs and dependence on traditional energy systems. Across all pilots in the COMMUNITAS project, decarbonization and supporting the transition to renewable energy sources emerge as central motivations. Additionally, motivations such as enhancing comfort, fostering social cohesion, avoiding network congestion, setting an example for others, ensuring thermal comfort, activating citizens, preparing for future opportunities related to ECs, improving overall well-being, gaining insights into consumption patterns, enhancing energy literacy, and adopting more efficient technologies are commonly cited drivers for EC participation.

In Bornholm, for instance, a significant driver for engagement is the desire to decrease reliance on oil boilers due to their associated odour and safety concerns. The prospect of transitioning away from oil boilers serves as a compelling incentive for community members to participate actively in EC initiatives. These diverse motivations not only underscore the multifaceted nature of engagement but also highlight the potential for varied strategies to stimulate and sustain community involvement.

The scope of EC activities also plays a pivotal role in motivating participation. While most participating communities primarily focus on energy-related services, offering opportunities such as collective solar roofs and heat networks, the Spanish pilot stands out as a notable exception. With roots dating back to 1925, this longstanding initiative boasts a large and diverse membership base, engaging in a wide array of activities beyond the energy domain. In addition to energy services, the cooperative organizes cultural events, supports healthcare facilities, fosters sports activities, and contributes to local museums. Proceeds generated from energy-related endeavours are reinvested into social initiatives, further reinforcing community bonds and collective well-being. Moreover, the cooperative is exploring the inclusion of water-related initiatives, recognizing the importance of water conservation in the region.

Similarly, other pilots' express interest in addressing broader social issues within their communities, such as reducing poverty, alleviating loneliness, enhancing health and well-being, and promoting social cohesion. These aspirations reflect a holistic approach to community development, recognizing the interconnectedness of energy-related challenges with broader societal concerns. By addressing these multifaceted issues, ECs have the potential to serve as catalysts for positive change, fostering resilient and inclusive communities.

The varying motivations and scopes of ECs underscore the importance of tailoring engagement strategies to align with community needs and interests. Recognizing the diverse drivers of participation enables stakeholders to design initiatives that resonate with community members and foster sustained engagement. Moreover, by embracing a holistic

approach that integrates energy-related activities with broader social and environmental objectives, ECs can maximize their impact and contribute to the creation of vibrant and sustainable communities.

B. Methodology

In COMMUNITAS, a mixed methods approach was employed to comprehensively gather information and substantiate the identified topics outlined in chapter 2. This methodological approach involved key steps:

Development of Questionnaire and Workshops: The initial step involved developing a questionnaire to explore the experiences with methodologies, methods, tools, and regulatory frameworks in the pilots. Workshops were then conducted to further delve into these topics and gather insights. These workshops provided a platform to discuss the past, ongoing, and future engagement activities within the pilots, as well as the community's needs for these activities. A similar work was conducted in the DATA CELLAR project [20], when an online survey was designed to ask identified stakeholders, among a series of topics, their literacy in EC-related subjects. This survey served as a basis for the elaboration of the questionnaires sent to participants prior to the workshops.

Social Innovation Explorations: Another crucial component of the mixed methods approach was the implementation of Social Innovation Explorations. This involved inquiry into the values, needs, and desires of citizens/EC members concerning engagement and technological propositions.

Workshop and Pre-form Questionnaire: The initial insights were obtained through a short pre-form questionnaire and subsequent workshops held within each EC. The COMMUNITAS D1.1 report [21] extensively detailed these workshops, questionnaires, and their outcomes.

The primary objective of the workshops and pre-form questionnaire was to directly gather insights from EC members and coordinators. EC members were queried about their motivations, expectations, challenges, successes, activities, and experiences within the EC. Similarly, EC coordinators provided insights into their motivations, challenges, successes, and experiences. This information served as an initial step towards listing and characterizing the needs, desires, and recommendations of EC stakeholders concerning the formation, expansion, and sustainability of ECs. These encompassed various aspects such as data collection, pricing mechanisms, regulatory support, engagement methods, and technical and financial tools.

The pre-form questionnaire was collaboratively developed by EDP and TNO, with a list of questions condensed to six key inquiries. These questions underwent review and refinement during an online meeting with local partners, leading to several amendments. Subsequently, each organization's team translated the questionnaire into the local language and distributed it digitally to EC members and coordinators. The outcomes of the questionnaire were then discussed during the workshops, providing valuable insights for further analysis and action.

C. Case studies and stakeholders involved

Within the COMMUNITAS project, a total of eight pilots are actively participating. These pilots are categorized into

three distinct groups based on their developmental stage and specific interests within the project:

Leader pilots: Located in Spain (Crevillent), Italy (Primiero Valley), and the Netherlands (Groningen), these three pilots represent already-operational energy communities. They serve as key testing grounds for all COMMUNITAS tools, aiming to assess their effectiveness and applicability within established ECs.

Learner pilots: Situated in Portugal (Cascais), Denmark (Hyllegaard Høje), and Greece (Halkidiki), the learner pilots are keen to glean insights from the leader pilots' experiences with COMMUNITAS tools. Their primary objective is to observe and learn from the application of these tools in leader pilot contexts, subsequently adopting those deemed useful, viable, and applicable to their own pilot sites. These learner pilots will also be included in later evaluations of COMMUNITAS tools in WP4.

Listener pilots: Found in Croatia (Zagreb) and Denmark (Sun Gate), the listener pilots are positioned to potentially evolve into fully-fledged ECs. Their focus lies in exploring and demonstrating solutions relevant to their pilot areas, with the possibility of partially replicating successful approaches from leader pilots. This adaptation will be guided by the specific needs and developmental stages of each EC.

It is noteworthy that in the Netherlands, apart from the Buurtwarmte pilot, additional activities were conducted in Loppersum, an existing EC in the northern region, where Grunneger Power is actively engaged in various initiatives.

Fig. 3 summarises the general characteristics of the pilots participating in COMMUNITAS.

V. RESULTS AND INSIGHTS COLLECTED

The mixed method approach, including workshops with all pilots' members, has resulted in an overview of practices and challenges of ECs in relation to the engagement of their members and the development of tools and services to support their activities:

A. Legislation and Regulation for ECs

All COMMUNITAS pilots express a keen interest in evolving legal frameworks at the European level and their implications on national EC operations. Concerns include the criteria for EC recognition, self-consumption regulations, and local energy supply limitations. Regulatory hurdles, such as lengthy approval processes and unclear definitions, hinder EC establishment and operation in several countries, including Italy, Portugal, and Croatia.

B. Initiation: Top-Down or Bottom-Up

Pilots exhibit varying initiation approaches, ranging from bottom-up citizen-driven initiatives to top-down efforts led by government or utility companies. Each approach has unique advantages and challenges, impacting the pace of development and community engagement. For instance, bottom-up initiatives prioritize member involvement from the outset, fostering a sense of ownership and participation, while top-down initiatives benefit from resource availability but may face engagement challenges.

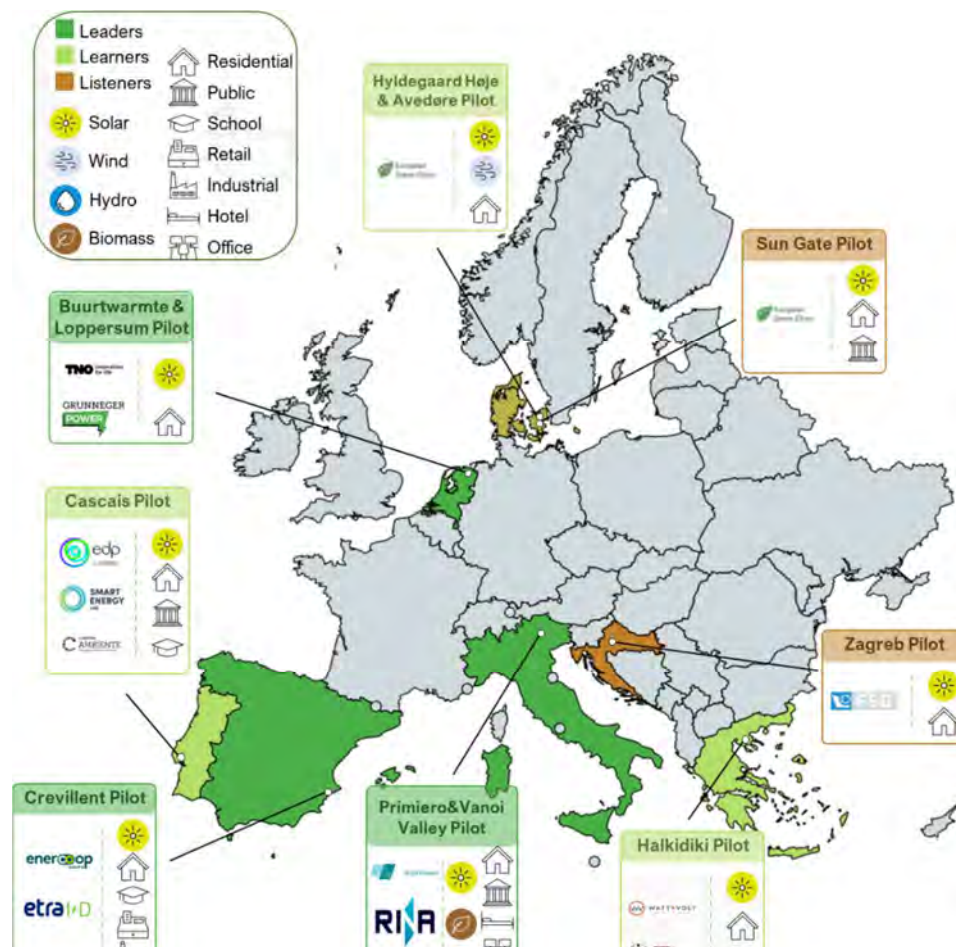


Fig. 3. Pilots participating in COMMUNITAS and their general characteristics.

C. Governance/Organization of the Community

Governance structures within ECs vary significantly based on pilot maturity and development stage. Established initiatives like the Spanish cooperative in Crevillent have well-defined structures, while newer initiatives, such as those in Portugal and Greece, are still in the process of formalizing governance arrangements.

D. Becoming a Member and Inclusion

Membership processes differ across pilots, with variations in entry requirements and opt-out procedures. Some ECs, like Hyllegaard Høje in Denmark, tie membership to property ownership, while others, such as Primiero & Vanoi Valley in Italy, automatically enrol connected households. Inclusion considerations encompass accessibility and participation opportunities for diverse community segments.

E. Knowledge and Awareness of ECs: EC Literacy, Energy Literacy, Digital Literacy

Limited awareness and understanding of EC concepts and benefits are common challenges across pilots. Initiatives aim to enhance EC literacy, energy literacy, and digital literacy through targeted educational efforts. Strategies include workshops, school presentations, and digital communication channels tailored to diverse user groups.

F. Communication-User Types

Effective communication strategies address the diverse needs and preferences of community members. Pilots employ multiple channels, including social media, public information displays, and mobile apps, to disseminate information and engage residents. Tailored approaches accommodate different age demographics and communication preferences, ensuring broad outreach.

G. Engagement-User Types

Engagement strategies seek to transition members from passive involvement to active participation in EC activities. Challenges include sustaining engagement levels and catering to diverse user needs. Initiatives prioritize awareness-raising, participatory workshops, and community-driven events to foster collaboration and commitment.

H. Challenges From Pilot's Perspective

Social Dynamics: One of the primary challenges faced by Energy Communities (ECs) lies in navigating the complex social dynamics inherent in their operation. Effective governance structures are paramount for ECs to function smoothly, requiring facilitation of discussions and organization of decision-making processes. Moreover, managing stakeholders within the community poses significant challenges, necessitating the acquisition of the right mandate, legitimacy, and support from EC members for the EC board. Additionally, determining the role and place of ECs within the broader energy system is crucial yet challenging. ECs often find themselves dependent on various stakeholders such as government entities, Distribution System Operators (DSOs), aggregators, and Energy Service Companies (ESCOs). Coordinating activities with these entities and obtaining influence within the energy system can be daunting tasks. Furthermore, developing effective communication strategies tailored to different types of community members is essential for fostering participation and sustaining EC initiatives. Similarly, devising engagement strategies that strike a balance between time and effort is

critical for ensuring continued involvement of EC members. This entails exploring various methods and tools for raising awareness and engaging members both initially and over the long term. Additionally, educational initiatives aimed at enhancing EC members' literacy on ECs, energy, and digital technology play a vital role in ensuring the success and sustainability of EC projects.

Legislation and Regulations: Navigating the legal landscape is another significant challenge faced by ECs, with regulatory frameworks at both national and European levels posing hurdles. Staying updated on legislation and understanding its implications for ECs is essential for compliance and success. Furthermore, securing access to the public grid for small-scale producers within ECs is a crucial aspect of their viability. Adapting to regulatory frameworks and learning from the experiences of other ECs can help pilot projects overcome regulatory challenges and achieve their goals, such as energy sharing and community empowerment.

Financial: Financial sustainability is a key concern for ECs, necessitating the development of viable business models that can sustain operations in the long term. However, accessing financing for EC projects can be challenging, as they may struggle to secure funding sources for their establishment and ongoing operation. Finding innovative solutions to financial challenges and exploring alternative funding mechanisms are essential for the success of EC initiatives.

Administration: Streamlining administrative processes and billing systems is essential for reducing the burden on EC members and ensuring smooth operation. Many members may feel overwhelmed by additional administrative tasks and bureaucracy, highlighting the need for efficient and user-friendly administrative procedures. Standardizing administration and billing processes to be cost-effective and inclusive, while also incorporating digital solutions where feasible, can enhance efficiency and member satisfaction.

Technical: Keeping pace with technological innovations in energy generation, distribution, and management is crucial for the success and sustainability of ECs. Understanding and integrating innovative solutions can enhance the effectiveness and resilience of EC initiatives, allowing them to adapt to changing energy landscapes and emerging challenges. However, staying abreast of technological developments and implementing new technologies effectively require significant investment in research, training, and infrastructure.

VI. CONCLUSIONS

The journey of ECs within the COMMUNITAS project has illuminated several key insights into the development, challenges, and potential pathways towards resilient and sustainable community energy initiatives. As we reflect on the findings and experiences shared by the participating pilots, several overarching conclusions emerge, providing valuable guidance for future endeavours in community energy development.

The development process of ECs is inherently dynamic and iterative, characterized by a non-linear trajectory from initiation to exploitation. While existing literature offers a framework comprising five distinct phases, the experiences of COMMUNITAS pilots underscore the need for flexibility and adaptability in navigating this journey. Each EC project presents its unique set of challenges and opportunities, shaped

by factors such as initiation approach (top-down or bottom-up), size, composition, organizational structure, communication methods, and cultural context. Embracing this fuzziness and adopting an agile approach is essential for fostering resilience and success in EC development.

Across Europe, ECs exhibit both similarities and differences, reflecting the diverse socio-cultural, economic, and regulatory landscapes within which they operate. While commonalities exist in their overarching goals of community empowerment, renewable energy adoption, and sustainable development, variations abound in initiation processes, organizational structures, communication strategies, and cultural norms. Recognizing and embracing this diversity is crucial for tailoring strategies and interventions to suit the specific contexts and needs of individual ECs, fostering inclusivity and ownership among community members.

A stringent interpretation of legal definitions poses challenges for many ECs, with only a few qualifying as energy communities in terms of the Clean Energy Package. Issues surrounding openness, voluntariness, and membership dynamics present hurdles, particularly during the conception and early stages of development. Navigating complex legislation and administrative tasks remains a persistent challenge for pilots, highlighting the need for streamlined processes and supportive regulatory frameworks conducive to community energy initiatives.

Effective engagement strategies are paramount for fostering awareness, participation, and sustained involvement within ECs. Tailoring engagement approaches to the unique needs and characteristics of different community segments, whether top-down or bottom-up initiatives, is essential for cultivating a sense of ownership and commitment among members. Strategies for sustaining engagement in larger groups, reaching marginalized populations, and catering to diverse demographics are key areas of focus for ECs seeking to maximize community participation.

Establishing robust governance structures and organizational frameworks is essential for the effective operation of ECs. Clear delineation of roles, decision-making processes, rights, and obligations is crucial for fostering transparency, accountability, and trust within the community. However, many pilots grapple with the complexities of governance, underscoring the importance of establishing legal entities and formalizing structures early in the development process.

Access to comprehensive data on the needs, desires, and values of community members is essential for informed decision-making and the development of tailored activities and services. Pilots express a need for educational tools to enhance members' understanding of ECs, energy literacy, and digital skills, facilitating greater participation and engagement.

Lastly, clear, regular, and honest communication is essential for building trust, managing expectations, and aligning stakeholders' interests within ECs. Robust communication strategies and tools are required to facilitate dialogue, disseminate information, and prevent misunderstandings, fostering a culture of transparency and collaboration.

Moving forward, the insights gleaned from this endeavour will be harnessed and evaluated through participatory

laboratories, ensuring that lessons learned are translated into actionable outcomes, driving the advancement of community energy initiatives across Europe and beyond.

ACKNOWLEDGMENT

This research was partly funded by the European Union's Horizon Europe programme as part of the COMMUNITAS project ("Bound to accelerate the roll-out and expansion of Energy Communities and empower consumers as fully fledged energy market players"), Grant Agreement 101096508 and DATA CELLAR ("Data hub for the Creation of Energy communities at Local Level and to Advance Research on them"), Grant Agreement 101069694.

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U21870-UCC-CE-0688

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Question:

4.Refer to Consumer Energy Co's Response to UCC's First Discovery Request, U21870-UCC-CE-236_ATT_1.
Is the Company seeking to recover membership dues for any nondiscretionary memberships? If yes, please provide a list of all nondiscretionary organizations and how much the Company is seeking to recover for each organization.

Response:

The Company is not seeking to recover membership dues for any nondiscretionary memberships.

Witness: Matthew J. Foster

Date: September 19, 2025

U21870-UCC-CE-0236

Page 1 of 1

Question:

4. Refer to Direct Testimony of Matthew J. Foster at Pages 3-5, where the witness mentions Corporate Services expenses, specifically "trade association dues and memberships".
- a. Please provide a list of all the Company's corporate memberships, include the cost of each membership that the Company is requesting to recover in this case, and clarify which memberships are discretionary and which are non-discretionary.
 - b. Please point to where the costs of the Company's various memberships are outlined in the Company's testimony and application.

Response:

Please see U21870-UCC-CE-0236_ATT_1.

Although Edison Electric Institute (EEI) costs could be considered discretionary, the membership provides value to Consumers Energy customers through Mutual Assistance coordination to quickly secure resources for storm restoration. The electric utility industry has no other mutual assistance structure. Other benefits from the EEI membership include utility benchmarking, best practices, and research.

Michigan Electric and Gas Association (MEGA) costs could be considered discretionary. MEGA provides value to Consumers Energy customers by working with the Michigan legislature, federal and state regulatory agencies, and the entire Michigan energy industry to ensure safe, reliable, and affordable electric utility service.

Keystone Policy Center costs could be considered discretionary. The Keystone Policy Center provides value to Consumers Energy customers providing utility benchmarking, best practices, and research with a focus on environmental issues and renewable energy standards.

Chamber of Commerce costs could be considered discretionary. Chamber of Commerce memberships help Consumers Energy promote continued economic growth, connect with business customers, and support community engagement.

Witness: Matthew J. Foster

Date: August 25, 2025

SCR Workpaper 2

Data from A-91 (MJF-2)

Line No.	Description	12 Mos Ending 4/30/2027 Projected
2	Sustainability & External Affairs	\$5,277
11	Administration & Other-Electric Portion	\$3,076
		\$8,353

ISSUES & POLICY

Reliability, Resilience & Emergency Response

Overview

EEI's member companies are committed to providing the electricity that powers our economy and our way of life. The electric power industry has a strong track record of maintaining high levels of reliability. However, incidents such as hurricanes, wildfires, or earthquakes can impact the energy grid and cause widespread power outages.

That is why electric companies invest in resilience and undertake power restoration and business continuity planning year-round to prepare for all types of emergencies. EEI supports member companies by identifying and promoting best practices through benchmark efforts and forums and finds collective solutions to business continuity programs, processes, and projects across the industry and companies. Additionally, companies regularly exercise and drill to prepare for cyber and physical attacks against the energy grid and significant outages caused by severe weather events.

Restoring electricity after a major storm or other disruption is a complex task, and a safe and efficient restoration requires significant logistical expertise, skilled lineworkers, and specialized equipment. Electric companies affected by significant outages often turn to the industry's mutual assistance network—a voluntary partnership of electric companies from across the country—to help speed restoration.

[Preparing for Power Outages](#)

The Steps To The Power Restoration Process

Every electric company has a detailed plan for restoring power after storms. Typically, one of the first steps is to make sure that power is no longer flowing through downed lines.

Restoration then proceeds based on established priorities. Below are the steps to restore power after a storm. [Learn More](#).

Step 1



Step 2



Mutual Assistance and Storm Response

Mutual assistance is an essential part of the electric power industry's service restoration process and contingency planning. EEI's mutual assistance program is a voluntary partnership of investor-owned electric companies across the country committed to helping restore power whenever and wherever assistance is needed.

Through mutual assistance, electric companies impacted by a major outage event can request help from electric companies across the country. When called upon, a company will send skilled restoration workers—both company employees and contractors—along with specialized equipment to help with the restoration efforts of a fellow company.

The goal of the mutual assistance program is to restore electric service in a safe, effective manner. Mutual assistance partnerships also allow companies to share best practices and technologies that help the industry improve its ability to prepare for—and respond to—

emergencies; and enable a consistent, unified response to emergency events.

[Understanding the Electric Power Industry's Response and Restoration Process](#)

[Mutual Assistance: 5 Things to Know](#)

[EI Mutual Assistance Agreement and Suggested Governing Principles Covering Emergency Assistance Arrangement Between EI Member Companies](#)

[EI Emergency Response Programs and Playbooks](#)

Spare Equipment and Grid Resilience Programs

Electric companies plan for all types of contingencies, and they own and have access to spare equipment as part of their business continuity planning. For example, companies, on an individual basis, own hundreds of additional spare transformers, and other equipment. In addition, just as energy companies share crews as part of the industry's voluntary mutual assistance programs to restore power, they also regularly share transformers and other equipment.

[Spare Equipment and Grid Resilience](#)

Undergrounding

The nation's electric transmission and distribution systems deliver power along millions of miles of lines to neighborhoods, businesses, and customers. These lines are both overhead and underground.

Following any major storm or event that affects many customers or that damages a large part of the energy grid, it is common for customers, public officials, and the media to question whether underground electrical infrastructure would resolve or substantially mitigate weather-related outages.

There are many localized issues that electric companies, policymakers, and community leaders need to consider to assess the feasibility of transitioning from an overhead system to an underground system.

ESCC and Industry Partnerships

The Electricity Subsector Coordinating Council (ESCC) serves as the principal liaison between the federal government and the electric power industry on efforts to prepare for, and respond to, national-level disasters or threats to critical infrastructure. During storms, wildfires, and other incidents, EEI works through the CEO-led ESCC to coordinate with government partners at the Department of Energy, the Department of Homeland Security, and the National Security Council to ensure that industry and government efforts are aligned.

[Visit The ESCC Website](#)

Uncrewed Aircraft Systems

New technologies like Uncrewed Aircraft Systems (UAS) or “drones” are increasingly an important tool for electric companies’ resilience and reliability programs. EEI and its member companies are advancing these technologies through testing and innovative use, supporting effective legislation and regulations for UAS and by sharing knowledge among member companies to safely, legally, efficiently, and intelligently integrate UAS technologies into electric company operations.

Members-Only Resources

EEI ISSUE COMMUNITIES

The EEI Issue Communities provide members with an online forum to facilitate policy development, information exchange and networking. Members can communicate and

share ideas, participate in discussion forums, send email blasts, create file libraries, organize conference calls, and keep track of important dates and upcoming events.

[Learn More](#)

COMMUNICATION TOOLS

[Industry Response and Restoration Communication Tools](#)

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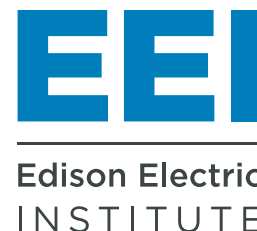
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2025 Lobbying, Advocacy, and Other Expenditures

April 2025

The Edison Electric Institute (EEI) is the trade association that represents all U.S. investor-owned electric companies. EEI's member companies provide electricity for nearly 250 million Americans and operate in all 50 states and the District of Columbia.

EEI's member companies provide the reliable, affordable, and resilient clean energy that drives our economy and powers communities and customers across the country. The electric power industry supports more than 7 million jobs and contributes at least 5 percent annually to our nation's GDP.

In addition to our U.S. members, EEI has more than 70 international electric companies as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums that drive industry innovation and collaboration.

Leading the Way to a Reliable, Secure Energy Future

We depend on electricity to run our economy and to power our daily lives. EEI's member companies know that their customers are counting on them to deliver this energy safely, 24 hours a day, 365 days a year, when and where it's needed.

Across the country, EEI's member companies are hard at work meeting today's energy challenges. They're strengthening and securing the energy grid to meet growing demand and to reduce outages and recover faster when they happen. They're advancing energy innovation while working to keep customer bills as low as possible and to meet the needs of their communities. And, they're using a diverse, balanced, and domestic energy mix that is increasingly clean and helps ensure reliability.

Thanks largely to the leadership of EEI's member companies, carbon emissions from the U.S. electric power sector today are as low as they were nearly 50 years ago, while electricity use has more than doubled since then.

With electricity demand growing at the fastest pace in decades, EEI's member companies are positioned to lead and to meet this demand safely and reliably.

Our Federal and State Policy Activities

EEl's member companies are among the most regulated companies in the country, and EEl engages on their behalf with federal and state legislators, regulators, and other policymakers through lobbying, advocacy, and regulatory proceedings, with the goal of providing customers with the affordable, reliable, and resilient clean energy they need and expect.

EEl also engages with a range of other industry stakeholders on issues related to grid reliability; cyber and physical security; mutual assistance and disaster response; finance and tax matters; and programs, services, and solutions for electricity customers.

EEl's Core Budget

EEl's core budget is funded through member dues. EEl's Board of Directors approves EEl's budget annually, including any increase in dues and expected expenditures. In general, the dues a company pays are a function of its average number of customers, total revenues attributed to its electric operations, and owned generating capacity. For transmission-only members, dues reflect total revenues attributed to electric operations and to transmission and distribution year-end assets that are either wholly or jointly owned.

Total dues revenue for 2025 is anticipated to be \$63.8 million; non-dues revenue, from meetings, publications, and international and associate memberships, is expected to be \$21.5 million.

EEl's core budget is devoted to business and policy issues that support our member companies' commitment to providing affordable, reliable, and resilient clean energy to the customers and communities they serve. The budget includes employee salaries and benefits, general office expenses and overhead, and programs and activities.

EEl's Board of Directors approved core budget expenditures by issue area for 2025 as follows:

Business and Policy Issues	Core 2025 Expense Budget <i>(in millions of \$s)</i>
Clean Energy, Climate & Environmental Regulations	14.4
Grid Security, Reliability, and Resilience	11.6
Grid Investment & Modernization	8.3
Customer Issues and Electric Transportation	8.3
Finance and Taxes	7.5
Member Services	5.5
Human Resources/Workforce Development	4.2
FERC and State Regulatory Policy	4.0
Total	63.8

Lobbying Expenditures and Disclosure

EEL reports its lobbying expenses to Congress as required by federal law via the quarterly filing of Lobbying Disclosure Reports. EEL uses the definitions provided by both the Lobbying Disclosure Act and the Internal Revenue Code (IRC) section 162(e) to identify lobbying expenses. This includes both federal lobbying and state-level lobbying and grassroots advocacy.

Following are links to EEL's lobbying disclosure reports for 2024:

- [Quarter 1](#)
- [Quarter 2](#)
- [Quarter 3](#)
- [Quarter 4](#)

EEL estimates the amount of member dues that likely will be spent on lobbying each year and provides that percentage to members as part of their annual dues invoice. EEL provides an actual percentage at the end of the year after all reports have been filed.

In 2024, 14.1 percent of EEL dues were used for lobbying activities. For 2025, we estimate a similar amount.

In addition, EEL runs the Political Action Committee (PAC) known as PowerPAC. PowerPAC is funded by contributions made by EEL member companies, member company executives and other employees, and eligible EEL employees. EEL matches employee PowerPAC contributions, directed to the charity of an employee's choice. In 2024, the PowerPAC match was approximately \$57,400 and came from EEL's core budget.

PowerPAC reports its activities to the Federal Election Commission (FEC) every month as required by law. These reports can be found on the [FEC website](#).

Contributions

EEL makes contributions to various political and charitable groups, including IRC section 501(c)(4) and section 527 organizations. The amounts for the 501(c)(4) and section 527 organizations are included in the amounts EEL reports to members as lobbying expenses. The 2024 contributions to these groups totaled approximately \$822,000. A similar contributions budget is expected for 2025.

A complete list of the groups to which EEL makes contributions that are greater than \$5,000 is reported each year on the Form 990, Return of Organization Exempt From Income Tax, filed with the Internal Revenue Service.

EEL's 2024 Form 990 will be filed in November 2025. The 2023 Form 990 can be found [here](#).

Organizations to which EEL contributed more than \$5,000 in 2023 include:

■ African American Mayors Association	■ American Benefits Council
■ All Hazards Consortium	■ American Cancer Society
■ Alliance to Save Energy	■ American Gas Association
■ Alzheimer's Association	■ American Legislative Exchange Council
■ American Association of Blacks in Energy	■ American Society of Association Executives

(continued)

(Contributions, continued)

- Americans for Tax Reform*
- Business Council for Sustainable Energy
- Center for Energy Workforce Development
- Citizens Against Government Waste
- Citizens for Responsible Energy Solutions*
- Commercial Drone Alliance
- Community Leaders of America [†]
- Conference of Western Attorneys General
- Congressional Black Caucus Institute*
- Congressional Hispanic Caucus Institute, Inc.
- Congressional Hispanic Leadership Institute, Inc.
- Congressional Sports for Charity
- Consumer Energy Alliance*
- Democratic Attorneys General Association [†]
- Democratic Governors Association [†]
- Democratic Legislative Campaign Committee [†]
- Democratic Mayors Association [†]
- Electric Drive Transportation Association
- Electrical Safety Foundation International
- Environmental Council of the States
- Forth Mobility Fund
- Freight Rail Customer Alliance
- GOPAC, Inc. [†]
- Hispanics for Energy
- Horton's Kids, Inc.
- Institute for Energy Research
- J Street Cup DBA NGS Invitational
- Keystone Policy Center
- Maine Affordable Energy [†]
- March on Washington Film Festival
- Mid-America Regulatory Conference, Inc.
- Mid-Atlantic Conference of Regulatory Utilities Commissioners
- NALEO Educational Fund
- National Association of Counties*
- National Association of Manufacturers
- National Association of Regulatory Utility Commissioners*
- National Association of State Energy Officials
- National Association of State Utility Consumer Advocates*
- National Black Caucus of State Legislators
- National Capital Area Council Boy Scouts of America
- National Conference of State Legislatures
- National Democratic Club
- National Endangered Species Act Reform Coalition
- National Energy & Utility Affordability Coalition
- National Energy Resources Organization
- National Foundation for Women Legislators
- National Governors Association
- National Hispanic Caucus of State Legislators
- National Labor & Management Public Affairs Committee
- National League of Cities*
- National Multiple Sclerosis Society
- National Organization of Black Elected Legislative Women
- National Urban League, Inc.
- NCSL Foundation for State Legislatures
- New England Conference of Public Utilities Commissioners
- No Blank Checks [†]
- North American Electric Reliability Corporation
- North American Energy Standards Board
- Northwestern University
- Prevent Cancer Foundation
- Public Affairs Council*
- Republican Governors Association [†]

(continued)

(Contributions, continued)

- Republican State Leadership Committee [†]
- Resources for the Future, Inc.
- Roosevelt Institute
- Senate Presidents' Forum
- Sexual Minority Youth Assistance League, Inc.
- So Others Might Eat
- Southeastern Association of Regulatory Utility Commissioners
- Southern States Energy Board
- St. Coletta of Greater Washington
- Taxpayers Protection Alliance*
- The American Consumer Institute Center for Citizen Research
- The Artists and Athletes Alliance
- The Aspen Institute
- The Congressional Institute*
- The Council of State Governments
- The Latino Coalition
- The Peregrine Fund, Inc.
- The Permitting Institute
- United States Conference of Mayors
- United States Hispanic Chamber of Commerce
- University of Missouri-FRI/PUD
- U.S. Chamber of Commerce
- U.S. Navy Memorial Foundation
- Washington Humane Society
- Washington State Society
- Washington Tennis & Education Foundation
- Western Conference of Public Service Commissioners
- Western Governors' Association
- Women's Energy Summit

* 501(c)(4) organization

[†] Section 527 entity

Separately Funded Activities

Some EEI member companies choose to pay for separate activities and programs that fall outside of the core EEI budget. EEI runs these programs for the benefit of these members. These activities and their expected budgets for 2025 are noted below.

For a fee, members and other electric companies can access a range of employment tests that are validated specifically for job functions within the electric industry, including power plant operators, maintenance and craft positions, power dispatching positions, and customer service representatives, among others. Fees are based on the size of the company. These funds are not used for lobbying or advocacy. More information about the Employment Testing Consortium can be found [here](#).

In addition, most EEI member companies contribute to the Restoration, Operations, and Crisis Management Program (Restore Power), which focuses on improvements to industry-wide responses to major outages; continuity of industry and business operations; and EEI's all hazards (storms, wildfires, cyber, etc.) support and coordination of the industry during times of crisis. Contributions to Restore Power depend on the number of customers a member company has, with a maximum contribution of \$15,000 annually. These funds are not used for lobbying or advocacy.

In 2006, federal energy regulators approved the Spare Transformer Equipment Program (STEP), an electric industry program that strengthens the sector's ability to restore the nation's transmission system more quickly in the event of a terrorist attack. STEP represents a coordinated approach to increasing the industry's inventory of spare transformers and to streamlining the process of transferring those transformers to affected companies in the event of a transmission outage caused by a terrorist attack. To participate in STEP, members make an annual voluntary contribution of not more than \$8,500. These funds are not used for lobbying or advocacy. More information about STEP can be found [here](#).

Activity	Budget (\$s)
Employment Testing Consortium	3,454,000
Restoration, Operations & Crisis Management (Restore Power)	589,000
Spare Transformer Equipment Program	416,000

Emerging Issues

Many EEI member companies choose to make an additional annual contribution of 10 percent of their dues to an emerging issues fund. This fund, controlled by EEI's President & CEO, is designed to allow EEI to respond to issues that were not expected and could not be planned for during the normal budgeting process. In addition, these funds are used to pay for political consultants, litigation expenses, and engagement in state legislation and policy matters.

The 2025 emerging issues budget is \$6 million.

Some of these funds are used for any advertising that EEI does, particularly social media ads designed to educate the public about power restoration events; public and media relations; and public opinion polling. In 2024, approximately \$136,000 was spent on advertising, including social media ads and radio spots designed to educate the public about power restoration events; approximately \$625,000 was spent on public and media relations. For 2025, these expenses are expected to be similar.

EEI estimates the amount of funds in the emerging issues budget that likely will be spent on lobbying each year and provides that percentage to members as part of their annual dues invoice. EEI provides an actual percentage at the end of the year.

In 2024, 29.9 percent of these funds were used on lobbying activities. For 2025, EEI estimates that this amount will be about the same.

Charitable Organizations and Foundations

EEI has two associated IRC section 501(c)(3) organizations: The Center for Energy Workforce Development (CEWD) and The Thomas Alva Edison Foundation (Edison Foundation).

EEI pays dues of \$100,000 to CEWD annually. These funds are from the core budget. In 2025, EEI anticipates providing \$300,000 of in-kind support to CEWD in the form of administrative, accounting, and legal support services.

EEI does not make any contributions to the Edison Foundation, nor do we anticipate providing any in-kind support in 2025.

EEI member companies can choose to support these organizations via separate voluntary contributions. To learn more about these groups, visit:

[The Center for Energy Workforce Development](#)

[The Edison Foundation](#)

About EEI

The **Edison Electric Institute** (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for nearly 250 million Americans, and operate in all 50 states and the District of Columbia. As a whole, the electric power industry supports more than 7 million jobs in communities across the United States. In addition to our U.S. members, EEI has more than 70 international electric companies with operations in more than 90 countries, as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.

For more information, visit our Web site at **www.eei.org**.

Contact

Victoria Calderon

Corporate Counsel

vcalderon@eei.org

202-508-5757

April 2025



Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, DC 20004-2696
202-508-5000 | www.eei.org



/EdisonElectricInstitute



@Edison_Electric



Edison Electric Institute

efile Public Visual Render

ObjectID: 202423209349328602 - Submission: 2024-11-15

TIN: 13-0659550

Form 990

Department of the Treasury
Internal Revenue Service

Return of Organization Exempt From Income Tax

Under section 501(c), 527, or 4947(a)(1) of the Internal Revenue Code (except private foundations)
Do not enter social security numbers on this form as it may be made public.
Go to www.irs.gov/Form990 for instructions and the latest information.

OMB No. 1545-0047
2023
Open to Public Inspection

A For the 2023 calendar year, or tax year beginning 01-01-2023 , and ending 12-31-2023

B Check if applicable:
☐ Address change
☐ Name change
☐ Initial return
☐ Final return/terminated
☐ Amended return
☐ Application pending

C Name of organization
EDISON ELECTRIC INSTITUTE INC

Doing business as

Number and street (or P.O. box if mail is not delivered to street address) Room/suite
701 PENNSYLVANIA AVENUE NW

City or town, state or province, country, and ZIP or foreign postal code
WASHINGTON, DC 200042696

D Employer identification number
13-0659550

E Telephone number
(202) 508-5000

G Gross receipts \$ 305,724,750

F Name and address of principal officer:
PATRICIA VINCENT-COLLAWN
701 PENNSYLVANIA AVENUE NW
WASHINGTON, DC 200042696

H(a) Is this a group return for subordinates? ☐ Yes ☒ No
H(b) Are all subordinates included? ☐ Yes ☐ No
If "No," attach a list. See instructions.
H(c) Group exemption number

I Tax-exempt status: ☐ 501(c)(3) ☒ 501(c) (6) (insert no.) ☐ 4947(a)(1) or ☐ 527

J Website: WWW.EEI.ORG

K Form of organization: ☒ Corporation ☐ Trust ☐ Association ☐ Other

L Year of formation: 1933 **M** State of legal domicile: VA

Part I Summary			
Activities & Governance	1 Briefly describe the organization's mission or most significant activities: THE EDISON ELECTRIC INSTITUTE (EEI) IS THE ASSOCIATION THAT REPRESENTS ALL U.S. INVESTOR-OWNED ELECTRIC COMPANIES. OUR MEMBERS PROVIDE ELECTRICITY FOR MORE THAN 250 MILLION AMERICANS, AND OPERATE IN ALL 50 STATES AND THE DISTRICT OF COLUMBIA. THE ELECTRIC POWER INDUSTRY SUPPORTS MORE THAN 7 MILLION JOBS IN COMMUNITIES ACROSS THE UNITED STATES. IN ADDITION TO OUR U.S. MEMBERS, EEI HAS MORE THAN 70 INTERNATIONAL ELECTRIC COMPANIES AS INTERNATIONAL MEMBERS AND HUNDREDS OF INDUSTRY SUPPLIERS AND RELATED ORGANIZATIONS AS ASSOCIATE MEMBERS. ORGANIZED IN 1933, EEI PROVIDES PUBLIC POLICY LEADERSHIP, STRATEGIC BUSINESS INTELLIGENCE, AND ESSENTIAL CONFERENCES AND FORUMS.		
Revenue	2 Check this box ☐		
	3 Number of voting members of the governing body (Part VI, line 1a)	3	62
	4 Number of independent voting members of the governing body (Part VI, line 1b)	4	62
	5 Total number of individuals employed in calendar year 2023 (Part V, line 2a)	5	211
	6 Total number of volunteers (estimate if necessary)	6	3,300
	7a Total unrelated business revenue from Part VIII, column (C), line 12	7a	375,009
	b Net unrelated business taxable income from Form 990-T, Part I, line 11	7b	0
Expenses			
	8 Contributions and grants (Part VIII, line 1h)	Prior Year	Current Year
	9 Program service revenue (Part VIII, line 2g)	0	0
	10 Investment income (Part VIII, column (A), lines 3, 4, and 7d)	85,738,661	92,987,882
	11 Other revenue (Part VIII, column (A), lines 5, 6d, 8c, 9c, 10c, and 11e)	399,910	2,971,528
	12 Total revenue—add lines 8 through 11 (must equal Part VIII, column (A), line 12)	0	88,243
		86,138,571	96,047,653
Net Assets or Fund Balances	13 Grants and similar amounts paid (Part IX, column (A), lines 1-3)	2,242,581	2,642,578
	14 Benefits paid to or for members (Part IX, column (A), line 4)	0	0
	15 Salaries, other compensation, employee benefits (Part IX, column (A), lines 5-10)	39,562,180	51,294,800
	16a Professional fundraising fees (Part IX, column (A), line 11e)	0	0
	b Total fundraising expenses (Part IX, column (D), line 25) 0		
	17 Other expenses (Part IX, column (A), lines 11a-11d, 11f-24e)	41,416,927	49,596,306
	18 Total expenses. Add lines 13-17 (must equal Part IX, column (A), line 25)	83,221,688	103,533,684
	19 Revenue less expenses. Subtract line 18 from line 12	2,916,883	-7,486,031
	20 Total assets (Part X, line 16)	Beginning of Current Year	End of Year
	21 Total liabilities (Part X, line 26)	217,541,309	221,643,885
	22 Net assets or fund balances. Subtract line 21 from line 20	165,280,968	171,502,781
		52,260,341	50,141,104

Part II

Signature Block

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete. Declaration of preparer (other than officer) is based on all information of which preparer has any knowledge.

Sign Here

Signature of officer
VICTORIA CALDERON TREASURER
Type or print name and title

2024-11-15
Date

Paid Preparer Use Only

Print/Type preparer's name

Preparer's signature

Date
2024-11-15

Check ☐ if self-employed

PTIN
P00202198

Firm's name

CLIFTONLARSONALLEN LLP

Firm's EIN

41-0746749

Firm's address

TWO INTERNATIONAL PLACE 22ND FLOOR
BOSTON, MA 02110

Phone no. (617) 717-0831

May the IRS discuss this return with the preparer shown above? See Instructions.

☒ Yes ☐ No

For Paperwork Reduction Act Notice, see the separate instructions.

Cat. No. 11282Y

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Part III

Statement of Program Service Accomplishments

Check if Schedule O contains a response or note to any line in this Part III

☒

1

Briefly describe the organization's mission:

THE EDISON ELECTRIC INSTITUTE(EEI)IS THE ASSOCIATION THAT REPRESENTS ALL U.S. INVESTOR-OWNED ELECTRIC COMPANIES. OUR MEMBERS PROVIDE ELECTRICITY FOR NEARLY 250 MILLION AMERICANS, AND OPERATE IN ALL 50 STATES AND THE DISTRICT OF COLUMBIA. THE ELECTRIC POWER INDUSTRY SUPPORTS MORE THAN 7 MILLION JOBS IN COMMUNITIES ACROSS THE UNITED STATES. IN ADDITION TO OUR U.S. MEMBERS, EEI HAS MORE THAN 70 INTERNATIONAL ELECTRIC COMPANIES AS INTERNATIONAL MEMBERS AND HUNDREDS OF INDUSTRY SUPPLIERS AND RELATED ORGANIZATIONS AS ASSOCIATE MEMBERS. ORGANIZED IN 1933, EEI PROVIDES PUBLIC POLICY LEADERSHIP, STRATEGIC BUSINESS INTELLIGENCE, AND ESSENTIAL CONFERENCES AND FORUMS.

2

Did the organization undertake any significant program services during the year which were not listed on the prior Form 990 or 990-EZ?

☐ Yes ☒ No

If "Yes," describe these new services on Schedule O.

3

Did the organization cease conducting, or make significant changes in how it conducts, any program services?

☐ Yes ☒ No

If "Yes," describe these changes on Schedule O.

4

Describe the organization's program service accomplishments for each of its three largest program services, as measured by expenses. Section 501(c)(3) and 501(c)(4) organizations are required to report the amount of grants and allocations to others, the total expenses, and revenue, if any, for each program service reported.

4a

(Code:) (Expenses \$ including grants of \$) (Revenue \$)
CLEAN ENERGY ACTIVITIES: EEI AND OUR MEMBER COMPANIES ARE WORKING TO GET THE ENERGY WE PROVIDE AS CLEAN AS WE CAN AS FAST AS WE CAN, WITHOUT COMPROMISING THE RELIABILITY AND AFFORDABILITY THAT ARE ESSENTIAL TO THE CUSTOMERS AND COMMUNITIES WE SERVE. EEI IS FOCUSED ON A NUMBER OF ISSUES AND ACTIVITIES RELATED TO THE CLEAN ENERGY TRANSFORMATION, INCLUDING ONGOING CLEAN ENERGY DEPLOYMENT AND EMISSIONS REDUCTIONS; THE NEED FOR A DIVERSE MIX OF GENERATION SOURCES; ENVIRONMENTAL REGULATIONS AND POLICIES; RESEARCH AND DEVELOPMENT FUNDING FOR THE RANGE OF NEW, CARBON-FREE TECHNOLOGIES NEEDED TO ACHIEVE LONG TERM CLEAN ENERGY GOALS; AND INTERCONNECTION POLICIES. THESE PROGRAMS AND ACTIVITIES RELATE TO EEI'S MISSION AS THE ASSOCIATION OF INVESTOR-OWNED ELECTRIC COMPANIES.

4b

(Code:) (Expenses \$ including grants of \$) (Revenue \$)
GRID MODERNIZATION ACTIVITIES: EEI'S MEMBER COMPANIES INVEST SIGNIFICANT CAPITAL TO MAKE THE ENERGY GRID STRONGER, SMARTER, CLEANER, MORE DYNAMIC, AND MORE SECURE. EEI IS FOCUSED ON GRID MODERNIZATION ACTIVITIES AND POLICIES TO ENHANCE THE VALUE, RELIABILITY, AND RESILIENCE OF THE GRID, INCLUDING THE NEED FOR INCREASED TRANSMISSION; ONGOING GRID TECHNOLOGY INVESTMENTS; THE CYBER AND PHYSICAL SECURITY OF THE GRID; AND THE PLANNING, BUILDING, AND OPERATION OF THE DISTRIBUTION SYSTEM. THESE PROGRAMS AND ACTIVITIES RELATE TO EEI'S MISSION AS THE ASSOCIATION OF INVESTOR-OWNED ELECTRIC COMPANIES.

4c

(Code:) (Expenses \$ including grants of \$) (Revenue \$)
CUSTOMER ACTIVITIES: EEI'S MEMBER COMPANIES ARE COMMITTED TO DELIVERING RELIABLE, AFFORDABLE, AND RESILIENT CLEAN ENERGY TO THE CUSTOMERS AND COMMUNITIES THEY SERVE. EEI'S CUSTOMER ACTIVITIES ARE FOCUSED ON HELPING MEMBER COMPANIES MEET CHANGING CUSTOMER ENERGY NEEDS; ON ENSURING THAT ELECTRIC COMPANIES ARE ABLE TO OFFER THE PRODUCTS AND SERVICES THAT CUSTOMERS WANT GIVEN CHANGES IN TECHNOLOGY, POLICY, AND CUSTOMER PREFERENCES; AND ON STREAMLINING AND ENHANCING CUSTOMER ASSISTANCE. THIS INCLUDES CORPORATE CUSTOMER SUSTAINABLE AND RELIABLE ENERGY SOLUTIONS; RESIDENTIAL CUSTOMER ENERGY EFFICIENCY AND COST MANAGEMENT SOLUTIONS, SERVICE ENHANCEMENTS, AND STREAMLINED ASSISTANCE; MILITARY CUSTOMER ENERGY SOLUTIONS; AND CUSTOMER-RELATED ELECTRIC TRANSPORTATION SOLUTIONS. THESE PROGRAMS AND ACTIVITIES RELATE TO EEI'S MISSION AS THE ASSOCIATION OF INVESTOR-OWNED ELECTRIC COMPANIES.

4d

Other program services (Describe in Schedule O.)
(Expenses \$ including grants of \$) (Revenue \$)

4e

Total program service expenses

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https://projects.propublica.org/nonprofits/organizations/130659550/202423209349328602/full

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Part IV Checklist of Required Schedules		Yes	No
1	Is the organization described in section 501(c)(3) or 4947(a)(1) (other than a private foundation)? If "Yes," complete Schedule A	1	No
2	Is the organization required to complete Schedule B, Schedule of Contributors? See instructions.	2	No
3	Did the organization engage in direct or indirect political campaign activities on behalf of or in opposition to candidates for public office? If "Yes," complete Schedule C, Part I	3	Yes
4	Section 501(c)(3) organizations. Did the organization engage in lobbying activities, or have a section 501(h) election in effect during the tax year? If "Yes," complete Schedule C, Part II	4	
5	Is the organization a section 501(c)(4), 501(c)(5), or 501(c)(6) organization that receives membership dues, assessments, or similar amounts as defined in Rev. Proc. 98-19? If "Yes," complete Schedule C, Part III	5	Yes
6	Did the organization maintain any donor advised funds or any similar funds or accounts for which donors have the right to provide advice on the distribution or investment of amounts in such funds or accounts? If "Yes," complete Schedule D, Part I	6	No
7	Did the organization receive or hold a conservation easement, including easements to preserve open space, the environment, historic land areas, or historic structures? If "Yes," complete Schedule D, Part II	7	No
8	Did the organization maintain collections of works of art, historical treasures, or other similar assets? If "Yes," complete Schedule D, Part III	8	No
9	Did the organization report an amount in Part X, line 21 for escrow or custodial account liability; serve as a custodian for amounts not listed in Part X; or provide credit counseling, debt management, credit repair, or debt negotiation services? If "Yes," complete Schedule D, Part IV	9	No
10	Did the organization, directly or through a related organization, hold assets in temporarily restricted endowments, permanent endowments, or quasi endowments? If "Yes," complete Schedule D, Part V	10	No
11	If the organization's answer to any of the following questions is "Yes," then complete Schedule D, Parts VI, VII, VIII, IX, or X, as applicable.		
a	Did the organization report an amount for land, buildings, and equipment in Part X, line 10? If "Yes," complete Schedule D, Part VI.	11a	Yes
b	Did the organization report an amount for investments—other securities in Part X, line 12 that is 5% or more of its total assets reported in Part X, line 16? If "Yes," complete Schedule D, Part VII	11b	No
c	Did the organization report an amount for investments—program related in Part X, line 13 that is 5% or more of its total assets reported in Part X, line 16? If "Yes," complete Schedule D, Part VIII	11c	No
d	Did the organization report an amount for other assets in Part X, line 15 that is 5% or more of its total assets reported in Part X, line 16? If "Yes," complete Schedule D, Part IX	11d	Yes
e	Did the organization report an amount for other liabilities in Part X, line 25? If "Yes," complete Schedule D, Part X	11e	Yes
f	Did the organization's separate or consolidated financial statements for the tax year include a footnote that addresses the organization's liability for uncertain tax positions under FIN 48 (ASC 740)? If "Yes," complete Schedule D, Part X	11f	Yes
12a	Did the organization obtain separate, independent audited financial statements for the tax year? If "Yes," complete Schedule D, Parts XI and XII	12a	No
b	Was the organization included in consolidated, independent audited financial statements for the tax year? If "Yes," and if the organization answered "No" to line 12a, then completing Schedule D, Parts XI and XII is optional	12b	Yes
13	Is the organization a school described in section 170(b)(1)(A)(ii)? If "Yes," complete Schedule E	13	No
14a	Did the organization maintain an office, employees, or agents outside of the United States?	14a	No
b	Did the organization have aggregate revenues or expenses of more than \$10,000 from grantmaking, fundraising, business, investment, and program service activities outside the United States, or aggregate foreign investments valued at \$100,000 or more? If "Yes," complete Schedule F, Parts I and IV	14b	Yes
15	Did the organization report on Part IX, column (A), line 3, more than \$5,000 of grants or other assistance to or for any foreign organization? If "Yes," complete Schedule F, Parts II and IV	15	No
16	Did the organization report on Part IX, column (A), line 3, more than \$5,000 of aggregate grants or other assistance to or for foreign individuals? If "Yes," complete Schedule F, Parts III and IV	16	No
17	Did the organization report a total of more than \$15,000 of expenses for professional fundraising services on Part IX, column (A), lines 6 and 11e? If "Yes," complete Schedule G, Part I. See instructions.	17	No
18	Did the organization report more than \$15,000 total of fundraising event gross income and contributions on Part VIII, lines 1c and 8a? If "Yes," complete Schedule G, Part II	18	No
19	Did the organization report more than \$15,000 of gross income from gaming activities on Part VIII, line 9a? If "Yes," complete Schedule G, Part III	19	No
20a	Did the organization operate one or more hospital facilities? If "Yes," complete Schedule H	20a	No
b	If "Yes" to line 20a, did the organization attach a copy of its audited financial statements to this return?	20b	
21	Did the organization report more than \$5,000 of grants or other assistance to any domestic organization or domestic government on Part IX, column (A), line 1? If "Yes," complete Schedule I, Parts I and II	21	Yes

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Part IV Checklist of Required Schedules (continued)		Yes	No
22	Did the organization report more than \$5,000 of grants or other assistance to or for domestic individuals on Part IX, column (A), line 2? If "Yes," complete Schedule I, Parts I and III	22	No
23	Did the organization answer "Yes" to Part VII, Section A, line 3, 4, or 5, about compensation of the organization's current and former officers, directors, trustees, key employees, and highest compensated employees? If "Yes," complete Schedule J	23	Yes
24a	Did the organization have a tax-exempt bond issue with an outstanding principal amount of more than \$100,000 as of the last day of the year, that was issued after December 31, 2002? If "Yes," answer lines 24b through 24d and complete Schedule K. If "No," go to line 25a	24a	No
b	Did the organization invest any proceeds of tax-exempt bonds beyond a temporary period exception?	24b	
c	Did the organization maintain an escrow account other than a refunding escrow at any time during the year to defease any tax-exempt bonds?	24c	
d	Did the organization act as an "on behalf of" issuer for bonds outstanding at any time during the year?	24d	
25a	Section 501(c)(3), 501(c)(4), and 501(c)(29) organizations. Did the organization engage in an excess benefit transaction with a disqualified person during the year? If "Yes," complete Schedule L, Part I	25a	
b	Is the organization aware that it engaged in an excess benefit transaction with a disqualified person in a prior year, and that the transaction has not been reported on any of the organization's prior Forms 990 or 990-EZ? If "Yes," complete Schedule L, Part I	25b	
26	Did the organization report any amount on Part X, line 5 or 22 for receivables from or payables to any current or former officer, director, trustee, key employee, creator or founder, substantial contributor, or 35% controlled entity or family member of any of these persons? If "Yes," complete Schedule L, Part II	26	No
27	Did the organization provide a grant or other assistance to any current or former officer, director, trustee, key employee, creator or founder, substantial contributor, or employee thereof, a grant selection committee member, or to a 35% controlled entity (including an employee thereof) or family member of any of these persons? If "Yes," complete Schedule L, Part III	27	No
28	Was the organization a party to a business transaction with one of the following parties (see the Schedule L, Part IV instructions for applicable filing thresholds, conditions, and exceptions):		
a	A current or former officer, director, trustee, key employee, creator or founder, or substantial contributor? If "Yes," complete Schedule L, Part IV	28a	No
b	A family member of any individual described in line 28a? If "Yes," complete Schedule L, Part IV	28b	No
c	A 35% controlled entity of one or more individuals and/or organizations described in line 28a or 28b? If "Yes," complete Schedule L, Part IV	28c	No
29	Did the organization receive more than \$25,000 in non-cash contributions? If "Yes," complete Schedule M	29	No
30	Did the organization receive contributions of art, historical treasures, or other similar assets, or qualified conservation contributions? If "Yes," complete Schedule M	30	No
31	Did the organization liquidate, terminate, or dissolve and cease operations? If "Yes," complete Schedule N, Part I	31	No
32	Did the organization sell, exchange, dispose of, or transfer more than 25% of its net assets? If "Yes," complete Schedule N, Part II	32	No
33	Did the organization own 100% of an entity disregarded as separate from the organization under Regulations sections 301.7701-2 and 301.7701-3? If "Yes," complete Schedule R, Part I	33	No
34	Was the organization related to any tax-exempt or taxable entity? If "Yes," complete Schedule R, Part II, III, or IV, and Part V, line 1	34	Yes
35a	Did the organization have a controlled entity within the meaning of section 512(b)(13)?	35a	Yes
b	If "Yes" to line 35a, did the organization receive any payment from or engage in any transaction with a controlled entity within the meaning of section 512(b)(13)? If "Yes," complete Schedule R, Part V, line 2	35b	Yes
36	Section 501(c)(3) organizations. Did the organization make any transfers to an exempt non-charitable related organization? If "Yes," complete Schedule R, Part V, line 2	36	
37	Did the organization conduct more than 5% of its activities through an entity that is not a related organization and that is treated as a partnership for federal income tax purposes? If "Yes," complete Schedule R, Part VI	37	No
38	Did the organization complete Schedule O and provide explanations on Schedule O for Part VI, lines 11b and 19? Note. All Form 990 filers are required to complete Schedule O.	38	Yes

Part V Statements Regarding Other IRS Filings and Tax Compliance		Yes	No
Check if Schedule O contains a response or note to any line in this Part V ☐			
1a	Enter the number reported in box 3 of Form 1096. Enter -0- if not applicable	1a	156
b	Enter the number of Forms W-2G included on line 1a. Enter -0- if not applicable	1b	0
c	Did the organization comply with backup withholding rules for reportable payments to vendors and reportable gaming (gambling) winnings to prize winners?	1c	Yes

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Part V Statements Regarding Other IRS Filings and Tax Compliance (continued)		
2a Enter the number of employees reported on Form W-3, Transmittal of Wage and Tax Statements, filed for the calendar year ending with or within the year covered by this return	2a	211
b If at least one is reported on line 2a, did the organization file all required federal employment tax returns?	2b	Yes
3a Did the organization have unrelated business gross income of \$1,000 or more during the year?	3a	Yes
b If "Yes," has it filed a Form 990-T for this year? If "No" to line 3b, provide an explanation in Schedule O	3b	Yes
4a At any time during the calendar year, did the organization have an interest in, or a signature or other authority over, a financial account in a foreign country (such as a bank account, securities account, or other financial account)?	4a	No
b If "Yes," enter the name of the foreign country: _____ See instructions for filing requirements for FinCEN Form 114, Report of Foreign Bank and Financial Accounts (FBAR).		
5a Was the organization a party to a prohibited tax shelter transaction at any time during the tax year?	5a	No
b Did any taxable party notify the organization that it was or is a party to a prohibited tax shelter transaction?	5b	No
c If "Yes," to line 5a or 5b, did the organization file Form 8886-T?	5c	
6a Does the organization have annual gross receipts that are normally greater than \$100,000, and did the organization solicit any contributions that were not tax deductible as charitable contributions?	6a	No
b If "Yes," did the organization include with every solicitation an express statement that such contributions or gifts were not tax deductible?	6b	
7 Organizations that may receive deductible contributions under section 170(c).		
a Did the organization receive a payment in excess of \$75 made partly as a contribution and partly for goods and services provided to the payor?	7a	
b If "Yes," did the organization notify the donor of the value of the goods or services provided?	7b	
c Did the organization sell, exchange, or otherwise dispose of tangible personal property for which it was required to file Form 8282?	7c	
d If "Yes," indicate the number of Forms 8282 filed during the year	7d	
e Did the organization receive any funds, directly or indirectly, to pay premiums on a personal benefit contract?	7e	
f Did the organization, during the year, pay premiums, directly or indirectly, on a personal benefit contract?	7f	
g If the organization received a contribution of qualified intellectual property, did the organization file Form 8899 as required?	7g	
h If the organization received a contribution of cars, boats, airplanes, or other vehicles, did the organization file a Form 1098-C?	7h	
8 Sponsoring organizations maintaining donor advised funds. Did a donor advised fund maintained by the sponsoring organization have excess business holdings at any time during the year?	8	
9 Sponsoring organizations maintaining donor advised funds.		
a Did the sponsoring organization make any taxable distributions under section 4966?	9a	
b Did the sponsoring organization make a distribution to a donor, donor advisor, or related person?	9b	
10 Section 501(c)(7) organizations. Enter:		
a Initiation fees and capital contributions included on Part VIII, line 12	10a	
b Gross receipts, included on Form 990, Part VIII, line 12, for public use of club facilities	10b	
11 Section 501(c)(12) organizations. Enter:		
a Gross income from members or shareholders	11a	
b Gross income from other sources. (Do not net amounts due or paid to other sources against amounts due or received from them.)	11b	
12a Section 4947(a)(1) non-exempt charitable trusts. Is the organization filing Form 990 in lieu of Form 1041?	12a	
b If "Yes," enter the amount of tax-exempt interest received or accrued during the year.	12b	
13 Section 501(c)(29) qualified nonprofit health insurance issuers.		
a Is the organization licensed to issue qualified health plans in more than one state? Note. See the instructions for additional information the organization must report on Schedule O.	13a	
b Enter the amount of reserves the organization is required to maintain by the states in which the organization is licensed to issue qualified health plans	13b	
c Enter the amount of reserves on hand	13c	
14a Did the organization receive any payments for indoor tanning services during the tax year?	14a	No
b If "Yes," has it filed a Form 720 to report these payments? If "No," provide an explanation in Schedule O	14b	

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15	Is the organization subject to the section 4960 tax on payment(s) of more than \$1,000,000 in remuneration or excess parachute payment(s) during the year? If "Yes," see the instructions and file Form 4720, Schedule N.	15	Yes	
16	Is the organization an educational institution subject to the section 4968 excise tax on net investment income? . . . If "Yes," complete Form 4720, Schedule O.	16		No
17	Section 501(c)(21) organizations. Did the trust, or any disqualified or other person engage in any activities that would result in the imposition of an excise tax under section 4951, 4952, or 4953? . . . If "Yes," complete Form 6069.	17		

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Part VI **Governance, Management, and Disclosure.** For each "Yes" response to lines 2 through 7b below, and for a "No" response to lines 8a, 8b, or 10b below, describe the circumstances, processes, or changes in Schedule O. See instructions.

Check if Schedule O contains a response or note to any line in this Part VI ☒

Section A. Governing Body and Management

		Yes	No
1a	Enter the number of voting members of the governing body at the end of the tax year If there are material differences in voting rights among members of the governing body, or if the governing body delegated broad authority to an executive committee or similar committee, explain in Schedule O.		
1b	Enter the number of voting members included in line 1a, above, who are independent		
2	Did any officer, director, trustee, or key employee have a family relationship or a business relationship with any other officer, director, trustee, or key employee?		No
3	Did the organization delegate control over management duties customarily performed by or under the direct supervision of officers, directors or trustees, or key employees to a management company or other person?		No
4	Did the organization make any significant changes to its governing documents since the prior Form 990 was filed?		No
5	Did the organization become aware during the year of a significant diversion of the organization's assets?		No
6	Did the organization have members or stockholders?	Yes	
7a	Did the organization have members, stockholders, or other persons who had the power to elect or appoint one or more members of the governing body?	Yes	
7b	Are any governance decisions of the organization reserved to (or subject to approval by) members, stockholders, or persons other than the governing body?	Yes	
8	Did the organization contemporaneously document the meetings held or written actions undertaken during the year by the following:		
8a	The governing body?	Yes	
8b	Each committee with authority to act on behalf of the governing body?	Yes	
9	Is there any officer, director, trustee, or key employee listed in Part VII, Section A, who cannot be reached at the organization's mailing address? If "Yes," provide the names and addresses in Schedule O		No

Section B. Policies (This Section B requests information about policies not required by the Internal Revenue Code.)

	Yes	No
10a		No
10b		
11a		No
11b		
12a	Yes	
12b	Yes	
12c	Yes	
13	Yes	
14	Yes	
15a	Yes	
15b	Yes	
16a		No
16b		

Section C. Disclosure

- 17** List the states with which a copy of this Form 990 is required to be filed _____
- 18** Section 6104 requires an organization to make its Form 1023 (1024 or 1024-A, if applicable), 990, and 990-T (section 501(c)(3)s only) available for public inspection. Indicate how you made these available. Check all that apply.
- ☒ Own website ☐ Another's website ☒ Upon request ☐ Other (explain in Schedule O)
- 19** Describe in Schedule O whether (and if so, how) the organization made its governing documents, conflict of interest policy, and financial statements available to the public during the tax year.
- 20** State the name, address, and telephone number of the person who possesses the organization's books and records:
VICTORIA CALDERON 701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 200042696 (202) 508-5757

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Page **7****Part VII Compensation of Officers, Directors, Trustees, Key Employees, Highest Compensated Employees, and Independent Contractors**Check if Schedule O contains a response or note to any line in this Part VII ☐**Section A. Officers, Directors, Trustees, Key Employees, and Highest Compensated Employees**

1a Complete this table for all persons required to be listed. Report compensation for the calendar year ending with or within the organization's tax year.

- List all of the organization's **current** officers, directors, trustees (whether individuals or organizations), regardless of amount of compensation. Enter -0- in columns (D), (E), and (F) if no compensation was paid.
 - List all of the organization's **current** key employees, if any. See the instructions for definition of "key employee."
 - List the organization's five **current** highest compensated employees (other than an officer, director, trustee or key employee) who received reportable compensation (box 5 of Form W-2, box 6 of Form 1099-MISC, and/or box 1 of Form 1099-NEC) of more than \$100,000 from the organization and any related organizations.
 - List all of the organization's **former** officers, key employees, or highest compensated employees who received more than \$100,000 of reportable compensation from the organization and any related organizations.
 - List all of the organization's **former directors or trustees** that received, in the capacity as a former director or trustee of the organization, more than \$10,000 of reportable compensation from the organization and any related organizations.
- See the instructions for the order in which to list the persons above.

☐ Check this box if neither the organization nor any related organization compensated any current officer, director, or trustee.

(A) Name and title	(B) Average hours per week (list any hours for related organizations below dotted line)	(C) Position (do not check more than one box, unless person is both an officer and a director/trustee)						(D) Reportable compensation from the organization (W-2/1099-MISC/1099-NEC)	(E) Reportable compensation from related organizations (W-2/1099-MISC/1099-NEC)	(F) Estimated amount of other compensation from the organization and related organizations
		Individual trustee or director	Institutional Trustee	Officer	Key employee	Highest compensated employee	Former			
(1) WARNER L BAXTER CHAIR UNTIL 6/23, MEMBER UNTIL 11/23	4.00 1.00	X		X				0	0	0
(2) PEDRO J PIZARRO VICE CHAIR THRU 6/23, CHAIR AT 6/23	4.00 1.00	X		X				0	0	0
(3) MARIA M POPE VICE CHAIR	4.00 1.00	X		X				0	0	0
(4) NICHOLAS K AKINS MEMBER (UNTIL 10/23)	1.00 1.00	X						0	0	0
(5) LINDA APSEY MEMBER	1.00 0.00	X						0	0	0
(6) PEDRO AZAGRA MEMBER	1.00 0.00	X						0	0	0
(7) SCOTT BALFOUR MEMBER	1.00 0.00	X						0	0	0
(8) ARUN BANSKOTA MEMBER (UNTIL 8/23)	1.00 0.00	X						0	0	0
(9) ROBERT F BEARD	1.00									

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MEMBER	0.00	X							0	0	0
(10) BRIAN B BIRD	1.00										
MEMBER	0.00	X							0	0	0
(11) ROBERT M BLUE	1.00										
MEMBER	0.00	X							0	0	0
(12) CALVIN G BUTLER JR	1.00										
MEMBER	0.00	X							0	0	0
(13) DAVID A CAMPBELL	1.00										
MEMBER	0.00	X							0	0	0
(14) CHRISTOPHER M CAPONE	1.00										
MEMBER (AS OF 3/23)	0.00	X							0	0	0
(15) TIMOTHY P CAWLEY	1.00										
MEMBER	0.00	X							0	0	0
(16) LEO P DENAULT	1.00										
MEMBER (UNTIL 2/23)	0.00	X							0	0	0
(17) THOMAS DUNN	1.00										
MEMBER	0.00	X							0	0	0

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Part VII Section A. Officers, Directors, Trustees, Key Employees, and Highest Compensated Employees (continued)

(A) Name and title	(B) Average hours per week (list any hours for related organizations below dotted line)	(C) Position (do not check more than one box, unless person is both an officer and a director/trustee)						(D) Reportable compensation from the organization (W-2/1099-MISC/1099-NEC)	(E) Reportable compensation from related organizations (W-2/1099-MISC/1099-NEC)	(F) Estimated amount of other compensation from the organization and related organizations
		Individual trustee or director	Institutional Trustee	Officer	Key employee	Highest compensated employee	Former			
(18) LINDEN R EVANS	1.00	X						0	0	0
MEMBER	0.00									
(19) THOMAS A FANNING	1.00	X						0	0	0
MEMBER	1.00									
(20) WILLIAM J FEHRMAN	1.00	X						0	0	0
MEMBER (UNTIL 9/23)	0.00									
(21) JOHN FLYNN	1.00	X						0	0	0
MEMBER	0.00									
(22) WILLIAM G FONTENOT	1.00	X						0	0	0
MEMBER	0.00									
(23) CHARLES A FRENI JR	1.00	X						0	0	0
MEMBER (UNTIL 2/23)	0.00									
(24) ROBERT C FRENZEL	1.00	X						0	0	0
MEMBER	0.00									
(25) ANDRES R GLUSKI	1.00	X						0	0	0
MEMBER	0.00									
(26) LYNN J GOOD	1.00	X						0	0	0
MEMBER	1.00									
(27) SUSAN M GRAY	1.00	X						0	0	0
MEMBER	0.00									
(28) LISA A GROW	1.00									

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(28) LISA R GROW	1.00	X								0	0	0
MEMBER	0.00											
(29) JEFFREY B GULDNER	1.00	X								0	0	0
MEMBER	0.00											
(30) GRADON R HAEHNEL	1.00	X								0	0	0
MEMBER (AS OF 6/23)	0.00											
(31) JEFFRY M HOUSEHOLDER	1.00	X								0	0	0
MEMBER	0.00											
(32) CHRISTOPHER HUSKILSON	1.00	X								0	0	0
MEMBER (AS OF 9/23)	0.00											
(33) DAVID G HUTCHENS	1.00	X								0	0	0
MEMBER	0.00											
(34) DAVID W JAMES II	1.00	X								0	0	0
MEMBER	0.00											
(35) JEFFREY M KEEBLER	1.00	X								0	0	0
MEMBER	0.00											
(36) JOHN W KETCHUM	1.00	X								0	0	0
MEMBER	0.00											
(37) MARY E KIPP	1.00	X								0	0	0
MEMBER	0.00											
(38) NICOLE A KIVISTO	1.00	X								0	0	0
MEMBER	0.00											
(39) RALPH A LAROSSA	1.00	X								0	0	0
MEMBER	0.00											
(40) JAMES C LARSEN	1.00	X								0	0	0
MEMBER (UNTIL 5/23)	0.00											
(41) JOHN O LARSEN	1.00	X								0	0	0
MEMBER	0.00											
(42) SCOTT J LAUBER	1.00	X								0	0	0
MEMBER	0.00											
(43) DAVID J LESAR	1.00	X								0	0	0
MEMBER	0.00											
(44) MARTIN J LYONS JR	1.00	X								0	0	0
MEMBER	0.00											
(45) CHARLES S MACFARLANE	1.00	X								0	0	0
MEMBER	0.00											
(46) ANDREW S MARSH	1.00	X								0	0	0
MEMBER	0.00											
(47) MARI MCCLURE	1.00	X								0	0	0
MEMBER	0.00											
(48) THOMAS P MEISSNER JR	1.00	X								0	0	0
MEMBER	0.00											
(49) JOSEPH R NOLAN	1.00	X								0	0	0
MEMBER	0.00											
(50) JERRY NORCIA	1.00	X								0	0	0
MEMBER	0.00											
(51) E ALLEN NYE	1.00	X								0	0	0
MEMBER	0.00											
(52) BETHANY M OWEN	1.00	X								0	0	0
MEMBER	0.00											
(53) JOHN M PETTIGREW	1.00	X								0	0	0
MEMBER	0.00											
(54) PATRICIA K POPPE	1.00	X								0	0	0
MEMBER	0.00											
(55) MICHAEL QUINN	1.00	X								0	0	0
MEMBER	0.00											
(56) GARRICK J ROCHOW	1.00	X								0	0	0
MEMBER	0.00											
(57) MICHAEL ROWE	1.00											

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.....	0.00	...	X							0	0	0
MEMBER	0.00											
(58) KEVIN C SAGARA	1.00									0	0	0
MEMBER (UNTIL 12/23)	0.00		...	X								
(59) SCOTT WH SEU	1.00									0	0	0
MEMBER	0.00		...	X								
(60) JULIE A SLOAT	1.00									0	0	0
MEMBER	0.00		...	X								
(61) JOHN W SOMERHALDER II	1.00									0	0	0
MEMBER (UNTIL 6/23)	0.00		...	X								
(62) VINCENT SORGI	1.00									0	0	0
MEMBER	0.00		...	X								
(63) BRIAN X TIERNEY	1.00									0	0	0
MEMBER (AS OF 6/23)	0.00		...	X								
(64) SCOTT THON	1.00									0	0	0
MEMBER (AS OF 9/23)	0.00		...	X								
(65) KELLY A TOMBLIN	1.00									0	0	0
MEMBER	0.00		...	X								
(66) SEAN TRAUSCHKE	1.00									0	0	0
MEMBER	0.00		...	X								
(67) DENNIS P VERMILLION	1.00									0	0	0
MEMBER	0.00		...	X								
(68) PATRICIA K VINCENT-COLLAWN	1.00									0	0	0
MEMBER	1.00		...	X								
(69) KEVIN E WALKER	1.00									0	0	0
MEMBER	0.00		...	X								
(70) CHRISTOPHER C WOMACK	1.00									0	0	0
MEMBER (AS OF 6/23)	0.00		...	X								
(71) LLOYD M YATES	1.00									0	0	0
MEMBER	0.00		...	X								
(72) THOMAS KUHN	43.00											
PRESIDENT AND CEO	2.00				X					5,597,026	0	8,803,592
(73) DANNY BROUILLETTE	45.00											
PRESIDENT AND CEO ELECT	0.00				X					2,950,322	0	253,765
(74) BRIAN WOLFF	44.00											
CSO & EVP, PUB POLICY & EXT AFFAIRS	1.00				X					1,491,155	0	701,964
(75) PHILIP MOELLER	45.00											
EVP, BUSINESS OPS & REG AFFAIRS	0.00				X					1,164,835	0	217,301
(76) RICHARD MCMAHON	45.00											
SVP ENERGY SUPPLY/FINANCE, CHIEF ESG	0.00				X					688,984	0	522,990
(77) EMILY FISHER	44.00											
EVP CLEAN ENERGY, GEN COUNSEL & SECRETARY	1.00				X					807,649	0	149,023
(78) JOHN SCHLENKER	44.00											
CFO & TREASURER (UNTIL 12/23)	1.00				X					855,797	0	237,824
(79) LISA WOOD	40.50											
VP, CUSTOMER SOLUTIONS (UNTIL 3/23)	4.50				X					200,590	22,288	66,957
(80) SCOTT AARONSON	45.00											
SVP, SECURITY & PREPAREDNESS	0.00				X					561,415	0	109,555
(81) STEPHANIE VOYDA	44.00											
SVP, COMMS & MEMBER ENGAGEMENT	1.00				X					552,372	11,273	63,036
(82) LAWRENCE JONES	45.00											
SVP, INTERNATIONAL PROGRAMS	0.00				X					474,566	0	86,223
(83) ERIC GREY	45.00											
VP, GOVERNMENT RELATIONS	0.00				X					484,455	0	101,162
(84) COURTNEY PETERSON	42.00											
VP, CHRO & CHIEF DIVERSITY OFFICER	3.00				X					488,899	0	65,250
(85) PHILIP DION	44.00											
SVP, CUSTOMER SOLUTIONS	1.00				X					420,537	0	55,293
(86) KRISTINE TELFORD	45.00											
.....					X					340.454	0	63.341

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c Fundraising events	1c
d Related organizations	1d
e Government grants (contributions)	1e
f All other contributions, gifts, grants, and similar amounts not included above	1f
g Noncash contributions included in lines 1a - 1f:\$	1g
h Total. Add lines 1a-1f	

		Business Code				
Program Service Revenue	2a MEMBER DUES & SPONSOR	900099	78,754,146	78,754,146		
	b MEETINGS	900099	10,387,868	10,387,868		
	c PROGRAMS	900099	3,444,509	3,444,509		
	d ADVERTISING	541800	375,009		375,009	
	e PUBLICATIONS	513120	26,350	26,350		
	f All other program service revenue.					
	9 Total. Add lines 2a-2f.		92,987,882			

Other Revenue	3 Investment income (including dividends, interest, and other similar amounts)		4,667,817			4,667,817
	4 Income from investment of tax-exempt bond proceeds					
	5 Royalties		517			517
	6a Gross rents	6a	(i) Real	(ii) Personal		
	b Less: rental expenses	6b				
	c Rental income or (loss)	6c				
	d Net rental income or (loss)					
	7a Gross amount from sales of assets other than inventory	7a	(i) Securities	(ii) Other		
	b Less: cost or other basis and sales expenses	7b	207,956,808	24,000		
	c Gain or (loss)	7c	209,673,922	3,175		
	d Net gain or (loss)		-1,717,114	20,825		
	d Net gain or (loss)		-1,696,289			-1,696,289
	a Gross income from fundraising events (not including \$ _____ of contributions reported on line 1c). See Part IV, line 18	8a				
	b Less: direct expenses	8b				
	c Net income or (loss) from fundraising events					
	9a Gross income from gaming activities. See Part IV, line 19	9a				
	b Less: direct expenses	9b				
	c Net income or (loss) from gaming activities					
	10a Gross sales of inventory, less returns and allowances	10a				

b Less: cost of goods sold		10b				
c Net income or (loss) from sales of inventory						
11a	CREDIT CARD REWARDS	Business Code 900099	87,726			87,726
b						
c	RevenueMiscAmt					
d	All other revenue					
e	Total. Add lines 11a-11d		87,726			
12	Total revenue. See instructions		96,047,653	92,612,873	375,009	3,059,771

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Part IX Statement of Functional Expenses				
Section 501(c)(3) and 501(c)(4) organizations must complete all columns. All other organizations must complete column (A).				
Check if Schedule O contains a response or note to any line in this Part IX ☒				
Do not include amounts reported on lines 6b, 7b, 8b, 9b, and 10b of Part VIII.	(A) Total expenses	(B) Program service expenses	(C) Management and general expenses	(D) Fundraising expenses
1 Grants and other assistance to domestic organizations and domestic governments. See Part IV, line 21	2,642,578			
2 Grants and other assistance to domestic individuals. See Part IV, line 22				
3 Grants and other assistance to foreign organizations, foreign governments, and foreign individuals. See Part IV, lines 15 and 16.				
4 Benefits paid to or for members				
5 Compensation of current officers, directors, trustees, and key employees	28,907,934			
6 Compensation not included above, to disqualified persons (as defined under section 4958(f)(1)) and persons described in section 4958(c)(3)(B)				
7 Other salaries and wages	22,205,959			
8 Pension plan accruals and contributions (include section 401(k) and 403(b) employer contributions)	-5,122,914			
9 Other employee benefits	3,311,968			
10 Payroll taxes	1,991,853			
11 Fees for services (non-employees):				
a Management				
b Legal	5,797,702			
c Accounting	158,501			
d Lobbying	1,557,892			
e Professional fundraising services. See Part IV, line 17				
f Investment management fees	335,708			
g Other (If line 11g amount exceeds 10% of line 25, column (A) amount, list line 11g expenses on Schedule O)	11,433,745			
12 Advertising and promotion	159,664			
13 Office expenses	1,458,773			
14 Information technology	2,332,480			
15 Royalties	1,150			
16 Occupancy	5,709,747			
17 Travel	3,261,905			
18 Payments of travel or entertainment expenses for any federal, state, or local public officials	19,696			
19 Conferences, conventions, and meetings	12,251,810			

20 Interest				
21 Payments to affiliates				
22 Depreciation, depletion, and amortization	1,195,869			
23 Insurance	239,776			
24 Other expenses. Itemize expenses not covered above (List miscellaneous expenses in line 24e. If line 24e amount exceeds 10% of line 25, column (A) amount, list line 24e expenses on Schedule O.)				
a OTHER TAXES	2,322,859			
b SUBSCRIPTIONS	1,047,482			
c MEMBERSHIPS/SPONSORSHIP	507,904			
d AFFILIATE OVERHEAD	-347,430			
e All other expenses	151,073			
25 Total functional expenses. Add lines 1 through 24e	103,533,684			
26 Joint costs. Complete this line only if the organization reported in column (B) joint costs from a combined educational campaign and fundraising solicitation. Check here ☐ if following SOP 98-2 (ASC 958-720).				

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Page **11**Part X **Balance Sheet**Check if Schedule O contains a response or note to any line in this Part IX ☐

		(A) Beginning of year		(B) End of year
Assets	1 Cash-non-interest-bearing	618,487	1	948
	2 Savings and temporary cash investments	28,634,008	2	30,073,646
	3 Pledges and grants receivable, net		3	
	4 Accounts receivable, net	2,000,368	4	1,569,707
	5 Loans and other receivables from any current or former officer, director, trustee, key employee, creator or founder, substantial contributor, or 35% controlled entity or family member of any of these persons		5	
	6 Loans and other receivables from other disqualified persons (as defined under section 4958(f)(1)), and persons described in section 4958(c)(3)(B)		6	
	7 Notes and loans receivable, net		7	
	8 Inventories for sale or use		8	
	9 Prepaid expenses and deferred charges	1,272,001	9	2,515,302
	10a Land, buildings, and equipment: cost or other basis. Complete Part VI of Schedule D	10a 16,365,592		
	b Less: accumulated depreciation	10b 11,412,538	5,912,925	10c 4,953,054
	11 Investments—publicly traded securities	120,141,720	11	120,323,910
	12 Investments—other securities. See Part IV, line 11		12	
	13 Investments—program-related. See Part IV, line 11		13	
	14 Intangible assets		14	
	15 Other assets. See Part IV, line 11	58,961,800	15	62,207,318
16 Total assets. Add lines 1 through 15 (must equal line 33)	217,541,309	16	221,643,885	
Liabilities	17 Accounts payable and accrued expenses	15,222,998	17	13,586,076
	18 Grants payable		18	
	19 Deferred revenue	28,059,750	19	30,731,226
	20 Tax-exempt bond liabilities		20	
	21 Escrow or custodial account liability. Complete Part IV of Schedule D		21	
	22 Loans and other payables to any current or former officer, director, trustee, key employee, creator or founder, substantial contributor, or 35% controlled entity or family member of any of these persons		22	
	23 Secured mortgages and notes payable to unrelated third parties		23	
	24 Unsecured notes and loans payable to unrelated third parties		24	
	25 Other liabilities (including federal income tax payables to related third parties)	121,998,220	25	127,185,479

25	Other liabilities (including federal income tax, property taxes and other liabilities not included on lines 17 - 24). Complete Part X of Schedule D.			
26	Total liabilities. Add lines 17 through 25	165,280,968	26	171,502,781
Net Assets or Fund Balances	Organizations that follow FASB ASC 958, check here ☒ and complete lines 27, 28, 32, and 33.			
	27 Net assets without donor restrictions	52,260,341	27	50,141,104
	28 Net assets with donor restrictions		28	
	Organizations that do not follow FASB ASC 958, check here ☐ and complete lines 29 through 33.			
	29 Capital stock or trust principal, or current funds		29	
	30 Paid-in or capital surplus, or land, building or equipment fund		30	
	31 Retained earnings, endowment, accumulated income, or other funds		31	
	32 Total net assets or fund balances	52,260,341	32	50,141,104
33	Total liabilities and net assets/fund balances	217,541,309	33	221,643,885

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Part XI	Reconciliation of Net Assets	
Check if Schedule O contains a response or note to any line in this Part XI		☒
1	Total revenue (must equal Part VIII, column (A), line 12)	96,047,653
2	Total expenses (must equal Part IX, column (A), line 25)	103,533,684
3	Revenue less expenses. Subtract line 2 from line 1	-7,486,031
4	Net assets or fund balances at beginning of year (must equal Part X, line 32, column (A))	52,260,341
5	Net unrealized gains (losses) on investments	4,049,628
6	Donated services and use of facilities	-587,322
7	Investment expenses	
8	Prior period adjustments	
9	Other changes in net assets or fund balances (explain in Schedule O)	1,904,488
10	Net assets or fund balances at end of year. Combine lines 3 through 9 (must equal Part X, line 32, column (B))	50,141,104
Part XII	Financial Statements and Reporting	
Check if Schedule O contains a response or note to any line in this Part XII		☐
1	Accounting method used to prepare the Form 990: ☐ Cash ☒ Accrual ☐ Other _____ If the organization changed its method of accounting from a prior year or checked "Other," explain on Schedule O.	
2a	Were the organization's financial statements compiled or reviewed by an independent accountant? If 'Yes,' check a box below to indicate whether the financial statements for the year were compiled or reviewed on a separate basis, consolidated basis, or both: ☐ Separate basis ☐ Consolidated basis ☐ Both consolidated and separate basis	No
2b	Were the organization's financial statements audited by an independent accountant? If 'Yes,' check a box below to indicate whether the financial statements for the year were audited on a separate basis, consolidated basis, or both: ☐ Separate basis ☒ Consolidated basis ☐ Both consolidated and separate basis	Yes
2c	If "Yes," to line 2a or 2b, does the organization have a committee that assumes responsibility for oversight of the audit, review, or compilation of its financial statements and selection of an independent accountant? If the organization changed either its oversight process or selection process during the tax year, explain in Schedule O.	Yes
3a	As a result of a federal award, was the organization required to undergo an audit or audits as set forth in the Uniform Guidance, 2 C.F.R. Part 200, Subpart F?	No
3b	If "Yes," did the organization undergo the required audit or audits? If the organization did not undergo the required audit or audits, explain why in Schedule O and describe any steps taken to undergo such audits.	

Form 990 (2023)

Form 990 (2023)

efile Public Visual Render		ObjectID: 202423209349328602 - Submission: 2024-11-15	TIN: 13-0659550
SCHEDULE C (Form 990) Department of the Treasury Internal Revenue Service	Political Campaign and Lobbying Activities		OMB No. 1545-0047
	For Organizations Exempt From Income Tax Under section 501(c) and section 527		2022
	▶Complete if the organization is described below. ▶Attach to Form 990 or Form 990-EZ. ▶Go to www.irs.gov/Form990 for instructions and the latest information.		Open to Public Inspection

If the organization answered "Yes" on Form 990, Part IV, Line 3, or Form 990-EZ, Part V, line 46 (Political Campaign Activities), then

- Section 501(c)(3) organizations: Complete Parts I-A and B. Do not complete Part I-C.
- Section 501(c) (other than section 501(c)(3)) organizations: Complete Parts I-A and C below. Do not complete Part I-B.
- Section 527 organizations: Complete Part I-A only.

If the organization answered "Yes" on Form 990, Part IV, Line 4, or Form 990-EZ, Part VI, line 47 (Lobbying Activities), then

- Section 501(c)(3) organizations that have filed Form 5768 (election under section 501(h)): Complete Part II-A. Do not complete Part II-B.
- Section 501(c)(3) organizations that have NOT filed Form 5768 (election under section 501(h)): Complete Part II-B. Do not complete Part II-A.

If the organization answered "Yes" on Form 990, Part IV, Line 5 (Proxy Tax) (see separate instructions) or Form 990-EZ, Part V, line 35c (Proxy Tax) (see separate instructions), then

- Section 501(c)(4), (5), or (6) organizations: Complete Part III.

Name of the organization EDISON ELECTRIC INSTITUTE INC	Employer identification number 13-0659550

Part I-A Complete if the organization is exempt under section 501(c) or is a section 527 organization.

- 1 Provide a description of the organization's direct and indirect political campaign activities in Part IV. See instructions for definition of "political campaign activities."
- 2 Political campaign activity expenditures. See instructions ▶ \$ 530,000
- 3 Volunteer hours for political campaign activities. See instructions

Part I-B Complete if the organization is exempt under section 501(c)(3).

- 1 Enter the amount of any excise tax incurred by the organization under section 4955 ▶ \$
- 2 Enter the amount of any excise tax incurred by organization managers under section 4955 ▶ \$
- 3 If the organization incurred a section 4955 tax, did it file Form 4720 for this year? ☐ Yes ☐ No
- 4a Was a correction made? ☐ Yes ☐ No
- b If "Yes," describe in Part IV.

Part I-C Complete if the organization is exempt under section 501(c), except section 501(c)(3).

- 1 Enter the amount directly expended by the filing organization for section 527 exempt function activities ▶ \$
- 2 Enter the amount of the filing organization's funds contributed to other organizations for section 527 exempt function activities ▶ \$ 530,000
- 3 Total exempt function expenditures. Add lines 1 and 2. Enter here and on Form 1120-POL, line 17b..... ▶ \$ 530,000
- 4 Did the filing organization file **Form 1120-POL** for this year? ☒ Yes ☐ No
- 5 Enter the names, addresses and employer identification number (EIN) of all section 527 political organizations to which the filing organization made payments. For each organization listed, enter the amount paid from the filing organization's funds. Also enter the amount of political contributions received that were promptly and directly delivered to a separate political organization, such as a separate segregated fund or a political action committee (PAC). If additional space is needed, provide information in Part IV.

(a) Name	(b) Address	(c) EIN	(d) Amount paid from filing organization's funds. If none, enter -0-.	(e) Amount of political contributions received and promptly and directly delivered to a separate political organization. If none, enter -0-.
(1) DEMOCRATIC GOVERNORS ASSOCIATION	1225 EYE STREET NW SUITE 1100 WASHINGTON, DC 20005	52-1304889	125,000	0
(2) REPUBLICAN GOVERNORS ASSOCIATION	1747 PENNSYLVANIA AVENUE NW SUITE WASHINGTON, DC 20006	11-3655877	100,000	0
(3) MAINE AFFORDABLE ENERGY	100 MIDDLE ST STE 206 PORTLAND, ME 04101	87-2441832	80,000	0
(4) NO BLANK CHECKS	100 MIDDLE ST STE 206 PORTLAND, ME 04101	87-2586020	80,000	0
(5) GOPAC INC	1201 WILSON BLVD SUITE 2110 ARLINGTON, VA 22209	52-1237780	50,000	0
(6) DEMOCRATIC ATTORNEYS GENERAL ASSOCIATION INC	PO BOX 34445 WASHINGTON, DC 20005	13-4220019	25,000	0
(7) DEMOCRATIC LEGISLATIVE CAMPAIGN COMMITTEE	1225 EYE STREET NW SUITE 1250 WASHINGTON, DC 20005	52-1870839	25,000	0
(8) REPUBLICAN STATE LEADERSHIP COMMITTEE	1201 F STREET NW SUITE 675 WASHINGTON, DC 20004	05-0532524	25,000	0
(9) COMMUNITY LEADERS OF AMERICA	PO BOX 2262	46-3149989	10,000	0

	SPRINGFIELD, VA 22152			
(10) DEMOCRATIC MAYORS ASSOCIATION	529 14TH STREET NW SUITE 1205 WASHINGTON, DC 20045	52-1535470	10,000	0
(11) POWER PAC OF THE EDISON ELECTRIC INSTITUTE	701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004	52-2084626	0	68,880

For Paperwork Reduction Act Notice, see the instructions for Form 990. Cat. No. 50084S Schedule C (Form 990) 2022

Schedule C (Form 990) 2022

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Part II-A Complete if the organization is exempt under section 501(c)(3) and filed Form 5768 (election under section 501(h)).

A Check ☐ if the filing organization belongs to an affiliated group (and list in Part IV each affiliated group member's name, address, EIN, expenses, and share of excess lobbying expenditures).

B Check ☐ if the filing organization checked box A and "limited control" provisions apply.

Limits on Lobbying Expenditures (The term "expenditures" means amounts paid or incurred.)		(a) Filing organization's totals	(b) Affiliated group totals
1a Total lobbying expenditures to influence public opinion (grass roots lobbying)			
b Total lobbying expenditures to influence a legislative body (direct lobbying)			
c Total lobbying expenditures (add lines 1a and 1b)			
d Other exempt purpose expenditures			
e Total exempt purpose expenditures (add lines 1c and 1d)			
f Lobbying nontaxable amount. Enter the amount from the following table in both columns.			
If the amount on line 1e, column (a) or (b) is:	The lobbying nontaxable amount is:		
Not over \$500,000	20% of the amount on line 1e.		
Over \$500,000 but not over \$1,000,000	\$100,000 plus 15% of the excess over \$500,000.		
Over \$1,000,000 but not over \$1,500,000	\$175,000 plus 10% of the excess over \$1,000,000.		
Over \$1,500,000 but not over \$17,000,000	\$225,000 plus 5% of the excess over \$1,500,000.		
Over \$17,000,000	\$1,000,000.		
g Grassroots nontaxable amount (enter 25% of line 1f)			
h Subtract line 1g from line 1a. If zero or less, enter -0-			
i Subtract line 1f from line 1c. If zero or less, enter -0-			
j If there is an amount other than zero on either line 1h or line 1i, did the organization file Form 4720 reporting section 4911 tax for this year?		☐ Yes ☐ No	

4-Year Averaging Period Under Section 501(h)
(Some organizations that made a section 501(h) election do not have to complete all of the five
columns below. See the separate instructions for lines 2a through 2f.)

Lobbying Expenditures During 4-Year Averaging Period

Calendar year (or fiscal year beginning in)	(a) 2019	(b) 2020	(c) 2021	(d) 2022	(e) Total
2a Lobbying nontaxable amount					
b Lobbying ceiling amount (150% of line 2a, column(e))					
c Total lobbying expenditures					
d Grassroots nontaxable amount					
e Grassroots ceiling amount (150% of line 2d, column (e))					
f Grassroots lobbying expenditures					

Schedule C (Form 990) 2022

Schedule C (Form 990) 2022

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Part II-B Complete if the organization is exempt under section 501(c)(3) and has NOT filed

Form 5768 (election under section 501(h)).

For each "Yes" response on lines 1a through 1i below, provide in Part IV a detailed description of the lobbying activity.

		(a)		(b)
		Yes	No	Amount
1	During the year, did the filing organization attempt to influence foreign, national, state or local legislation, including any attempt to influence public opinion on a legislative matter or referendum, through the use of:			
a	Volunteers?			
b	Paid staff or management (include compensation in expenses reported on lines 1c through 1i)?			
c	Media advertisements?			
d	Mailings to members, legislators, or the public?			
e	Publications, or published or broadcast statements?			
f	Grants to other organizations for lobbying purposes?			
g	Direct contact with legislators, their staffs, government officials, or a legislative body?			
h	Rallies, demonstrations, seminars, conventions, speeches, lectures, or any similar means?			
i	Other activities?			
j	Total. Add lines 1c through 1i			
2a	Did the activities in line 1 cause the organization to be not described in section 501(c)(3)?			
b	If "Yes," enter the amount of any tax incurred under section 4912			
c	If "Yes," enter the amount of any tax incurred by organization managers under section 4912			
d	If the filing organization incurred a section 4912 tax, did it file Form 4720 for this year?			

Part III-A Complete if the organization is exempt under section 501(c)(4), section 501(c)(5), or section 501(c)(6).

	Yes	No
1 Were substantially all (90% or more) dues received nondeductible by members?	1	No
2 Did the organization make only in-house lobbying expenditures of \$2,000 or less?	2	No
3 Did the organization agree to carry over lobbying and political expenditures from the prior year?	3 Yes	

Part III-B Complete if the organization is exempt under section 501(c)(4), section 501(c)(5), or section 501(c)(6) and if either (a) BOTH Part III-A, lines 1 and 2, are answered "No" OR (b) Part III-A, line 3, is answered "Yes."

1 Dues, assessments and similar amounts from members	1	73,769,588
2 Section 162(e) nondeductible lobbying and political expenditures (do not include amounts of political expenses for which the section 527(f) tax was paid).		
a Current year	2a	11,047,717
b Carryover from last year	2b	-4,015,022
c Total	2c	7,032,695
3 Aggregate amount reported in section 6033(e)(1)(A) notices of nondeductible section 162(e) dues .	3	9,515,811
4 If notices were sent and the amount on line 2c exceeds the amount on line 3, what portion of the excess does the organization agree to carryover to the reasonable estimate of nondeductible lobbying and political expenditure next year?	4	
5 Taxable amount of lobbying and political expenditures. See Instructions	5	-2,483,116

Part IV Supplemental Information

Provide the descriptions required for Part I-A, line 1; Part I-B, line 4; Part I-C, line 5; Part II-A (affiliated group list); Part II-A, lines 1 and 2 (see instructions), and Part II-B, line 1. Also, complete this part for any additional information.

Return Reference	Explanation
PART I-A, LINE 1:	EEI'S POLITICAL CAMPAIGN ACTIVITIES CONSIST OF CONTRIBUTIONS MADE TO CANDIDATES FOR STATE AND LOCAL OFFICE WHERE LEGALLY PERMISSIBLE AND CONTRIBUTIONS MADE TO OTHER POLITICAL ORGANIZATIONS.

Schedule C (Form 990) 2022

Additional Data[Return to Form](#)

Software ID:
Software Version:

SCHEDULE D
(Form 990)**Supplemental Financial Statements**

OMB No. 1545-0047

2022Open to Public
InspectionDepartment of the Treasury
Internal Revenue Service

► **Complete if the organization answered "Yes," on Form 990, Part IV, line 6, 7, 8, 9, 10, 11a, 11b, 11c, 11d, 11e, 11f, 12a, or 12b.**
► **Attach to Form 990.**
► **Go to www.irs.gov/Form990 for instructions and the latest information.**

Name of the organization
EDISON ELECTRIC INSTITUTE INC**Employer identification number**

13-0659550

Part I Organizations Maintaining Donor Advised Funds or Other Similar Funds or Accounts.

Complete if the organization answered "Yes" on Form 990, Part IV, line 6.

	(a) Donor advised funds	(b) Funds and other accounts
1 Total number at end of year		
2 Aggregate value of contributions to (during year)		
3 Aggregate value of grants from (during year)		
4 Aggregate value at end of year		
5 Did the organization inform all donors and donor advisors in writing that the assets held in donor advised funds are the organization's property, subject to the organization's exclusive legal control?		☐ Yes ☐ No
6 Did the organization inform all grantees, donors, and donor advisors in writing that grant funds can be used only for charitable purposes and not for the benefit of the donor or donor advisor, or for any other purpose conferring impermissible private benefit?		☐ Yes ☐ No

Part II Conservation Easements.

Complete if the organization answered "Yes" on Form 990, Part IV, line 7.

1 Purpose(s) of conservation easements held by the organization (check all that apply).

☐ Preservation of land for public use (e.g., recreation or education) ☐ Preservation of an historically important land area

☐ Protection of natural habitat ☐ Preservation of a certified historic structure

☐ Preservation of open space

2 Complete lines 2a through 2d if the organization held a qualified conservation contribution in the form of a conservation easement on the last day of the tax year.

	Held at the End of the Year
a Total number of conservation easements	2a
b Total acreage restricted by conservation easements	2b
c Number of conservation easements on a certified historic structure included in (a)	2c
d Number of conservation easements included in (c) acquired after July 25, 2006, and not on a historic structure listed in the National Register	2d

3 Number of conservation easements modified, transferred, released, extinguished, or terminated by the organization during the tax year ► _____

4 Number of states where property subject to conservation easement is located ► _____

5 Does the organization have a written policy regarding the periodic monitoring, inspection, handling of violations, and enforcement of the conservation easements it holds? ☐ Yes ☐ No

6 Staff and volunteer hours devoted to monitoring, inspecting, handling of violations, and enforcing conservation easements during the year ► _____

7 Amount of expenses incurred in monitoring, inspecting, handling of violations, and enforcing conservation easements during the year ► \$ _____

8 Does each conservation easement reported on line 2(d) above satisfy the requirements of section 170(h)(4)(B)(i) and section 170(h)(4)(B)(ii)? ☐ Yes ☐ No

9 In Part XIII, describe how the organization reports conservation easements in its revenue and expense statement, and balance sheet, and include, if applicable, the text of the footnote to the organization's financial statements that describes the organization's accounting for conservation easements.

Part III Organizations Maintaining Collections of Art, Historical Treasures, or Other Similar Assets.

Complete if the organization answered "Yes" on Form 990, Part IV, line 8.

1a If the organization elected, as permitted under FASB ASC 958, not to report in its revenue statement and balance sheet works of art, historical treasures, or other similar assets held for public exhibition, education, or research in furtherance of public service, provide, in Part XIII, the text of the footnote to its financial statements that describes these items.

b If the organization elected, as permitted under FASB ASC 958, to report in its revenue statement and balance sheet works of art, historical treasures, or other similar assets held for public exhibition, education, or research in furtherance of public service, provide the following amounts relating to these items:

(i) Revenue included on Form 990, Part VIII, line 1 ► \$ _____

(ii) Assets included in Form 990, Part X ► \$ _____

2 If the organization received or held works of art, historical treasures, or other similar assets for financial gain, provide the following amounts required to be reported under FASB ASC 958 relating to these items:

a Revenue included on Form 990, Part VIII, line 1 ► \$ _____

b Assets included in Form 990, Part X ► \$ _____

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Cat. No. 52283D

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Schedule D (Form 990) 2022

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Part III Organizations Maintaining Collections of Art, Historical Treasures, or Other Similar Assets (continued)

3 Using the organization's acquisition, accession, and other records, check any of the following that are a significant use of its collection items (check all that apply):

- a** ☐ Public exhibition **d** ☐ Loan or exchange programs
- b** ☐ Scholarly research **e** ☐ Other
- c** ☐ Preservation for future generations

4 Provide a description of the organization's collections and explain how they further the organization's exempt purpose in Part XIII.

5 During the year, did the organization solicit or receive donations of art, historical treasures or other similar assets to be sold to raise funds rather than to be maintained as part of the organization's collection? ☐ Yes ☐ No

Part IV Escrow and Custodial Arrangements.

Complete if the organization answered "Yes" on Form 990, Part IV, line 9, or reported an amount on Form 990, Part X, line 21.

1a Is the organization an agent, trustee, custodian or other intermediary for contributions or other assets not included on Form 990, Part X? ☐ Yes ☐ No

b If "Yes," explain the arrangement in Part XIII and complete the following table:

- c** Beginning balance
- d** Additions during the year
- e** Distributions during the year
- f** Ending balance

	Amount
1c	
1d	
1e	
1f	

2a Did the organization include an amount on Form 990, Part X, line 21, for escrow or custodial account liability? ☐ Yes ☐ No

b If "Yes," explain the arrangement in Part XIII. Check here if the explanation has been provided in Part XIII ☐

Part V Endowment Funds.

Complete if the organization answered "Yes" on Form 990, Part IV, line 10.

	(a) Current year	(b) Prior year	(c) Two years back	(d) Three years back	(e) Four years back
1a Beginning of year balance					
b Contributions					
c Net investment earnings, gains, and losses					
d Grants or scholarships					
e Other expenditures for facilities and programs					
f Administrative expenses					
g End of year balance					

2 Provide the estimated percentage of the current year end balance (line 1g, column (a)) held as:

- a** Board designated or quasi-endowment ▶
- b** Permanent endowment ▶
- c** Term endowment ▶

The percentages on lines 2a, 2b, and 2c should equal 100%.

3a Are there endowment funds not in the possession of the organization that are held and administered for the organization by:

(i) Unrelated organizations

(ii) Related organizations

b If "Yes" on 3a(ii), are the related organizations listed as required on Schedule R?

4 Describe in Part XIII the intended uses of the organization's endowment funds.

	Yes	No
3a(i)		
3a(ii)		
3b		

Part VI Land, Buildings, and Equipment.

Complete if the organization answered "Yes" on Form 990, Part IV, line 11a. See Form 990, Part X, line 10.

Description of property	(a) Cost or other basis (investment)	(b) Cost or other basis (other)	(c) Accumulated depreciation	(d) Book value
1a Land				
b Buildings				
c Leasehold improvements		8,892,123	5,131,273	3,760,850
d Equipment		3,603,416	2,954,547	648,869
e Other		3,870,053	3,326,718	543,335
Total. Add lines 1a through 1e. (Column (d) must equal Form 990, Part X, column (B), line 10(c).) . . . ▶				4,953,054

Schedule D (Form 990) 2022

Schedule D (Form 990) 2022

Page **3****Part VII Investments - Other Securities.**

Complete if the organization answered "Yes" on Form 990, Part IV, line 11b. See Form 990, Part X, line 12.

(a) Description of security or category (including name of security)	(b) Book value	(c) Method of valuation: Cost or end-of-year market value
(1) Financial derivatives		
(2) Closely-held equity interests		
(3) Other _____		
(A)		
(B)		
(C)		
(D)		
(E)		
(F)		
(G)		
(H)		
Total. (Column (b) must equal Form 990, Part X, col. (B) line 12.)		

Part VIII Investments - Program Related.

Complete if the organization answered 'Yes' on Form 990, Part IV, line 11c. See Form 990, Part X, line 13.

(a) Description of investment	(b) Book value	(c) Method of valuation: Cost or end-of-year market value
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
Total. (Column (b) must equal Form 990, Part X, col.(B) line 13.)		

Part IX Other Assets.

Complete if the organization answered 'Yes' on Form 990, Part IV, line 11d. See Form 990, Part X, line 15.

(a) Description	(b) Book value
(1) POSTRETIREMENT BENEFIT ASSET	39,913,722
(2) RIGHT OF USE ASSET - OPERATING	21,702,187
(3) AFFILIATED ORGANIZATIONS RECEIVABLE	591,409
(3)	
(4)	
(5)	
(6)	
(7)	
(8)	
(9)	
Total. (Column (b) must equal Form 990, Part X, col.(B) line 15.)	62,207,318

Part X Other Liabilities.

Complete if the organization answered 'Yes' on Form 990, Part IV, line 11e or 11f. See Form 990, Part X, line 25.

1. (a) Description of liability	(b) Book value
(1) Federal income taxes	

DEFERRED COMPENSATION	91,804,255
BENEFITS LIABILITIES	335,998
OTHER CURRENT LIABILITIES	1,960,590
OTHER LONG TERM LIABILITIES	2,694,953
LEASE LIABILITY	29,328,637
DUE TO RELATED PARTY	1,061,046
Total. (Column (b) must equal Form 990, Part X, col.(B) line 25.)	127,185,479

2. Liability for uncertain tax positions. In Part XIII, provide the text of the footnote to the organization's financial statements that reports the organization's liability for uncertain tax positions under FIN 48 (ASC 740). Check here if the text of the footnote has been provided in Part XIII ☒

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Schedule D (Form 990) 2022

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Part XI Reconciliation of Revenue per Audited Financial Statements With Revenue per Return.

Complete if the organization answered 'Yes' on Form 990, Part IV, line 12a.

1	Total revenue, gains, and other support per audited financial statements	1	
2	Amounts included on line 1 but not on Form 990, Part VIII, line 12:		
a	Net unrealized gains (losses) on investments	2a	
b	Donated services and use of facilities	2b	
c	Recoveries of prior year grants	2c	
d	Other (Describe in Part XIII.)	2d	
e	Add lines 2a through 2d	2e	
3	Subtract line 2e from line 1	3	
4	Amounts included on Form 990, Part VIII, line 12, but not on line 1 :		
a	Investment expenses not included on Form 990, Part VIII, line 7b	4a	
b	Other (Describe in Part XIII.)	4b	
c	Add lines 4a and 4b	4c	
5	Total revenue. Add lines 3 and 4c . (This must equal Form 990, Part I, line 12.)	5	

Part XII Reconciliation of Expenses per Audited Financial Statements With Expenses per Return.

Complete if the organization answered 'Yes' on Form 990, Part IV, line 12a.

1	Total expenses and losses per audited financial statements	1	
2	Amounts included on line 1 but not on Form 990, Part IX, line 25:		
a	Donated services and use of facilities	2a	
b	Prior year adjustments	2b	
c	Other losses	2c	
d	Other (Describe in Part XIII.)	2d	
e	Add lines 2a through 2d	2e	
3	Subtract line 2e from line 1	3	
4	Amounts included on Form 990, Part IX, line 25, but not on line 1 :		
a	Investment expenses not included on Form 990, Part VIII, line 7b	4a	
b	Other (Describe in Part XIII.)	4b	
c	Add lines 4a and 4b	4c	
5	Total expenses. Add lines 3 and 4c . (This must equal Form 990, Part I, line 18.)	5	

Part XIII Supplemental Information

Provide the descriptions required for Part II, lines 3, 5, and 9; Part III, lines 1a and 4; Part IV, lines 1b and 2b; Part V, line 4; Part X, line 2; Part XI, lines 2d and 4b; and Part XII, lines 2d and 4b. Also complete this part to provide any additional information.

Return Reference	Explanation
PART X, LINE 2:	EEI IS EXEMPT FROM FEDERAL INCOME TAXES UNDER SECTION 501(C)(6) OF THE IRC. EEI HAS EVALUATED ITS TAX POSITIONS AND DETERMINED THAT ITS POSITIONS ARE MORE LIKELY THAN NOT TO BE SUSTAINED ON EXAMINATION. EEI'S TAX RETURNS ARE SUBJECT TO REVIEW AND EXAMINATION BY FEDERAL AND STATE AUTHORITIES.

Schedule D (Form 990) 2022

Additional Data

Return to Form

Software ID:

Software Version:

Part I	General Information on Activities Outside the United States. Complete if the organization answered "Yes" on Form 990, Part IV, line 14b.

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[illegible]

3 Enter total number of other organizations or entities

Schedule F (Form 990) 2023

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Part III **Grants and Other Assistance to Individuals Outside the United States.** Complete if the organization answered "Yes" on Form 990, Part IV, line 16.
Part III can be duplicated if additional space is needed.

[illegible]

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Part IV Foreign Forms

1	Was the organization a U.S. transferor of property to a foreign corporation during the tax year? <i>If "Yes," the organization may be required to file Form 926, Return by a U.S. Transferor of Property to a Foreign Corporation (see Instructions for Form 926)</i>	☐ Yes ☒ No
2	Did the organization have an interest in a foreign trust during the tax year? <i>If "Yes," the organization may be required to separately file Form 3520, Annual Return to Report Transactions with Foreign Trusts and Receipt of Certain Foreign Gifts, and/or Form 3520-A, Annual Information Return of Foreign Trust With a U.S. Owner (see Instructions for Forms 3520 and 3520-A; don't file with Form 990)</i>	☐ Yes ☒ No
3	Did the organization have an ownership interest in a foreign corporation during the tax year? <i>If "Yes," the organization may be required to file Form 5471, Information Return of U.S. Persons with Respect to Certain Foreign Corporations. (see Instructions for Form 5471)</i>	☐ Yes ☒ No
4	Was the organization a direct or indirect shareholder of a passive foreign investment company or a qualified electing fund during the tax year? <i>If "Yes," the organization may be required to file Form 8621, Information Return by a Shareholder of a Passive Foreign Investment Company or Qualified Electing Fund. (see Instructions for Form 8621)</i>	☐ Yes ☒ No
5	Did the organization have an ownership interest in a foreign partnership during the tax year? <i>If "Yes," the organization may be required to file Form 8865, Return of U.S. Persons with Respect to Certain Foreign Partnerships (see Instructions for Form 8865)</i>	☐ Yes ☒ No
6	Did the organization have any operations in or related to any boycotting countries during the tax year? <i>If "Yes," the organization may be required to separately file Form 5713, International Boycott Report (see Instructions for Form 5713; don't file with Form 990).</i>	☐ Yes ☒ No

Schedule F (Form 990) 2023

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Part V Supplemental Information

Provide the information required by Part I, line 2 (monitoring of funds); Part I, line 3, column (f) (accounting method; amounts of investments vs. expenditures per region); Part II, line 1 (accounting method); Part III (accounting method); and Part III, column (c) (estimated number of recipients), as applicable. Also complete this part to provide any additional information. See instructions.

ReturnReference	Explanation
PART I, LINE 3:	FEI USES THE ACCRUAL METHOD OF ACCOUNTING TO REPORT EXPENDITURES FOR ACTIVITIES

Schedule F (Form 990) 2023

Software ID:
Software Version:

efile Public Visual Render		ObjectID: 202423209349328602 - Submission: 2024-11-15		TIN: 13-0659550	
Note: To capture the full content of this document, please select landscape mode (11" x 8.5") when printing.					
Schedule I (Form 990)		Grants and Other Assistance to Organizations, Governments and Individuals in the United States			OMB No. 1545-0047
Department of the Treasury Internal Revenue Service		Complete if the organization answered "Yes," on Form 990, Part IV, line 21 or 22. ▶ Attach to Form 990. ▶ Go to www.irs.gov/Form990 for the latest information.			2023 Open to Public Inspection
Name of the organization EDISON ELECTRIC INSTITUTE INC					Employer identification number 13-0659550

Part I General Information on Grants and Assistance

- 1 Does the organization maintain records to substantiate the amount of the grants or assistance, the grantees' eligibility for the grants or assistance, and the selection criteria used to award the grants or assistance?
- 2 Describe in Part IV the organization's procedures for monitoring the use of grant funds in the United States.

☒ Yes

☐ No

Part II Grants and Other Assistance to Domestic Organizations and Domestic Governments. Complete if the organization answered "Yes" on Form 990, Part IV, line 21, for any recipient that received more than \$5,000. Part II can be duplicated if additional space is needed.

(a) Name and address of organization or government	(b) EIN	(c) IRC section (if applicable)	(d) Amount of cash grant	(e) Amount of non-cash assistance	(f) Method of valuation (book, FMV, appraisal, other)	(g) Description of noncash assistance	(h) Purpose of grant or assistance
(1) AFRICAN AMERICAN MAYORS ASSOCIATION INC 660 NORTH CAPITOL STREET NW SUITE 450 WASHINGTON, DC 20001	46-5593933	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(2) ALL HAZARDS CONSORTIUM INC 47 EAST SOUTH STREET SUITE 201 FREDERICK, MD 21701	26-0275096	501(C)(3)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(3) ALLIANCE TO SAVE ENERGY 607 14TH STREET NW SUITE 560 WASHINGTON, DC 20005	52-1082991	501(C)(3)	30,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(4) ALZHEIMER'S DISEASE & RELATED DISORDERS ASSOCIATION INC 3550 S CLARK ST SUITE 203 ARLINGTON, VA 22202	13-3039601	501(C)(3)	21,922	0	N/A	N/A	CORPORATE RESPONSIBILITY
(5) AMERICAN ASSOCIATION OF BLACKS IN ENERGY 1625 K STREET NW SUITE 1200 WASHINGTON, DC 20006	84-0782569	501(C)(3)	30,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(6) AMERICAN BENEFITS COUNCIL 1501 M STREET NW SUITE 600 WASHINGTON, DC 20005	06-6100040	501(C)(6)	6,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(7) AMERICAN CANCER SOCIETY INC 270 PEACHTREE STREET NW SUITE 1300 ATLANTA, GA 30303	13-1788491	501(C)(3)	5,343	0	N/A	N/A	CORPORATE RESPONSIBILITY
(8) AMERICAN GAS ASSOCIATION 400 NORTH CAPITOL ST NW SUITE 450 WASHINGTON, DC 20001	13-0431590	501(C)(6)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(9) AMERICAN LEGISLATIVE EXCHANGE COUNCIL 2900 CRYSTAL DRIVE SUITE 600 ARLINGTON, VA 22202	52-0140979	501(C)(3)	12,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(10) AMERICAN SOCIETY OF ASSOCIATION EXECUTIVES 1575 I STREET NW WASHINGTON, DC 20005	53-0026940	501(C)(6)	18,495	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(11) AMERICANS FOR TAX REFORM 722 12TH STREET NW 4TH FLOOR WASHINGTON, DC 20005	52-1403587	501(C)(4)	75,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(12) BOY SCOUTS OF AMERICA NATIONAL CAPITAL AREA COUNCIL 9190 ROCKVILLE PIKE BETHESDA, MD 20814	53-0204610	501(C)(3)	7,500	0	N/A	N/A	CORPORATE RESPONSIBILITY
(13) BUSINESS COUNCIL FOR SUSTAINABLE ENERGY 805 15TH STREET NW SUITE 710 WASHINGTON, DC 20005	52-1801630	501(C)(6)	7,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(14) CENTER FOR ENERGY WORKFORCE DEVELOPMENT 701 PENNSYLVANIA AVENUE NW 3RD FLOOR WASHINGTON, DC 20004	20-4504014	501(C)(3)	132,523	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(15) CHAMBER OF COMMERCE OF THE USA 1615 H STREET NW WASHINGTON, DC 20062	53-0045720	501(C)(6)	60,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(16) CITIZENS AGAINST GOVERNMENT WASTE 317 MASSACHUSETTS AVE NE STE 300 WASHINGTON, DC 20002	52-1363952	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(17) CITIZENS FOR RESPONSIBLE ENERGY SOLUTIONS INC 1200 NEWINGTON AVENUE WASHINGTON, DC 20005	46-0558330	501(C)(4)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT

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1201 PENNSYLVANIA AVENUE NW SUITE 220 WASHINGTON, DC 20004							
(18) COMMERCIAL DRONE ALLIANCE 555 13TH STREET NW WASHINGTON, DC 20004	81-2931755	501(C)(6)	5,417	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(19) COMMUNITY LEADERS OF AMERICA PO BOX 2262 SPRINGFIELD, VA 22152	46-3149989	SECTION 527	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(20) CONFERENCE OF WESTERN ATTORNEYS GENERAL 5050 LAGUNA BLVD SUITE 112-323 ELK GROVE, CA 95758	68-0250561	501(C)(3)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(21) CONGRESSIONAL BLACK CAUCUS POLITICAL EDUCATION & LEADERSHIP INSTITUTE 413 NEW JERSEY AVENUE SE WASHINGTON, DC 20003	52-2270607	501(C)(4)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(22) CONGRESSIONAL HISPANIC CAUCUS INSTITUTE INC 1128 16TH STREET NW WASHINGTON, DC 20036	52-1114225	501(C)(3)	45,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(23) CONGRESSIONAL HISPANIC LEADERSHIP INSTITUTE INC 700 PENNSYLVANIA AVENUE SE SUITE 2004 WASHINGTON, DC 20003	20-0392012	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(24) CONGRESSIONAL SPORTS FOR CHARITY PO BOX 1987 ALEXANDRIA, VA 22314	81-2118591	501(C)(3)	16,700	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(25) CONSUMER ENERGY ALLIANCE 2211 NORFOLK STREET SUITE 610 HOUSTON, TX 77098	26-1658339	501(C)(4)	16,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(26) CURATORS OF THE UNIVERSITY OF MISSOURI 118 UNIVERSITY HALL COLUMBIA, MO 65211	43-6003859	SECTION 115	8,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(27) DEMOCRATIC ATTORNEYS GENERAL ASSOCIATION INC PO BOX 34445 WASHINGTON, DC 20005	13-4220019	SECTION 527	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(28) DEMOCRATIC GOVERNORS ASSOCIATION 1225 EYE STREET NW SUITE 1100 WASHINGTON, DC 20005	52-1304889	SECTION 527	125,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(29) DEMOCRATIC LEGISLATIVE CAMPAIGN COMMITTEE 1225 EYE STREET NW SUITE 1250 WASHINGTON, DC 20005	52-1870839	SECTION 527	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(30) DEMOCRATIC MAYORS ASSOCIATION 529 14TH STREET NW SUITE 1206 WASHINGTON, DC 20045	52-1535470	SECTION 527	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(31) ELECTRIC DRIVE TRANSPORTATION ASSOCIATION 1250 EYE STREET NW SUITE 902 WASHINGTON, DC 20005	52-1665058	501(C)(6)	16,975	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(32) ELECTRICAL SAFETY FOUNDATION INTERNATIONAL 1300 N 17TH STREET SUITE 900 ARLINGTON, VA 22209	52-1892239	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(33) ENVIRONMENTAL COUNCIL OF THE STATES 1250 H STREET NW SUITE 850 WASHINGTON, DC 20005	36-3962169	501(C)(6)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(34) FORTH MOBILITY FUND 2035 NW FRONT AVENUE SUITE 101 PORTLAND, OR 97209	45-4726335	501(C)(3)	7,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(35) FREIGHT RAIL CUSTOMER ALLIANCE 4301 WILSON BLVD ARLINGTON, VA 22203	52-1331523	501(C)(6)	7,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(36) GOPAC INC 1201 WILSON BLVD SUITE 2110 ARLINGTON, VA 22209	52-1237780	SECTION 527	50,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(37) HISPANICS IN ENERGY 1017 L STREET 719 SACRAMENTO, CA 95814	46-1415746	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(38) HORTON'S KIDS INC 2233 HUNTER PLACE SE WASHINGTON, DC 20020	52-1755403	501(C)(3)	15,120	0	N/A	N/A	CORPORATE RESPONSIBILITY
(39) INSTITUTE FOR ENERGY RESEARCH 1155 15TH STREET NW SUITE 525 WASHINGTON, DC 20005	76-0149778	501(C)(3)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(40) J STREET CUP	20-4561025	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM

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1001 JANNEYS LANE ALEXANDRIA, VA 22302							SUPPORT
(41) MAINE AFFORDABLE ENERGY 100 MIDDLE STREET SUITE 206 PORTLAND, ME 04101	87-2441832	SECTION 527	80,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(42) MARCH ON WASHINGTON FILM FESTIVAL 525 9TH STREET NW 7TH FLOOR WASHINGTON, DC 20004	46-4604132	501(C)(3)	10,000	0	N/A	N/A	CORPORATE RESPONSIBILITY
(43) MID ATLANTIC CONFERENCE OF REGULATORY UTILITIES COMMISSIONERS INC 1101 VERMONT AVENUE NW SUITE 401 WASHINGTON, DC 20005	52-2027917	501(C)(3)	12,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(44) MID-AMERICA REGULATORY CONFERENCE INC 1375 E COURT AVENUE DES MOINES, IA 50319	43-6053680	501(C)(6)	7,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(45) NALEO EDUCATIONAL FUND 1122 W WASHINGTON BOULEVARD 3RD FLOOR LOS ANGELES, CA 90015	52-1212849	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(46) NATIONAL ASSOCIATION OF COUNTIES 660 NORTH CAPITOL STREET NW SUITE 400 WASHINGTON, DC 20001	53-0190321	501(C)(4)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(47) NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS 1101 VERMONT AVENUE NW SUITE 200 WASHINGTON, DC 20005	53-0204609	501(C)(4)	70,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(48) NATIONAL ASSOCIATION OF STATE ENERGY OFFICIALS 1300 N 17TH STREET SUITE 1275 ARLINGTON, VA 22209	52-1474553	501(C)(3)	12,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(49) NATIONAL ASSOCIATION OF STATE UTILITY CONSUMER ADVOCATES 8380 COLESVILLE ROAD SUITE 101 SILVER SPRING, MD 20910	59-1986067	501(C)(4)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(50) NATIONAL BLACK CAUCUS OF STATE LEGISLATORS 444 N CAPITOL STREET NW SUITE 622 WASHINGTON, DC 20001	52-1218832	501(C)(3)	35,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(51) NATIONAL CONFERENCE OF STATE LEGISLATURES 7700 EAST FIRST PLACE DENVER, CO 80230	84-0772595	SECTION 115	45,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(52) NATIONAL ENDANGERED SPECIES ACT REFORM COALITION 1050 THOMAS JEFFERSON STREET NW 6TH FLOOR WASHINGTON, DC 20007	52-1763800	501(C)(6)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(53) NATIONAL ENERGY AND UTILITY AFFORDABILITY COALITION PO BOX 33878 WASHINGTON, DC 20033	52-1559709	501(C)(3)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(54) NATIONAL ENERGY RESOURCES ORGANIZATION INC 3803 CALVERT STREET NW WASHINGTON, DC 20007	91-1850125	501(C)(3)	22,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(55) NATIONAL FOUNDATION FOR WOMEN LEGISLATORS 5434 CHIEFTAIN CIRCLE SUITE B ALEXANDRIA, VA 22312	52-1480785	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(56) NATIONAL GOVERNORS ASSOCIATION CENTER FOR BEST PRACTICES 444 N CAPITOL STREET NW SUITE 267 WASHINGTON, DC 20001	23-7391796	501(C)(3)	30,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(57) NATIONAL HISPANIC CAUCUS OF STATE LEGISLATORS 1444 I STREET NW SUITE 900 WASHINGTON, DC 20005	84-1168319	501(C)(3)	40,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(58) NATIONAL LABOR & MANAGEMENT PUBLIC AFFAIRS COMMITTEE 701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004	26-2620296	501(C)(6)	70,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(59) NATIONAL LEAGUE OF CITIES 660 N CAPITOL STREET NW SUITE 450 WASHINGTON, DC 20001	53-0226780	501(C)(4)	28,750	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(60) NATIONAL MULTIPLE SCLEROSIS SOCIETY 733 THIRD AVENUE 3RD FLOOR NEW YORK, NY 10017	13-5661935	501(C)(3)	7,500	0	N/A	N/A	CORPORATE RESPONSIBILITY

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FLOOR NEW YORK, NY 10017							
(61) NATIONAL ORGANIZATION OF BLACK ELECTED LEGISLATIVE WOMEN 20 F STREET NW SUITE 700 WASHINGTON, DC 20001	95-4546966	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(62) NATIONAL URBAN LEAGUE INC 80 PINE STREET 9TH FLOOR NEW YORK, NY 10005	13-1840489	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(63) NCSL FOUNDATION FOR STATE LEGISLATURES 7700 EAST FIRST PLACE DENVER, CO 80230	74-2232576	501(C)(3)	12,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(64) NEW ENGLAND CONFERENCE OF PUBLIC UTILITIES COMMISSIONERS PO BOX 9111 ESSEX, VT 05451	05-0376760	501(C)(3)	8,974	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(65) NO BLANK CHECKS 100 MIDDLE STREET SUITE 206 PORTLAND, ME 04101	87-2586020	SECTION 527	80,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(66) NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION 3353 PEACHTREE ROAD NE SUITE 600 NORTH TOWER ATLANTA, GA 30326	20-4821888	501(C)(6)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(67) NORTH AMERICAN ENERGY STANDARDS BOARD INC 1415 LOUISIANA ST SUITE 3460 HOUSTON, TX 77002	76-0451850	501(C)(6)	8,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(68) NORTHWESTERN UNIVERSITY 633 CLARK STREET EVANSTON, IL 60208	36-2167817	501(C)(3)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(69) PREVENT CANCER FOUNDATION 333 JOHN CARLYLE STREET SUITE 635 ALEXANDRIA, VA 22314	52-1429544	501(C)(3)	10,000	0	N/A	N/A	CORPORATE RESPONSIBILITY
(70) PUBLIC AFFAIRS COUNCIL 2121 K STREET NW SUITE 900 WASHINGTON, DC 20037	13-1790733	501(C)(4)	14,800	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(71) REPUBLICAN GOVERNORS ASSOCIATION 1747 PENNSYLVANIA AVENUE NW SUITE 250 WASHINGTON, DC 20006	11-3655877	SECTION 527	100,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(72) REPUBLICAN STATE LEADERSHIP COMMITTEE 1201 F STREET NW SUITE 675 WASHINGTON, DC 20004	05-0532524	SECTION 527	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(73) RESOURCES FOR THE FUTURE INC 1616 P STREET NW SUITE 600 WASHINGTON, DC 20036	53-0220900	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(74) ROOSEVELT INSTITUTE 570 LEXINGTON AVENUE 5TH FLOOR NEW YORK, NY 10022	23-7213592	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(75) SENATE PRESIDENTS' FORUM INC 579 BROADWAY HASTINGS ON HUDSON, NY 10706	22-3284046	501(C)(3)	35,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(76) SEXUAL MINORITY YOUTH ASSISTANCE LEAGUE INC 410 7TH STREET SE WASHINGTON, DC 20003	52-1394900	501(C)(3)	10,000	0	N/A	N/A	CORPORATE RESPONSIBILITY
(77) SOME INC 71 O STREET NW WASHINGTON, DC 20001	23-7098123	501(C)(3)	14,190	0	N/A	N/A	CORPORATE RESPONSIBILITY
(78) SOUTHEASTERN ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS 501 N WEST STREET SUITE 201A JACKSON, MS 39201	62-1331903	501(C)(6)	7,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(79) SOUTHERN STATES ENERGY BOARD 6325 AMHERST COURT PEACHTREE CORNERS, GA 30092	58-0864888	SECTION 115	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(80) ST COLETTA OF GREATER WASHINGTON INC 1901 INDEPENDENCE AVENUE SE WASHINGTON, DC 20003	54-0968224	501(C)(3)	7,500	0	N/A	N/A	CORPORATE RESPONSIBILITY
(81) TAXPAYERS PROTECTION ALLIANCE 1101 14TH STREET NW SUITE 1120 WASHINGTON, DC 20005	45-0702828	501(C)(4)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(82) THE AMERICAN CONSUMER INSTITUTE CENTER FOR CITIZEN RESEARCH 4350 FAIRFAX DRIVE SUITE 725 ARLINGTON, VA 22203	20-8601897	501(C)(3)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(83) THE ARTISTS AND	26-2255679	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM

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ATHLETES ALLIANCE INC 1800 M STREET NW SUITE 500 SOUTH WASHINGTON, DC 20036							SUPPORT
(84) THE ASPEN INSTITUTE 2300 N STREET NW SUITE 700 WASHINGTON, DC 20037	84-0399006	501(C)(3)	25,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(85) THE CONGRESSIONAL INSTITUTE INC 1700 DIAGONAL ROAD SUITE 300 ALEXANDRIA, VA 22314	52-1504189	501(C)(4)	28,125	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(86) THE COUNCIL OF STATE GOVERNMENTS 1776 AVENUE OF THE STATES LEXINGTON, KY 40511	36-6000818	501(C)(3)	22,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(87) THE KEYSTONE CENTER 1628 SAINTS JOHN ROAD KEYSTONE, CO 80435	84-0688506	501(C)(3)	60,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(88) THE LATINO COALITION 1455 PENNSYLVANIA AVENUE NW SUITE 400 WASHINGTON, DC 20004	52-2266386	501(C)(6)	20,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(89) THE NATIONAL ASSOCIATION OF MANUFACTURERS 733 10TH STREET NW SUITE 700 WASHINGTON, DC 20001	13-1084330	501(C)(6)	6,600	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(90) THE NATIONAL DEMOCRATIC CLUB INC 30 IVY STREET SE WASHINGTON, DC 20003	53-0233594	501(C)(7)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(91) THE PEREGRINE FUND INC 5668 W FLYING HAWK LANE BOISE, ID 83709	23-1969973	501(C)(3)	15,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(92) THE PERMITTING INSTITUTE 1307 NEW YORK AVENUE NW SUITE 602 WASHINGTON, DC 20005	86-1659330	501(C)(6)	37,500	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(93) US NAVY MEMORIAL FOUNDATION 701 PENNSYLVANIA AVE NW WASHINGTON, DC 20004	52-1104476	501(C)(3)	6,000	0	N/A	N/A	CORPORATE RESPONSIBILITY
(94) UNITED STATES CONFERENCE OF MAYORS 1620 EYE STREET NW SUITE 400 WASHINGTON, DC 20006	53-0196642	501(C)(3)	55,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(95) UNITED STATES HISPANIC CHAMBER OF COMMERCE 750 17TH STREET NW SUITE 825 WASHINGTON, DC 20006	43-1249249	501(C)(6)	35,417	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(96) WASHINGTON HUMANE SOCIETY 71 OGLETHORPE STREET NW WASHINGTON, DC 20011	53-0219724	501(C)(3)	5,900	0	N/A	N/A	CORPORATE RESPONSIBILITY
(97) WASHINGTON STATE SOCIETY PO BOX 77531 WASHINGTON, DC 20013	52-6075803	501(C)(7)	6,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(98) WASHINGTON TENNIS & EDUCATION FOUNDATION 200 STODDERT PLACE SE WASHINGTON, DC 20019	52-6046504	501(C)(3)	13,500	0	N/A	N/A	CORPORATE RESPONSIBILITY
(99) WESTERN CONFERENCE OF PUBLIC SERVICE COMMISSIONERS INC 1101 VERMONT AVENUE NW SUITE 200 WASHINGTON, DC 20005	45-5529620	501(C)(3)	12,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(100) WESTERN GOVERNORS ASSOCIATION 1700 BROADWAY SUITE 500 DENVER, CO 80290	84-0747227	SECTION 115	13,125	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT
(101) WOMEN'S ENERGY SUMMIT PO BOX 31045 CHICAGO, IL 60631	47-5309525	501(C)(3)	10,000	0	N/A	N/A	CONTRIBUTION/PROGRAM SUPPORT

2 Enter total number of section 501(c)(3) and government organizations listed in the line 1 table 59

3 Enter total number of other organizations listed in the line 1 table 42

For Paperwork Reduction Act Notice, see the Instructions for Form 990.

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Part III Grants and Other Assistance to Domestic Individuals. Complete if the organization answered "Yes" on Form 990, Part IV, line 22.
Part III can be duplicated if additional space is needed.

(a) Type of grant or assistance	(b) Number of recipients	(c) Amount of cash grant	(d) Amount of noncash assistance	(e) Method of valuation (book, FMV, appraisal, other)	(f) Description of noncash assistance
(1)					
(2)					
(3)					
(4)					
(5)					

(6)					
(7)					

Part IV Supplemental Information. Provide the information required in Part I, line 2; Part III, column (b); and any other additional information.

Return Reference	Explanation
PART I, LINE 2:	THE ORGANIZATION MAINTAINS RECORDS TO SUBSTANTIATE THE AMOUNT OF ASSISTANCE, THE GRANTEE'S ELIGIBILITY FOR ASSISTANCE AND THE SELECTION CRITERIA FOR THE AWARD.

Schedule I (Form 990) 2023

Additional Data

Return to Form

Software ID:
Software Version:

efile Public Visual Render		ObjectID: 202423209349328602 - Submission: 2024-11-15		TIN: 13-0659550	
Schedule J (Form 990)		Compensation Information			OMB No. 1545-0047
Department of the Treasury Internal Revenue Service		For certain Officers, Directors, Trustees, Key Employees, and Highest Compensated Employees ▶ Complete if the organization answered "Yes" on Form 990, Part IV, line 23. ▶ Attach to Form 990. ▶ Go to www.irs.gov/Form990 for instructions and the latest information.			2023 Open to Public Inspection
Name of the organization EDISON ELECTRIC INSTITUTE INC				Employer identification number 13-0659550	

Part I Questions Regarding Compensation		Yes	No
1a Check the appropriate box(es) if the organization provided any of the following to or for a person listed on Form 990, Part VII, Section A, line 1a. Complete Part III to provide any relevant information regarding these items.			
☒ First-class or charter travel	☐ Housing allowance or residence for personal use		
☒ Travel for companions	☐ Payments for business use of personal residence		
☐ Tax idemnification and gross-up payments	☒ Health or social club dues or initiation fees		
☐ Discretionary spending account	☒ Personal services (e.g., maid, chauffeur, chef)		
b If any of the boxes on Line 1a are checked, did the organization follow a written policy regarding payment or reimbursement or provision of all of the expenses described above? If "No," complete Part III to explain		1b	Yes
2 Did the organization require substantiation prior to reimbursing or allowing expenses incurred by all directors, trustees, officers, including the CEO/Executive Director, regarding the items checked on Line 1a?		2	Yes
3 Indicate which, if any, of the following the filing organization used to establish the compensation of the organization's CEO/Executive Director. Check all that apply. Do not check any boxes for methods used by a related organization to establish compensation of the CEO/Executive Director, but explain in Part III.			
☒ Compensation committee	☐ Written employment contract		
☒ Independent compensation consultant	☒ Compensation survey or study		
☒ Form 990 of other organizations	☒ Approval by the board or compensation committee		
4 During the year, did any person listed on Form 990, Part VII, Section A, line 1a, with respect to the filing organization or a related organization:			
a Receive a severance payment or change-of-control payment?		4a	Yes
b Participate in, or receive payment from, a supplemental nonqualified retirement plan?		4b	Yes
c Participate in, or receive payment from, an equity-based compensation arrangement?		4c	No
If "Yes" to any of lines 4a-c, list the persons and provide the applicable amounts for each item in Part III.			
Only 501(c)(3), 501(c)(4), and 501(c)(29) organizations must complete lines 5-9.			
5 For persons listed on Form 990, Part VII, Section A, line 1a, did the organization pay or accrue any compensation contingent on the revenues of:			
a The organization?		5a	
b Any related organization?		5b	
If "Yes," on line 5a or 5b, describe in Part III.			
6 For persons listed on Form 990, Part VII, Section A, line 1a, did the organization pay or accrue any compensation contingent on the net earnings of:			
a The organization?		6a	
b Any related organization?		6b	
If "Yes," on line 6a or 6b, describe in Part III.			
7 For persons listed on Form 990, Part VII, Section A, line 1a, did the organization provide any nonfixed payments not described in lines 5 and 6? If "Yes," describe in Part III		7	
8 Were any amounts reported on Form 990, Part VII, paid or accrued pursuant to a contract that was subject to the initial contract exception described in Regulations section 53.4958-4(a)(3)? If "Yes," describe in Part III		8	
9 If "Yes" on line 8, did the organization also follow the rebuttable presumption procedure described in Regulations section 53.4958-6(c)?		9	

For Paperwork Reduction Act Notice, see the Instructions for Form 990. Cat. No. 50053T Schedule J (Form 990) 2023

Part II Officers, Directors, Trustees, Key Employees, and Highest Compensated Employees. Use duplicate copies if additional space is needed.							
For each individual whose compensation must be reported on Schedule J, report compensation from the organization on row (i) and from related organizations, described in the instructions, on row (ii). Do not list any individuals that are not listed on Form 990, Part VII.							
Note. The sum of columns (B)(i)-(iii) for each listed individual must equal the total amount of Form 990, Part VII, Section A, line 1a, applicable column (D) and (E) amounts for that individual.							
(A) Name and Title		(B) Breakdown of W-2, 1099-MISC compensation, and/or 1099-NEC			(C) Retirement and other deferred compensation	(D) Nontaxable benefits	(E) Total of columns (B)(i)-(D)
		(i) Base compensation	(ii) Bonus & incentive compensation	(iii) Other reportable compensation			
1 THOMAS KUHN PRESIDENT AND CEO	(i)	1,202,323	1,329,420	3,065,283	8,764,772	38,820	14,400,618
	(ii)	0	0	0	0	0	0
2 DANNY BROUILLETTE PRESIDENT AND CEO ELECT	(i)	448,000	2,500,000	2,322	252,000	1,765	3,204,087
	(ii)	0	0	0	0	0	0
3 BRIAN WOLFF CSO & EVP, PUB POLICY & EXT AFFAIRS	(i)	900,757	577,000	13,398	688,557	13,407	2,193,119
	(ii)	0	0	0	0	0	0
4 PHILIP MOELLER EVP, BUSINESS OPS & REG AFFAIRS	(i)	747,207	408,000	9,628	180,260	37,041	1,382,136
	(ii)	0	0	0	0	0	0
5 RICHARD MCMAHON SVP ENERGY SUPPLY/FINANCE, CHIEF ESG	(i)	479,448	200,000	9,536	497,504	25,486	1,211,974
	(ii)	0	0	0	0	0	0
6 JOHN SCHLENKER CFO & TREASURER (UNTIL 12/23)	(i)	319,538	138,000	398,259	208,601	29,223	1,093,621
	(ii)	0	0	0	0	0	0

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	(ii)	- 0	- 0	- 0	- 0	- 0	- 0	- 0
7 EMILY FISHER EVP, CLEAN ENERGY, GEN COUNSEL & SECR	(i)	540,088	263,000	4,561	131,732	17,291	956,672	0
	(ii)	0	0	0	0	0	0	0
8 SCOTT AARONSON SVP, SECURITY & PREPAREDNESS	(i)	388,207	169,000	4,208	75,970	33,585	670,970	0
	(ii)	0	0	0	0	0	0	0
9 STEPHANIE VOYDA SVP, COMMS & MEMBER ENGAGEMENT	(i)	387,840	158,760	5,772	37,364	24,411	614,147	0
	(ii)	7,915	3,240	118	763	498	12,534	0
10 ERIC GREY VP, GOVERNMENT RELATIONS	(i)	304,708	178,000	1,747	66,090	35,072	585,617	0
	(ii)	0	0	0	0	0	0	0
11 LAWRENCE JONES SVP, INTERNATIONAL PROGRAMS	(i)	328,038	141,000	5,528	55,130	31,093	560,789	0
	(ii)	0	0	0	0	0	0	0
12 COURTNEY PETERSON VP, CHRO & CHIEF DIVERSITY OFFICER	(i)	337,868	145,000	6,031	46,280	18,970	554,149	0
	(ii)	0	0	0	0	0	0	0
13 PHILIP DION SVP, CUSTOMER SOLUTIONS	(i)	327,067	50,000	43,470	29,000	26,293	475,830	0
	(ii)	0	0	0	0	0	0	0
14 SADEGH RAZEGHI CIO (UNTIL 10/23)	(i)	213,198	39,300	190,684	0	1,791	444,973	0
	(ii)	0	0	0	0	0	0	0
15 KRISTINE TELFORD EXECUTIVE DIRECTOR, EXTERNAL AFFAIRS	(i)	243,810	92,000	4,644	39,620	23,721	403,795	0
	(ii)	0	0	0	0	0	0	0
16 JOHN ANDERSON EXECUTIVE DIRECTOR, EWAC	(i)	236,986	43,900	8,743	34,556	33,213	357,398	0
	(ii)	0	0	0	0	0	0	0
17 ANDREA KOCH SENIOR DIRECTOR, RELIABILITY POLICY	(i)	238,222	59,100	1,787	35,376	20,836	355,321	0
	(ii)	0	0	0	0	0	0	0
18 ROBERT MICHEL MANAGING DIR, EMPLOYMENT TESTING	(i)	268,045	39,800	2,059	17,901	20,265	348,070	0
	(ii)	0	0	0	0	0	0	0
19 SHELBY LINTON-KEDDIE EXEC DIR, REG AFFAIRS (UNTIL 10/23)	(i)	205,802	90,000	14,595	17,900	11,262	339,559	0
	(ii)	0	0	0	0	0	0	0
20 ERIC HOLDSWORTH MANAGING DIR, CLEAN ENERGY & ENVIRON	(i)	259,717	37,700	4,498	13,325	661	315,901	0
	(ii)	0	0	0	0	0	0	0
21 LISA WOOD VP, CUSTOMER SOLUTIONS (UNTIL 3/23)	(i)	69,962	116,100	14,528	57,463	2,798	260,851	0
	(ii)	7,774	12,900	1,614	6,385	311	28,984	0

Schedule J (Form 990) 2023

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Schedule J (Form 990) 2023

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Part III Supplemental Information

Provide the information, explanation, or descriptions required for Part I, lines 1a, 1b, 3, 4a, 4b, 4c, 5a, 5b, 6a, 6b, 7, and 8, and for Part II. Also complete this part for any additional information.

Return Reference	Explanation
PART I, LINE 1A	PART I, LINE 1A - EDISON ELECTRIC INSTITUTE ALLOWS FOR BUSINESS CLASS UPGRADE FOR INTERNATIONAL FLIGHTS OVER SIX HOURS. ALSO, ONE EMPLOYEE IS PERMITTED A BUSINESS CLASS/FIRST CLASS UPGRADE FOR DOMESTIC FLIGHTS DUE TO A MEDICAL CONDITION. AMOUNTS FOR BUSINESS CLASS/FIRST CLASS TRAVEL ARE NOT INCLUDED IN TAXABLE INCOME. PART I, LINE 1A - EEI PROVIDES THE SVP, INTERNATIONAL PROGRAMS WITH COMPANION TRAVEL, WHICH IS INCLUDED IN TAXABLE INCOME. PART I, LINE 1A - HEALTH OR SOCIAL CLUB DUES OR INITIATION FEES: RICHARD MCMAHON \$1,183 INCLUDED IN TAXABLE INCOME PART I, LINE 1A - PERSONAL SERVICES: EEI PROVIDES LIMITED TAX AND FINANCIAL PLANNING SERVICES TO CERTAIN OFFICERS. THESE SERVICES ARE INCLUDED IN TAXABLE INCOME.
PART I, LINES 4A-B	SADEGH RAZEGHI RECEIVED \$172,990 SEVERANCE PAY UPON HIS RETIREMENT AFTER 20 YEARS OF SERVICE. JOHN SCHLENKER, CHIEF FINANCIAL OFFICER, RECEIVED \$342,784 SEVERANCE PAY UPON HIS RETIREMENT AFTER 30 YEARS OF SERVICE. THESE ARE INCLUDED IN SCHEDULE J, PART II, COLUMN (B)(III). THOMAS KUHN EARNED BENEFITS OF \$10,856,142 UNDER NON-QUALIFIED PLANS. CURRENT AMOUNTS ARE INCLUDED IN SCHEDULE J, PART II, COLUMN (B)(III) AND COLUMN (C). IN ADDITION TO THE BENEFITS LISTED ABOVE IN PART I, LINE 4B, THE EDISON ELECTRIC INSTITUTE PROVIDES NON-QUALIFIED DEFERRED COMPENSATION PLANS FOR ELIGIBLE MANAGEMENT EMPLOYEES. CURRENT YEAR AMOUNTS ARE INCLUDED IN SCH J, PART II, COLUMN (C). FOR A FROZEN GROUP OF ELIGIBLE MANAGEMENT EMPLOYEES, THESE NON-QUALIFIED PLAN BENEFITS ARE VESTED ONE YEAR AFTER SEPARATION FROM SERVICE FROM EEI PROVIDED THE EMPLOYEE SEPARATES ON OR AFTER ATTAINING AGE 55 AND COMPLETING FIVE OR MORE YEARS OF SERVICE OR ATTAINING AGE 65 AND SATISFYING THE RESTRICTIVE COVENANTS OF A CONFIDENTIAL INFORMATION, NON-COMPETITION AND NON-SOLICITATION AGREEMENT. FOR A SECOND GROUP OF ELIGIBLE MANAGEMENT EMPLOYEES, THE NON-QUALIFIED PLAN BENEFITS ARE VESTED ON THE ELIGIBLE EMPLOYEE'S RETIREMENT DATE WHICH OCCURS ON OR AFTER ATTAINING THE AGE OF 55 AND COMPLETING FIVE OR MORE YEARS OF SERVICE OR ATTAINING THE AGE OF 65. DANNY BROUILLETTE \$242,100 BRIAN WOLFF \$666,757 PHILIP MOELLER \$141,960 RICHARD MCMAHON \$509,656 EMILY FISHER \$111,620 LAWRENCE JONES \$16,830 JOHN SCHLENKER \$221,745 SCOTT AARONSON \$32,470 STEPHANIE VOYDA \$30,160 LISA WOOD \$46,305 ERIC GREY \$21,190 COURTNEY PETERSON \$14,580 PHILIP DION \$300 KRISTINE TELFORD \$1,320 THE FOLLOWING PARTICIPANTS IN THE EDISON ELECTRIC INSTITUTE NON-QUALIFIED DEFERRED COMPENSATION PLAN RECEIVED PAYMENTS, AS INCLUDED IN SCHEDULE J, PART II, COLUMN (B)(III) AND AS DISCLOSED IN COLUMN (F): THOMAS KUHN \$1,639,066

Schedule J (Form 990) 2023

Additional Data

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Software ID:
Software Version:

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ObjectID: 202423209349328602 - Submission: 2024-11-15

TIN: 13-0659550

SCHEDULE O
(Form 990)Department of the Treasury
Internal Revenue Service**Supplemental Information to Form 990 or 990-EZ**Complete to provide information for responses to specific questions on
Form 990 or 990-EZ or to provide any additional information.

Attach to Form 990 or 990-EZ.

Go to www.irs.gov/Form990 for the latest information.

OMB No. 1545-0047

2023Open to Public
InspectionName of the organization
EDISON ELECTRIC INSTITUTE INC

Employer identification number

13-0659550

Return Reference	Explanation
FORM 990, PART VI, SECTION A, LINE 1A	THE BOARD OF DIRECTORS, AFTER EACH ANNUAL ELECTION OF DIRECTORS AND BY THE RESOLUTION ADOPTED BY A MAJORITY OF THE ENTIRE BOARD, MAY DESIGNATE FROM ITS OWN MEMBERSHIP AN EXECUTIVE COMMITTEE. IN ADDITION TO THOSE DESIGNATED TO SERVE ON THE EXECUTIVE COMMITTEE, THE FORMER CHAIRMAN OF THE INSTITUTE WHO CONTINUES AS CHAIR OR CHIEF EXECUTIVE OFFICER OF A CLASS A INSTITUTE MEMBER SHALL SERVE AS EX OFFICIO, NON-VOTING MEMBERS OF THE COMMITTEE. THE EXECUTIVE COMMITTEE MAY EXERCISE ALL THE POWERS OF THE BOARD OF DIRECTORS BETWEEN MEETINGS OF THE BOARD EXCEPT: 1. APPROVAL OR RECOMMENDATION TO MEMBERS OF ACTION THAT IS REQUIRED TO BE APPROVED BY MEMBERS UNDER STATUTE; 2. THE FILLING OF VACANCIES IN THE BOARD OF DIRECTORS OR IN ANY COMMITTEE THEREOF; 3. DETERMINING COMPENSATION OF THE DIRECTORS FOR SERVING ON THE BOARD OR ON ANY COMMITTEE THEREOF; 4. AMENDMENT OR REPEAL OF THE BYLAWS OR THE ADOPTION OF NEW BYLAWS; 5. AMENDMENT OR REPEAL OF ANY RESOLUTION OF THE BOARD WHICH BY ITS TERMS SHALL NOT BE SO AMENDABLE OR REPEALABLE AND AS OTHERWISE REQUIRED BY RESOLUTION OF THE BOARD OF DIRECTORS. THE CHAIR SHALL PRESIDE AT MEETINGS OF THE EXECUTIVE COMMITTEE. VACANCIES IN THE MEMBERSHIP OF THE COMMITTEE SHALL BE FILLED BY THE BOARD OF DIRECTORS. THE EXECUTIVE COMMITTEE SHALL KEEP REGULAR MINUTES OF THE PROCEEDINGS AND REPORT THE SAME TO THE BOARD WHEN REQUIRED.
FORM 990, PART VI, SECTION A, LINE 6	THE ORGANIZATION HAS THREE VOTING CLASSES OF MEMBERSHIP: OPERATING COMPANY MEMBERS - INVESTOR-OWNED ELECTRIC COMPANIES ENGAGED IN THE GENERATION, TRANSMISSION OR DISTRIBUTION OF ELECTRICITY TO THE CUSTOMERS IN THE U.S. EEI'S U.S. INVESTOR-OWNED ELECTRIC COMPANY MEMBERS PROVIDE ELECTRICITY FOR NEARLY 250 MILLION AMERICANS AND OPERATE IN ALL 50 STATES AND THE DISTRICT OF COLUMBIA. HOLDING COMPANY MEMBERS - BEING CORPORATIONS IN THE U.S., WHICH BY VIRTUE OF OWNERSHIP OR SECURITIES IN INVESTOR-OWNED CORPORATIONS ARE INTERESTED IN ADVANCING THE BUSINESS OF OPERATING ELECTRIC COMPANIES IN RELATION TO THE SALE OF ELECTRICITY TO CUSTOMERS. SUBSIDIARY COMPANY MEMBERS - BEING SUBSIDIARY COMPANIES OF OPERATING COMPANY OR HOLDING COMPANY MEMBERS, SHALL BE ELIGIBLE FOR SEPARATE MEMBERSHIP. PARTICIPATION ON STANDING COMMITTEES AND IN OTHER ACTIVITIES OF THE ORGANIZATION SHALL BE DEFINED BY AND DETERMINED FROM TIME TO TIME BY THE BOARD. THE ORGANIZATION HAS THREE NON-VOTING CLASSES OF MEMBERSHIP: INTERNATIONAL MEMBERS - EEI'S INTERNATIONAL MEMBERS' PROGRAM PROVIDES THE CRITICAL LINK THAT BRINGS TOGETHER ELECTRIC COMPANIES AROUND THE WORLD WITH THE U.S. ELECTRIC POWER INDUSTRY. THIS SPECIAL PROGRAM OFFERS ELECTRIC COMPANIES OUTSIDE THE U.S. THE OPPORTUNITY TO BECOME EEI MEMBERS REGARDLESS OF THEIR OWNERSHIP FORM. THROUGH ITS EXPANDED INTERNATIONAL INVOLVEMENT, EEI BROADENS THE VALUE OF SHARED EXPERTISE AND EXPERIENCE ON ISSUES OF CONCERN AND INTEREST TO ELECTRIC COMPANIES AROUND THE WORLD. ASSOCIATES - EEI CREATED AN ASSOCIATE MEMBER CATEGORY IN 1995, AND CURRENTLY COUNTS MORE THAN 250 COMPANIES AS ASSOCIATE MEMBERS. THESE COMPANIES ARE SUPPLIERS; CONSULTANTS; MEMBERS OF THE FINANCIAL, MARKETING, CONSTRUCTION, AND LEGAL COMMUNITIES; AND OTHER SERVICE PROVIDERS TO THE ELECTRIC POWER INDUSTRY. EEI ASSOCIATE MEMBERSHIP IS DESIGNED FOR FIRMS THAT HAVE AN INTEREST IN ADVANCING THE DEVELOPMENT OF THE ELECTRIC POWER INDUSTRY. THESE FIRMS MAY PROVIDE GOODS AND SERVICES TO THE INDUSTRY, BUT MAY NOT BE ENGAGED IN THE GENERATION, TRANSMISSION, DISTRIBUTION, BROKERAGE, OR SALE OF ELECTRICITY, OR IF SO ENGAGED, NOT REGULATED AS AN ELECTRIC COMPANY. ASSOCIATE MEMBERS DO NOT HAVE VOTING RIGHTS. STRATEGIC PARTNERS - ELECTRIC AND WATER COMPANIES THAT DO NOT QUALIFY FOR MEMBERSHIP UNDER EEI'S BYLAWS OR BECAUSE OF THEIR FOUNDING LEGISLATION BUT THAT OTHERWISE SHARE SIMILAR OPERATIONAL, ENVIRONMENTAL, SECURITY, AND CUSTOMER SERVICE AS EEI MEMBER COMPANIES. STRATEGIC PARTNERS DO NOT HAVE VOTING RIGHTS.
FORM 990, PART VI, SECTION A, LINE 7A	THE DIRECTORS ARE ELECTED AT THE ANNUAL MEETING BY VOTING CLASS MEMBERS OF THE ORGANIZATION EITHER IN-PERSON OR BY PROXY.
FORM 990, PART VI, SECTION A, LINE 7B	THE MEMBERSHIP OF THE ORGANIZATION APPROVES BYLAW AMENDMENTS.
FORM 990, PART VI, SECTION B, LINE 11B	THE FORM 990 FOR THE EDISON ELECTRIC INSTITUTE IS PREPARED BY THE ORGANIZATION'S OUTSIDE CPA FIRM AND REPORTED BY THE ENGAGEMENT PRINCIPAL TO THE INSTITUTE'S EXECUTIVE COMMITTEE IN ADVANCE OF FILING. COPIES OF THE FORM 990 ARE MADE AVAILABLE TO THE EEI BOARD PRIOR TO FILING. THE RETURN IS REVIEWED BY THE INSTITUTE'S CHIEF FINANCIAL OFFICER AND TREASURER.
FORM 990, PART VI, SECTION B, LINE 12C	THE ORGANIZATION HAS WRITTEN CONFLICT OF INTEREST POLICIES FOR ALL OFFICERS, DIRECTORS, AND KEY EMPLOYEES. EDISON ELECTRIC INSTITUTE INC.'S CODE OF BUSINESS CONDUCT HAS BEEN DISTRIBUTED TO ALL EMPLOYEES AND IS ON THE ORGANIZATION'S INTRANET SITE. THIS DOCUMENT INCLUDES, IN PART, EEI'S CORE VALUES, OPERATING PRINCIPLES, CONFLICT OF INTEREST POLICY AND WHISTLEBLOWER POLICY, WHICH INCLUDES A CONFIDENTIAL 800 TELEPHONE NUMBER. PERIODIC REMINDERS ARE GIVEN. EDISON ELECTRIC INSTITUTE, INC. HAS A WRITTEN DIRECTOR'S CONFLICT OF INTEREST POLICY. APPLICABLE TO ALL MEMBERS OF ITS BOARD OF

	DIRECTORS, WHICH WAS FORMALLY ADOPTED BY THE ORGANIZATION'S BOARD. PERIODIC REMINDERS ARE GIVEN. THE ORGANIZATION ALSO HAS A CORPORATE COMPLIANCE OFFICER, A POLICY AND PROCEDURE FOR REPORTING VIOLATIONS OF THE CODE OF BUSINESS CONDUCT AS WELL AS CONCERNS ABOUT THE USE OF EDISON ELECTRIC INSTITUTE INC.'S CORPORATE RESOURCES AND FINANCIAL REPORTING AND A VENDOR CODE OF CONDUCT POLICY. THERE HAS NOT BEEN A VIOLATION OF THE CONFLICT OF INTEREST POLICIES; ALTHOUGH WE STAND READY TO ENFORCE THE POLICIES IN APPROPRIATE CIRCUMSTANCES.
FORM 990, PART VI, SECTION B, LINE 15	THE COMPENSATION OF THE ORGANIZATION'S PRESIDENT IS BASED ON RESULTS FROM COMPENSATION SURVEYS AND A REVIEW BY AN INDEPENDENT CONSULTANT ON AN ANNUAL BASIS. THE PRESIDENT'S COMPENSATION IS REVIEWED BY THE ORGANIZATION'S COMPENSATION COMMITTEE AND APPROVED BY THE EXECUTIVE COMMITTEE AND THE BOARD. COMPENSATION DECISIONS ARE DOCUMENTED IN THE BOARD MINUTES. THE PROCESS RECENTLY TOOK PLACE IN 2023. THE COMPENSATION OF THE ORGANIZATION'S OFFICERS IS BASED ON RESULTS FROM COMPENSATION SURVEYS AND A REVIEW BY AN INDEPENDENT COMPENSATION CONSULTANT ON AN ANNUAL BASIS. OFFICER COMPENSATION IS REVIEWED BY THE ORGANIZATION'S COMPENSATION COMMITTEE AND APPROVED BY THE EXECUTIVE COMMITTEE. COMPENSATION DECISIONS ARE DOCUMENTED IN A SIGNED MEMO BY THE PRESIDENT, COMPENSATION COMMITTEE CHAIR OR IN THE BOARD MINUTES. THE PROCESS RECENTLY TOOK PLACE IN 2023.
FORM 990, PART VI, SECTION C, LINE 18	EEI PROVIDES ITS FORM 990 TO THE PUBLIC ON ITS WEBSITE AND UPON REQUEST.
FORM 990, PART VI, SECTION C, LINE 19	THE ORGANIZATION'S ARTICLES OF INCORPORATION ARE A PUBLIC DOCUMENT AND ARE AVAILABLE ON THE VIRGINIA SECRETARY OF STATE WEBSITE. THE ORGANIZATION'S CONFLICT OF INTEREST POLICY IS AVAILABLE UPON REQUEST. THE ORGANIZATION'S AUDITED FINANCIAL STATEMENTS ARE NOT MADE AVAILABLE TO THE PUBLIC; HOWEVER, THE BALANCE SHEET AND STATEMENT OF REVENUE AND EXPENSES CAN BE FOUND ON THE FORM 990 WHICH IS MADE AVAILABLE TO THE PUBLIC ON EEI'S WEBSITE, VARIOUS WEBSITES AND UPON REQUEST.
FORM 990, PART IX, LINE 11G	CONSULTING 10,621,400. PERSONNEL & TEMPORARY HELP 737,549. VIDEO, RADIO, PHOTOGRAPHY 74,796.
FORM 990, PART XI, LINE 9:	CHANGE IN PROJECTED EMPLOYEE BENEFITS OBLIGATIONS 1,904,488.

For Paperwork Reduction Act Notice, see the Instructions for Form 990 or 990-EZ.

Cat. No. 51056K

Schedule O (Form 990) 2023

Additional Data**Return to Form****Software ID:****Software Version:**

efile Public Visual Render		ObjectID: 202423209349328602 - Submission: 2024-11-15		TIN: 13-0659550	
SCHEDULE R (Form 990)		Related Organizations and Unrelated Partnerships			OMB No. 1545-0047
					2023
Department of the Treasury Internal Revenue Service		Complete if the organization answered "Yes" on Form 990, Part IV, line 33, 34, 35b, 36, or 37. Attach to Form 990. Go to www.irs.gov/Form990 for instructions and the latest information.			Open to Public Inspection
Name of the organization EDISON ELECTRIC INSTITUTE INC				Employer identification number 13-0659550	

Part I Identification of Disregarded Entities. Complete if the organization answered "Yes" on Form 990, Part IV, line 33.					
(a) Name, address, and EIN (if applicable) of disregarded entity	(b) Primary activity	(c) Legal domicile (state or foreign country)	(d) Total income	(e) End-of-year assets	(f) Direct controlling entity

Part II Identification of Related Tax-Exempt Organizations. Complete if the organization answered "Yes" on Form 990, Part IV, line 34 because it had one or more related tax-exempt organizations during the tax year.								
(a) Name, address, and EIN of related organization	(b) Primary activity	(c) Legal domicile (state or foreign country)	(d) Exempt Code section	(e) Public charity status (if section 501(c)(3))	(f) Direct controlling entity	(g) Section 512(b)(13) controlled entity?		
						Yes	No	
(1)THOMAS ALVA EDISON FOUNDATION 701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004 52-2106274	SCIENTIFIC/EDUCATION	DC	501(C)(3)	LINE 7	EDISON ELECTRIC INSTITUTE INC	Yes		
(2)CENTER FOR ENERGY WORKFORCE DEVELOPMENT 701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004 20-4504014	EDUCATION	DC	501(C)(3)	LINE 12A, I	EDISON ELECTRIC INSTITUTE INC	Yes		
(3)EDISON ELECTRIC INSTITUTE RETIREE BENEFITS VOLUNTARY EMPLOYEES BENEFICIARY 701 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004 52-1660737	RETIREE MEDICAL AND LIFE INSURANCE BENEFITS	DC	501(C)(9)		EDISON ELECTRIC INSTITUTE INC	Yes		

Part III Identification of Related Organizations Taxable as a Partnership. Complete if the organization answered "Yes" on Form 990, Part IV, line 34, because it had one or more related organizations treated as a partnership during the tax year.												
(a) Name, address, and EIN of related organization	(b) Primary activity	(c) Legal domicile (state or foreign country)	(d) Direct controlling entity	(e) Predominant income(related, unrelated, excluded from tax under sections 512-514)	(f) Share of total income	(g) Share of end-of-year assets	(h) Disproportionate allocations?		(i) Code V-UBI amount in box 20 of Schedule K-1 (Form 1065)	(j) General or managing partner?		(k) Percentage ownership
							Yes	No		Yes	No	

Part IV Identification of Related Organizations Taxable as a Corporation or Trust. Complete if the organization answered "Yes" on Form 990, Part IV, line 34 because it had one or more related organizations treated as a corporation or trust during the tax year.												

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(a) Name, address, and EIN of related organization	(b) Primary activity	(c) Legal domicile (state or foreign country)	(d) Direct controlling entity	(e) Type of entity (C corp, S corp, or trust)	(f) Share of total income	(g) Share of end- of-year assets	(h) Percentage ownership	(i) Section 512(b)(13) controlled entity?	
								Yes	No

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Part V Transactions With Related Organizations. Complete if the organization answered "Yes" on Form 990, Part IV, line 34, 35b, or 36.

Note. Complete line 1 if any entity is listed in Parts II, III, or IV of this schedule.

1 During the tax year, did the organization engage in any of the following transactions with one or more related organizations listed in Parts II-IV?		Yes	No
a Receipt of (i) interest, (ii) annuities, (iii) royalties, or (iv) rent from a controlled entity			No
b Gift, grant, or capital contribution to related organization(s)		Yes	
c Gift, grant, or capital contribution from related organization(s)			No
d Loans or loan guarantees to or for related organization(s)			No
e Loans or loan guarantees by related organization(s)			No
f Dividends from related organization(s)			No
g Sale of assets to related organization(s)		Yes	
h Purchase of assets from related organization(s)			No
i Exchange of assets with related organization(s)			No
j Lease of facilities, equipment, or other assets to related organization(s)			No
k Lease of facilities, equipment, or other assets from related organization(s)			No
l Performance of services or membership or fundraising solicitations for related organization(s)			No
m Performance of services or membership or fundraising solicitations by related organization(s)			No
n Sharing of facilities, equipment, mailing lists, or other assets with related organization(s)		Yes	
o Sharing of paid employees with related organization(s)		Yes	
p Reimbursement paid to related organization(s) for expenses			No
q Reimbursement paid by related organization(s) for expenses		Yes	
r Other transfer of cash or property to related organization(s)		Yes	
s Other transfer of cash or property from related organization(s)			No

2 If the answer to any of the above is "Yes," see the instructions for information on who must complete this line, including covered relationships and transaction thresholds.

(a) Name of related organization	(b) Transaction type (a-s)	(c) Amount involved	(d) Method of determining amount involved
(1) CENTER FOR ENERGY WORKFORCE DEVELOPMENT	B	132,523	CASH
(2) CENTER FOR ENERGY WORKFORCE DEVELOPMENT	N	131,414	FMV
(3) CENTER FOR ENERGY WORKFORCE DEVELOPMENT	O	823,247	FMV
(4) CENTER FOR ENERGY WORKFORCE DEVELOPMENT	R	172,385	CASH
(5) THOMAS ALVA EDISON FOUNDATION	N	183,022	FMV
(6) THOMAS ALVA EDISON FOUNDATION	O	653,651	FMV
(7) THOMAS ALVA EDISON FOUNDATION	R	1,340,329	CASH

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Part VI Unrelated Organizations Taxable as a Partnership. Complete if the organization answered "Yes" on Form 990, Part IV, line 37.

Provide the following information for each entity taxed as a partnership through which the organization conducted more than five percent of its activities (measured by total assets or gross revenue) that was not a related organization. See instructions regarding exclusion for certain investment partnerships.

(a) Name, address, and EIN of entity	(b) Primary activity	(c) Legal domicile (state or foreign country)	(d) Predominant income (related, unrelated, excluded from tax under sections 512- 514)	(e) Are all partners section 501(c)(3) organizations?		(f) Share of total income	(g) Share of end-of-year assets	(h) Disproportionate allocations?		(i) Code V-UBI amount in box 20 of Schedule K-1 (Form 1065)	(j) General or managing partner?		(k) Percentage ownership
				Yes	No			Yes	No		Yes	No	

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Provide additional information for responses to questions on Schedule R. See instructions.

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STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **CONSUMERS ENERGY COMPANY** for authority to increase its rates for generation and distribution of electricity and for other relief.

Case No. U-21870

ALJ Jonathan F. Thoits

PROOF OF SERVICE

I, Mark N. Templeton, certify that an electronic copy of the Official Exhibits of Sergio Cira-Reyes on Behalf of Urban Core Collective, UCC-52 to UCC-74 (Part 5 of 6), was served on the following on November 13, 2025.

Name/Party	E-mail Address
Administrative Law Judge Jonathan F. Thoits	thoitsj@michigan.gov
Consumers Energy Company Gary A. Gensch Jr. Anne M. Uitvlugt Evan B. Keimach Mark R. Ruszkiewicz Spencer A. Sattler Bret A. Totoraitis Kelly Hall	mpsc.filings@cmsenergy.com gary.genschjr@cmsenergy.com anne.uitvlugt@cmsenergy.com evan.keimach@cmsenergy.com mark.ruszkiewicz@cmsenergy.com spencer.sattler@cmsenergy.com bret.totoraitis@cmsenergy.com kelly.hall@cmsenergy.com
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The statements above are true to the best of my knowledge, information, and belief.

Date: November 13, 2025

Counsel for Urban Core Collective

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