



Project Name:

Illinois Solar for All Residential Solar (Small)
Sub-Program - Barriers & Opportunities

Prepared for:

Illinois Power Agency

Prepared by:

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ILLUME Advising, LLC is a forward-thinking consulting company at the rare intersection of insight and execution. Founded in 2013, the company has quickly grown to include a deep bench of quantitative and qualitative research experts. ILLUME uses cutting edge research strategies to help build a resilient energy ecosystem to enrich lives, improve global health, and ensure a more secure and sustainable future.

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TABLE OF CONTENTS

Executive Summary	4
Introduction	7
Methods.....	9
Demographic Research & Market Analysis	9
Approved Vendor Interviews	10
Nonparticipating Vendor/Installer Interviews	10
Program Administrator Interview	10
Program Tracking Data Review	11
Materials Review	11
Results	12
Demographic Analysis & Patterns.....	12
Approved Vendor Locations	14
Addressable Market	15
Process Visualization/Service Blueprint	16
Barriers to Program Participation	19
General Findings Regarding Program Evolution	23
Discussion & Recommendations	25
Financing.....	26
Job Placement Requirements.....	27
Paperwork Requirements	27
Appendix	30
Appendix A. Definitions	30
Appendix B. Additional Demographic Analysis.....	32
Population Patterns	32
Illinois Shines Approved Vendor/Designee Analysis & Patterns	32
Income Eligibility	34
Approved Vendor Availability.....	34
Appendix C. Detailed Addressable Market Method and Results.....	38
Total Addressable Market.....	38
Total Serviceable Market	38
Serviceable Obtainable Market	38
Detailed Project Review Process	39
ILSFA Project Life Cycle for Residential Solar (Small) Subprogram	40

EXECUTIVE SUMMARY

The Residential (Small) Solar subprogram of the Illinois Solar for All (ILSFA) program, now in its sixth program year, has not met its spending goals since its creation. Each year, few enough project applications are submitted such that the program cannot allocate its entire incentive budget, meaning small residential income eligible households are not experiencing the full benefit of this program. The Illinois Shines program, which offers solar incentives to market-rate customers does see robust participation among the small residential segment, implying that unique challenges exist to serving income eligible customers in this segment. At the request of the Illinois Power Agency (IPA), the Illinois Solar For All (ILSFA) evaluation team explored the Residential (Small) Solar subprogram to identify ways to increase participation from customers and solar photovoltaic (PV) installers throughout the state of Illinois.¹

We addressed three main research questions:

1. What are opportunities to generate greater interest in the Residential Solar (Small) subprogram?
2. What are barriers to entry and participation for installers, particularly small installers, in the Residential Solar (Small) subprogram?
3. How might we increase the geographic reach of the subprogram?

To address these questions, the evaluation team examined demographic patterns for program participants and approved vendors in the subprogram, interviewed ILSFA approved vendors and non-participating installers to assess marketing effectiveness and barriers to engagement, and reviewed program processes and program materials to identify friction points.

Our research results suggest that there is enough market to conservatively exhaust the program budget over a 10-year period with current budget levels provided the program can unlock demand and engage installers in the program. There are additional challenges and areas of opportunity we uncovered as part of the research conducted for this report that may point to other ways to support the program. Below we summarize our findings and possible next steps to address the findings.

FINDING ONE:

Current ILSFA approved vendors find the paperwork and subsequent process-related delays caused by needing to correct paperwork to be an impediment to participating in the program, as this requires a lot of time investment by their staff.

Next steps for consideration:

- Conduct usability testing with approved vendors to find choke points in the paperwork process and review paperwork for simplification.
- Review paperwork for redundant or unnecessary data. Often programs collect information in forms to provide data to drive program design, but this can also create friction in efficient program delivery. A review of the current design may identify data collection that is not needed to drive projects forward.

¹ 389nm conducted primary research and was the primary author of this report in collaboration with ILLUME Advising, who provided methodological input, research support, and deliverable review.

Eliminating that data collection or finding other ways to access data may reengage approved vendors that have complained of paperwork overload.

- Review vendor-submitted paperwork for suitability to fast-track certain processes. As approved vendors become more consistent in their project quality, they may be able to avoid certain paperwork processes for all projects and be subject to a quality assurance process that reviews a sample of projects.
- Provide web service endpoints for certain data to pre-populate other program paperwork processes outside of the Portal (e.g., provide basic project data fields such as address and project size to pre-populate net metering and integration paperwork processes. The Salesforce database that is used in the program provides this functionality.²
- Coordinate with program partners, such as utilities and the Illinois Commerce Commission (ICC), to reduce redundant information or provide a fast-tracked approach for certain projects or jurisdictions.

FINDING TWO:

Approved vendors cited financing/bridge funding as a barrier to scale. Because Renewable Energy Credits (RECs) can only be paid out upon energization of constructed projects and one of the requirements of the program is that participants do not to pay any up-front costs, vendors must incur the costs of project construction several months or years ahead of receiving REC payments. This can create challenges, particularly for smaller vendors, as they don't have access to sufficient capital and may not be able to secure loans with financially favorable terms to be able to finance the cost of these projects in the interim.

Next steps for consideration:

Vendors and installers have noted that the REC price is not a barrier to funding a project in most cases, but the cash flow of the project can prevent smaller vendors and installers from engaging with a project that does not cover the carrying costs of the project from initiation to completion. This can be somewhat alleviated by providing financing programs like low-income financing programs already offered in energy efficiency programs. This involves:

- Engage lenders (e.g. credit unions, community banks, and the Illinois Finance Authority Climate Bank) to provide unsecured loans that provide up-front financing to income eligible homeowners with credit scores down to 650, structured to allow renovation projects that enable solar PV. These may be part of a residential PACE program, private loans backed by a loan-loss reserve fund or offered in the ILSFA Residential (Small) subprogram similar to successful financing programs in adjacent states, such as Michigan with its Michigan Saves program. Providing these program expansions may require enabling legislation.³
- Fund the approved vendor directly by providing a loan-loss reserve to enable small contractors to take lines of credit from a participating lender to ease cash flow while waiting for REC payments. This may require enabling legislation or a partnership with another program designed for this purpose.

² https://developer.salesforce.com/docs/atlas.en-us.apexcode.meta/apexcode/apex_rest.htm

³ <https://michigansaves.org/residential-homes/>

FINDING THREE:

Approved vendors found job trainee placement requirements to be difficult to meet due to challenges in moving staff across subprograms or qualifying and non-qualifying projects, annual escalator requirements, the way the program calculates trainee requirements, and ability to make connections with qualified trainees.

Next steps for consideration:

- Review the job placement requirements to enable larger companies to take credit for hires that do not necessarily work on ILSFA projects all the time, or that may do projects across multiple subprograms. Aligning job training requirements with the intention of the IPA Act may require reviewing current program job training goals to encourage hiring of job trainees while meeting the subprogram spending goals.
- Review the annual escalator requirements to align with the number of potential projects and available job trainees to make sure they are realistic based on the number of quality applicants.
- Provide a calculation based on company size that is not related to number of jobs completed to allow smaller companies to enter the program and focus on acquiring participants and completing projects.
- Work more directly as a clearing house for trainees and approved vendors to make connections between approved vendors and trainees rather than just to job programs in general.

FINDING FOUR:

The demographics analysis suggests that owner-occupied properties in Northeast Illinois (including the Chicago metropolitan area) will continue to be targeted by approved vendors, as there is both a sufficiently sized market as well as available approved vendors. The program administrator may need to take proactive steps to encourage participation in other parts of the state.

Next steps for consideration:

To encourage participation in other parts of the state, the program administrator may wish to:

- Target service areas that have high participation in Illinois Shines (also known as the Adjustable Block Program or ABP) and work with approved vendors to reach out to existing installers in these areas.
- Engage with county and other municipal housing authorities to identify groups of detached and attached 1 – 4-unit affordable housing buildings, which may provide large numbers of identical units that can reduce paperwork, provide economies of scale, and increase participation in a targeted project, reducing acquisition and implementation costs for vendors.
- Engage with the Illinois Home Weatherization Assistance Program (IHWAP) to identify Community Action Agencies (CAAs) in the Northwest, Southern, East Central, and West Central program regions of the state to partner with, either within existing pilot program structures or as part of targeted marketing efforts with grassroots educators or approved vendors.

INTRODUCTION

The enabling legislation for the ILSFA lays out the high-level requirements of the program and provides a foundation for IPA and the program administrator to develop a clear program design to serve small residential PV solar participants.⁴

The Residential Solar (Small and Large) subprograms, which includes large multifamily (5+ units) and small (1–4-unit) distributed generation, are in their 6th year of operation. These programs have a budget of \$5,775,000 for program year (PY) 6, and a previous budget of \$29,550,000 for PY1 – PY5. Unallocated funds from previous years roll over to future years if unspent. The Residential Solar (Small) subprogram currently supports 11 approved vendors and has approved or installed approximately 523 projects through PY6 out of 1,441 submitted projects that are currently in development.⁵ Furthermore, around three quarters of projects were submitted by a single vendor in PY1-5. In contrast, Illinois Shines, which focuses on market rate customers, has approved, or installed approximately 33,131 small residential PV solar projects to date, and the largest portion of projects submitted by a single vendor was approximately 36%. The opportunity for small residential income eligible customers remains a priority for the ILSFA program.

The ILSFA residential programs serve both owner occupied and landlord-owned structures in the state of Illinois with household members below 80% of the median income for their geography, or that live in designated Environmental Justice Communities (EJCs). The ILSFA Residential Solar (Small) subprogram, which serves income eligible households in residential 1–4-unit single-family and multifamily buildings, has an opportunity to expand income eligible solar PV in the state, but also experiences actual and perceived barriers to scale due to several challenges experienced by the target population.

The program is designed to enable a market-based approach to allowing approved vendors to service participants and meet the programs stated objectives, which include installing projects to meet a target budget in the subprogram, providing clear consumer protections, and meeting job placement requirements identified in the statute.

The Solar Energy Industries Association (SEIA) reports that through the 1st quarter of 2023, approximately 1,760 Megawatts (MW) alternating current (AC) / 2,112 MW direct-current (DC) of solar has been installed in Illinois.⁶

Approximately 285 MW of this has been market rate small residential PV solar installations, and Illinois ranks 15th nationally for total installed solar capacity. Through the first quarter of 2023, approximately 33,131 small residential PV solar projects had been energized in Illinois Shines. This is in comparison to 785, or 6.98 MW AC (8.37 MW DC), of small residential PV solar projects installed or approved to be installed in ILSFA. The trend for residential solar installations continues to grow and the market is not yet mature.

⁴ 20 ILCS 3855/1-56

⁵ <https://www.illinoissfa.com/project-dashboard/> Updated 10/11/2023.

⁶ Solar Energy Industries Association, 2023. “State Solar Spotlight, Illinois.” Retrieved from <https://www.seia.org/sites/default/files/2023-07/Illinois.pdf>

As the cost of solar to date has not been subsidized in Illinois until the advent of ILSFA, the program provides an opportunity for the households in Illinois that make less than 80% of the area median income to take advantage of solar PV. The opportunity for income eligible households should be like market-rate customers.

To support the program in expanding participation in the Residential Solar (Small) subprogram, we conducted primary and secondary research to address three main research questions:

1. What are opportunities to generate greater interest in the Residential Solar (Small) subprogram?
2. What are barriers to entry and participation for installers, particularly small installers, in the Residential Solar (Small) subprogram?
3. How might we increase the geographic reach of the subprogram?

In the following sections we describe our research methodology to address these questions, detail our findings, and provide discussion and considerations for next steps.

METHODS

To develop address the key research questions, we executed several primary and secondary research methods as described below.

Demographic Research & Market Analysis

We developed an addressable market funnel to estimate the size of the serviceable obtainable market for the Residential (Small) subprogram.

To develop the addressable market funnel, we combined visual mapping and data analysis using the 2020 United States Census Summary File 1, Summary File 3, and the 5-year 2022 American Community Survey at the county, census tract and zip code level, incorporating data points such as median household income, population density, and household age:

Visual mapping: We created choropleth thematic maps of the vendor distribution, distribution of income eligible population, and population in each ILSFA service area.

Data analysis: Combining data sources, we developed an addressable market funnel to identify the likely serviceable obtainable market (SOM) for the Residential (Small) subprogram. SOM estimates the number of homes able and likely to install solar PV in the program. We summarize our approach below and provide a complete method in the Appendix A. .

MARKET SIZE FILTER	DEFINITION	METHOD
Total Addressable Market (TAM)	All single family, townhouse, and two-four-unit multifamily residential homes in Illinois with average household sizes and income that are below 80% of the Area Median Income.	Count by housing type for each County in Illinois; filter a percentage of these households that are below 80% of the state median income as demonstrated by earners earning under \$50,000 annually in 2021.
Total Serviceable Market (TSM)	Households in the TAM that can install a residential sized solar PV system.	Percent of TAM that is oriented correctly and unshaded calculated by multiplying TAM % of Illinois households by the percentage of residential households in Illinois that have sufficient insolation.
Serviceable Obtainable Market (SOM)	Estimate of the TSM that may be interested in installing Solar PV.	The percentage of TSM that is likely interested in and able to install solar PV based on known major barriers to installation for a 5kW AC average project size.

Approved Vendor Interviews

To understand the experiences and perspectives of approved vendors, we completed five 50-minute in-depth interviews with ILSFA-approved vendors, exceeding our goal of three interviews. To identify candidates for approved vendor interviews, we:

- Compiled a list of approved vendors from the ILSFA online approved vendor list (as of August 18th, 2023).
- Screened approved vendors for program activity and suspension status with data provided by the program administrator for jobs approved and installed through the end of May 2023.
- Prioritized approved vendors that have had high participation rates in the Residential Solar (Small) subprogram for interviews.
- Contacted 17 approved vendors via email and followed up with a phone call to schedule an interview, requesting that the interviewee be an owner, sales manager, or someone who is the point person for ILSFA.

We developed an in-depth interview guide (see Appendix), reviewed by the project team and IPA. We conducted interviews via Microsoft Teams Meetings the week of September 11th and September 18th, 2023. We recorded the interviews with permission from the interviewee for notetaking purposes.

Nonparticipating Vendor/Installer Interviews

To understand the experiences and perspectives of vendors who participate in Illinois Shines, but not in ILSFA, we completed three 50-minute in-depth interviews with nonparticipating vendors, meeting our goal of two to five interviews. To identify candidate vendors for interviews, we:

- Compiled a list of nonparticipating vendors from Illinois Shines online approved vendor list (as of August 18th).
- Screened approved vendors for program activity and suspension status with data provided by the program administrator for jobs approved and installed through the end of May 2023, focusing on contractors that had installed, or were approved to install, small residential PV solar projects.
- Contacted 17 approved vendors via email and followed up with a phone call to schedule an interview, requesting that the interviewee be an owner, sales manager, or someone who is the point person for Illinois Shines.

We conducted interviews via Microsoft Teams Meetings the week of September 11th and September 18th, 2023. We recorded the interviews with permission from the interviewee for notetaking purposes.

Program Administrator Interview

We interviewed staff from the program administrator to understand the approved vendor onboarding process, project approval process, job trainee hiring requirements, and outreach efforts specific to the sub program. Staff included program leadership, vendor outreach staff, and job training liaison staff. The interview followed an in-depth interview guide, reviewed by the program team and IPA, (see Appendix). We conducted the initial

interviews on October 25th, 2023. We submitted additional follow-up questions to the program administrator on October 26th, 2023, and received answers on November 7th, 2023.

Program Tracking Data Review

We received program tracking data in June 2023 covering the ILSFA and Illinois Shines program activity through the end of May 2023, including system size, location, date of install, vendor, installer, and project type. We analyzed the data to identify vendors with high participation, to review the average system size, to identify where installations were most common in the state for both the ILSFA program and Illinois Shines, and to identify descriptive statistics for small residential PV solar projects to understand average, median, min, max and quartile breaks for DC and AC system sizes.

Materials Review

We reviewed program materials, documentation, and public comments including:

- The paperwork and project documentation process to understand potential concerns about paperwork that were shared by approved vendors in interviews.
- Public comments for prior approved plans to determine if issues have been communicated in the past, with some approved vendors and Solar Renewable Energy Credit (SREC) aggregators providing specific recommendations on process.^{7,8}
- Training materials provided by the program administrator as well as the Approved Vendor Manual and all supporting documentation required in the program.

Using this documentation, we mapped the ideal process for a current project to move through the program and contrasted this process with what we heard in approved vendor interviews to understand improvements that may be made to streamline the program.

We also reviewed the grassroots educator reports. Grassroots educators are required to report their outreach activities periodically to the program administrator as part of their contracted outreach efforts. We reviewed and categorized barriers identified in periodic reports for each grassroots educator currently contracted with the program.

⁷ <https://ipa.illinois.gov/energy-procurement/prior-approved-plans.html>

⁸ Certasun, 2019. 2019 Plan Comments., SREC Trade, 2017. 2017 Plan Comments.

RESULTS

Our research shows that the ILSFA Residential Solar (Small) subprogram has potential to expand but is competing with the Illinois Shines program for attention from some approved vendors and non-participating installers due to the latter program's perceived simplicity and available cash flow. Additionally, there are process efficiencies that may be realized to lower the barrier to participation for existing and prospective approved vendors, and financing opportunities to allow non-participating installers to enter the program as approved vendors or designated installers (referred to as "designees"). The report results and recommendations are provided in more detail below in each Results subsection and the Discussion & Recommendations section.

Demographic Analysis & Patterns

Below we step through our analysis showing housing unit counts, population characteristics and geographic distribution of customers and ILSFA approved vendors, with key findings in bold.

The majority (over 80%) of potential participants are in the ComEd Service territory (Figure 2), indicating that the program will need to continue serving the Northeast program region of Illinois to be able to meet annual budget spending. The program should also target municipalities in the South, East Central, and West Central service areas that have high concentrations of EJC's (Environmental Justice Communities) and income-eligible populations. As the program tracks approved vendors based on the program regions they serve, the program may need to either coordinate with participating vendors already serving those regions or recruit vendors in those regions to ensure that interested potential participants are able to complete projects. Illinois has 4,998,385 occupied housing units with a population of 12,812,508. Approximately 74% of these are in the Northeast Program area (Cook, Lake, DuPage, Grundy, Kane, Kankakee, Kendall, McHenry, Will Counties).

Commonwealth Edison (ComEd) is the largest investor-owned utility company in Illinois and serves the Northeast, Cook, and part of the Northwest and East Central program regions (see Figures 1 and 2), where much of the state's housing is concentrated. Ameren Illinois is another investor-owned utility company in Illinois, serving 1.2 electric million customers and serves most of the remainder of the state (see Figure 2). Additional electric customers outside of the ComEd and Ameren service territories are served by 25 rural cooperative utilities, 41 municipal utilities, and MidAmerican Energy, an investor-owned utility that serves approximately 50 municipalities in the Quad Cities area of Illinois, including Moline and Rock Island customers. These utilities are not a focal point of this report but may provide conduits to targeted outreach efforts in the future.

Figure 1. ILSFA program regions

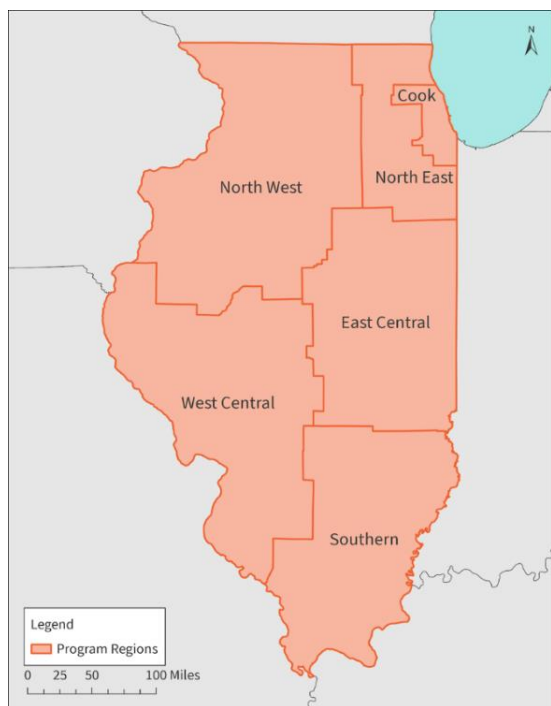
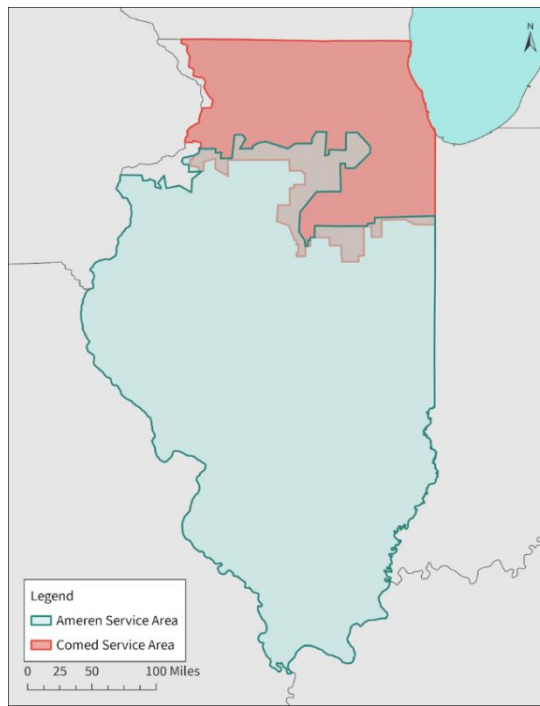


Figure 2. Utility service territories



There are 2,813,011 detached single-family dwellings in Illinois. These are the most likely dwellings to be suitable for small residential PV solar, as in many cases they have ownership control over roofing and electrical upgrades.

About one-third of the population of Illinois lives in detached single-family dwellings with another third in attached single family dwellings and the final third in multifamily dwellings. Dwellings with two to four units are also eligible for the Residential Solar (Small) subprogram. While there are 656,559 occupied units in 2–4-unit buildings in Illinois, these may present further challenges as they are not always owner occupied, and may present site selection barriers that limit their eligibility (e.g., many multifamily buildings have flat roofs which may have high parapets that shade panels or present load, roofing penetration and ballast considerations). Though the “split-incentive” barrier is well known it may not be an issue with solar PV projects that don’t require roofing or electrical upgrades.⁹

Approximately 42% of households in Illinois are eligible for the program based on income. On average, 67% of households are owner occupied in the state, though many of these households are likely higher income. Income eligible households are less likely to own their homes. Around two-thirds of households earning \$65,000 or less own their homes (similar to the statewide average) and 60% of households earning \$45,000 or less own their homes. Households earning less than \$25,000 or less per year comprise less than 52% of owner-occupied households, with rates of home ownership dropping to 40% for households reporting little to no income.¹⁰

⁹ Dyson, Christopher, Caroline Chen, Shahana Samiullah, Southern California Edison. 2010. The Split Incentive Barrier: Theory or Practice in the Multifamily Sector. American Council on an Energy Efficient Economy (ACEEE)

¹⁰ Census Bureau. 2023. Annual Social & Economic Supplement

Over half (51%) of the housing stock in Illinois was built before 1970, when the Council of American Building Officials began publishing one- and two-family dwelling building codes (CERTI).¹¹ Homes that were built under modern construction standards have the structural ability to support solar PV, often without requiring a Professional Engineer (PE) stamp.¹² Newer homes may be able to take advantage of pre-approved live and deadload calculations. This is the case in the City of Chicago, where permitting is significantly easier for standard 16" on-center (o.c.) construction with pine versus larger truss spacing in homes built with longer truss spacing, as installers may use City-provided tables to measure load as opposed to requiring a PE stamp. Additionally, more modern homes may provide more space in service panels, have service panels with code compliant wiring throughout the house and to the meter, and have code compliant grounding – common issues identified as reasons that may add cost to a job or prevent a project from being pursued because of electrical needs.

Approved Vendor Locations

The distribution of approved vendors follows population trends, with most approved vendors headquartered in the Northeast program region of Illinois, positioning them to serve the many EJC's within 50 miles of their headquarters. No approved vendors, except for one vendor participating in the Bright Neighborhoods pilot, have headquarters in the Southern program region.

Figure 3 and Figure 4 visualize the approved vendor distribution throughout the state and in the Northeast program region and show a 50-mile radius around their headquarters. Approved vendors in the Northeast program region are well positioned to serve EJC's within 50 miles of their headquarters. Several approved vendors identified their ability to serve the entire state, but generally served an area in the vicinity of their headquarters (Interviewee #4, Interviewee #6, Interviewee #7). Most projects in ILSFA have been installed in the Northeast program region, with the south side of Chicago having the most uptake. This distribution also coincides with a high density of EJC's.

Currently, there is one approved vendor in the Southern program region serving customers in the Carbondale-Marion area through the Bright Neighborhoods pilot, which is conducting targeted outreach for small residential solar projects in targeted geographic areas in Illinois. Outside this pilot there are no approved vendors with headquarters in the Southern program region. Only one large, approved vendor identified field offices that serve the North and Northeast service territories outside of Chicago, and another in Peoria to serve central Illinois customers, meaning that most vendors tended to operate in proximity to their headquarters. During interviews, approved vendors of all sizes noted they were willing to travel occasionally outside of their immediate area to serve participants throughout the state. However, their ability to undertake projects may be constrained by available personnel and equipment, or by achieving sufficient project volume to justify project costs particularly in areas with lower population density where multiple follow up visits may be needed over the course of a project. A few grassroots educators noted the lack of approved vendors in Central & Southern Illinois as a concern, noting that sometimes they educate their constituents about ILSFA and people express interest, but then there are no approved vendors willing to install projects.

¹¹ An introduction to model codes - CERTI. (1997). Retrieved from https://www.certi.us/Downloads/RRNC/Sample_Ordinances/Model_Bldg_codes.pdf

¹² https://www.chicago.gov/content/dam/city/depts/bldgs/general/Solar/102113PVpanelPackage_with_logo.pdf

Figure 3. ILSFA active and inactive approved vendor headquarters with 50-mile radius.

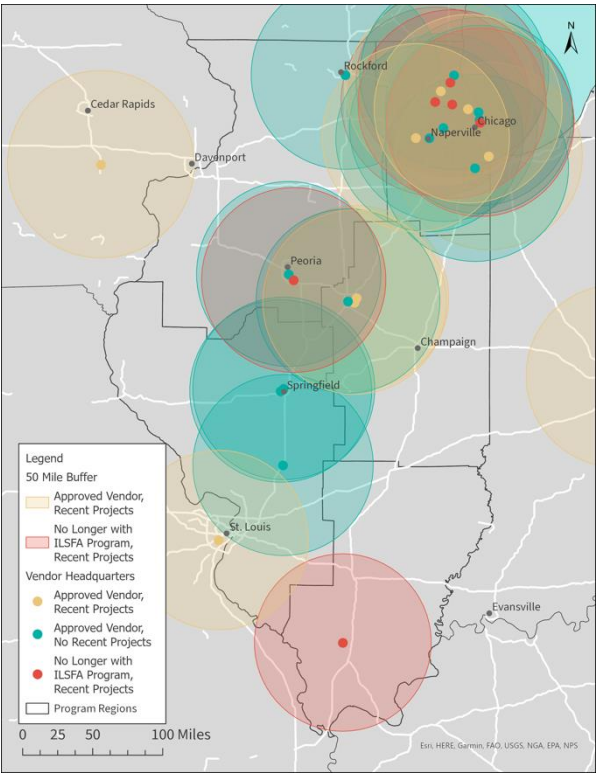
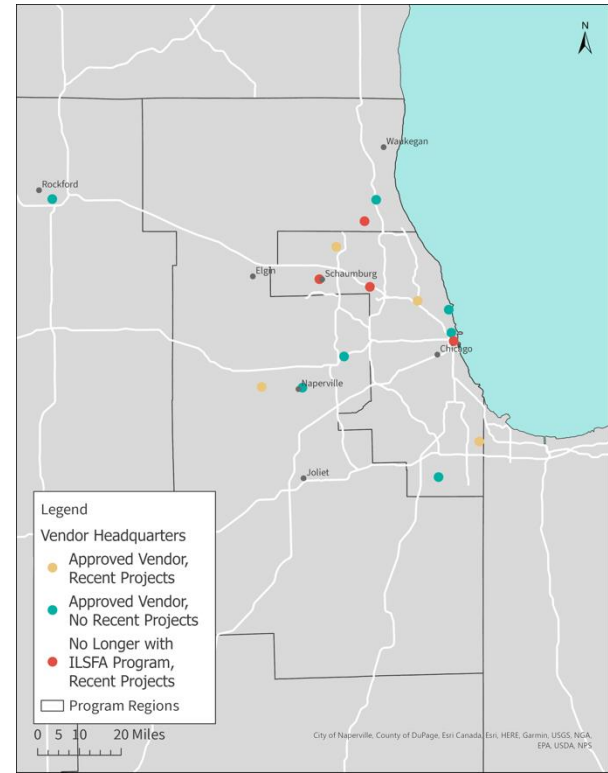


Figure 4. ILSFA active and inactive approved vendor headquarters Northeast Illinois and Cook County.



Addressable Market

Addressable market analysis is a research process in product and service development that helps determine product-market fit by creating a funnel of the total market in dollars down to the likely captured market based on known and potential barriers to purchase or use. It is useful in identifying pricing models, budgets, and marketing efforts required to reach a customer segment. In some cases, it can also assist businesses in assessing the financial viability of a product or service or help to make the decision to pivot to different business models. We conducted a market analysis on the ILSFA Residential (Small) subprogram by calculating the Total Addressable Market (TAM), which is all eligible program households in Illinois; the Total Serviceable Market (TSM), which is all households that can feasibly install a solar PV project; and the Serviceable Obtainable Market (SOM), which is an estimate of the households that may be interested in the product.

We estimate (conservatively) that the Serviceable Obtainable Market (SOM) of ILSFA Residential (Small) subprogram projects in Illinois is between 4,500 and 15,000 projects in total. Currently the program is serving 10% to 30% of the potential participants in its 6th year. We assumed 5kW AC for an average system size based on both the 1st quartile of Illinois Shines Small Distributed Generation projects and the 5kW DC Sunroof methodology to provide a reasonable estimate of 19 – 63 MW AC / 23 - 76 MW DC of solar potential in the subprogram. This limited the TAM considerably, as there are only so many households that demonstrate site suitability and size. We further estimated a decrease in the TSM to obtain the SOM, primarily using penetration rates in mature solar PV markets in the US to estimate a market for Illinois (see Appendix for full method). At a weighted average REC price of \$176.49 between the two service territories based on 2022 prices and Illinois Shines Small Distributed Generation installations by territory, **the SOM for solar PV in the ILSFA Residential Solar (Small) subprogram is \$60 - \$202M** before the market levels off. See Table 1 for summarized results.

Table 1. Addressable Market Summary

MARKET SIZE FILTER	DEFINITION	NUMBER	KW (AC)	REC VALUE (\$)
Total Addressable Market (TAM)	All single family, townhouse, and two to four-unit multifamily residential homes in Illinois with average household sizes and income that are below 80% of the Area Median Income	1,760,927	NA	NA
Total Serviceable Market (TSM)	Households in the Total Addressable Market that can install a residential sized solar PV system	171,111	855,555	\$2,264,894,298
Serviceable Obtainable Market (SOM)	Estimate of the Total Serviceable Market that may be interested in installing Solar PV	4,568 - 15,229	22,843 -76,144	\$60,472,678 - \$201,575,593

Process Visualization/Service Blueprint

There is a gap between approved vendor (four weeks) and program administrator (10 weeks) ideal timelines for the paperwork review process and typical project completion timelines which are four to six months. The paperwork review process conducted by the program administrator before providing RECs includes review of a proposed project for eligibility and project design. According to the program administrator, the Part I process will ideally take six weeks. The Part II review and approval is ideally less than one month if extensions are not filed. This process is potentially quicker during rolling applications, as projects are not part of formal submission windows that can include the other subprograms and cause bottlenecks in review.

In actuality, the completion of this process can take four to six months with delays in multiple areas, as there are touch points between the participant and the program and approved vendor that are reviewed by the program administrator. There are also touchpoints during the Approval and Construction phases that involve the approved vendor, participant, program administrator, utility, IPA, the local municipality, and ICC that may

require clarifications, changes to paperwork, and multiple reviews before approval to continue to the next phase.

Some of the delays, such as scheduling local permit inspection, may add several weeks to a review that are beyond the control of the approved vendor, program administrator, or participant. The program administrator does not currently track review times or reasons for delay for the Residential (Small) subprogram.

Some of the approved vendors that the evaluation team interviewed shared that a timeframe of under 30 days from contract to complete energized project is a “happy path” timeline. The difference in these expectations is an opportunity for collaboration and process efficiency improvements.

Both Illinois Shines and ILSFA stipulate that approved vendors collect project information and comply with the program. Approved vendors who don’t directly install PV systems may also work with designees to submit required documents before proceeding with an installation and after construction to verify the projects are following program requirements.

The review process is visualized in Figure 5 and Figure 6 for Part I and Part II.

The diagram illustrates the REC program process flow across seven swim lanes: Participant, AV, PA, IPA, ICC, Utility, and DI. The process begins with a Participant's commitment, followed by AV's disclosure forms and eligibility check. PA handles income verification and paperwork review. IPA manages REC commitment and ranking. ICC oversees REC contracting. Utility handles REC commitment and contracting. DI manages the WMBE subcontractor agreement. The process ends with AV's approval and a project database update.

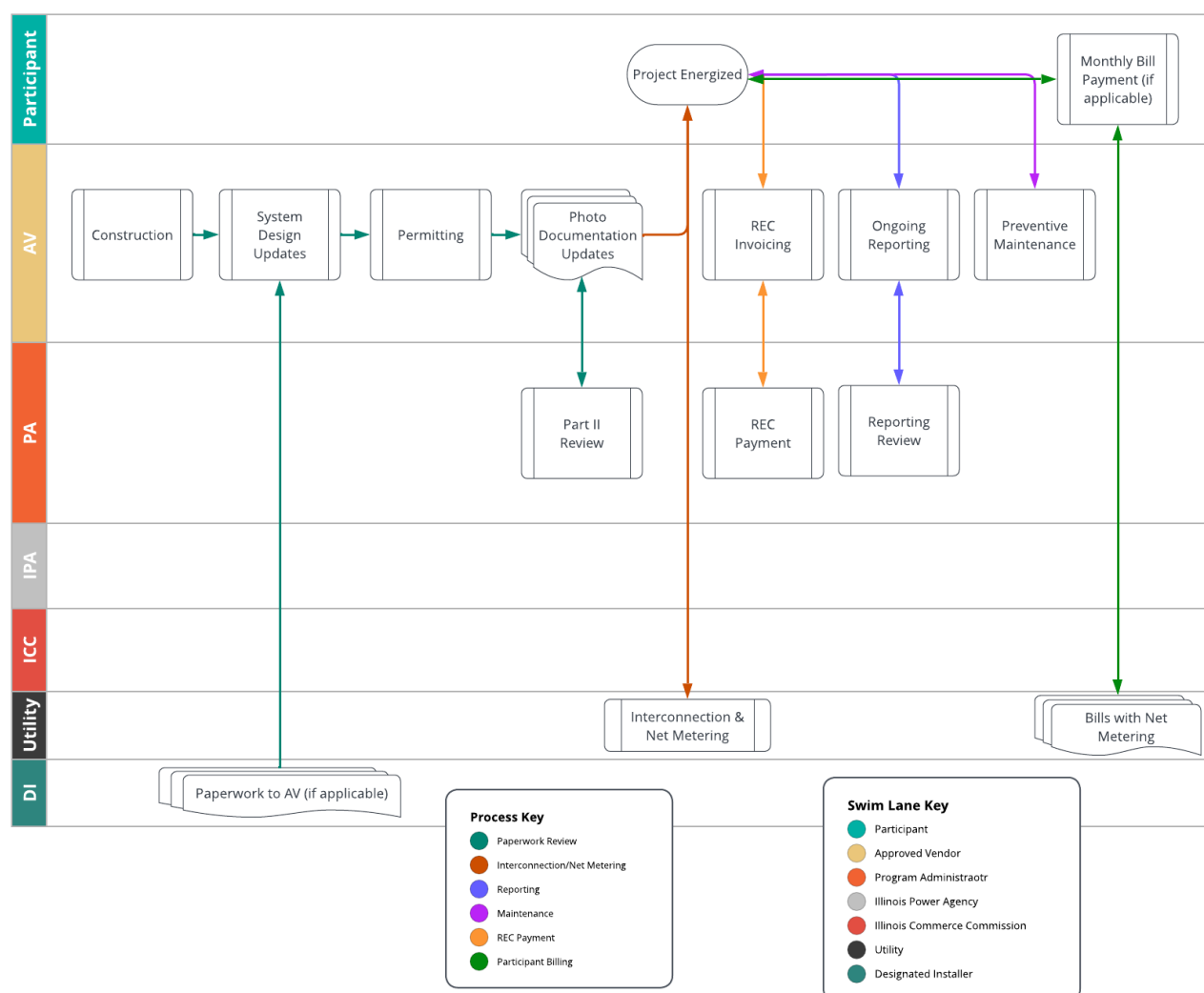
Swim Lane Key:

- Participant
- Approved Vendor
- Program Administrator
- Illinois Power Agency
- Illinois Commerce Commission
- Utility
- Designated Installer

Process Key:

- Customer Acquisition
- Income Verification
- Paperwork Review
- REC Review & Ranking
- REC Contracting
- Participant Data Journey

Figure 6. Part II Process Flow Chart



Barriers to Program Participation

Interviews with the program administrator, ILSFA approved vendors and non-participating installers and a review of grassroots educator reports provided insight into how ILSFA approved vendors, nonparticipating installers, and customers interact with the program. Major findings highlighting barriers to program participation are summarized below.

Approved vendors and nonparticipating installers cited issues with financing, not pricing, as a major barrier.

Smaller companies identified financing of projects as a major issue, but larger companies did not. Interviewee #3 and Interviewee #7, both ILSFA approved vendors that have completed several projects in the Residential Solar (Small) subprogram, self-finance their projects, with one providing leasing terms that pay for additional retrofits (roof and electrical) that would normally disqualify a project. The other identified using \$3M cash on hand/credit for getting projects funded while they wait for reimbursement.

Multiple smaller companies described self-financing upfront as a non-starter. Interviewee #1, a non-participating installer, “heard about the program a year ago, looked at who was participating in the program and saw that there wasn’t a very long list and tried to understand why”. The more they dug into the model they understood there may be fiscal barriers to get into the program, so they decided not to continue to pursue it. Interviewee #2, an ILSFA approved vendor, saw financing as an issue for installers, and as one reason many installers are not participating in the ILSFA program.

Only two large ILSFA approved vendors self-funded projects and waited for reimbursement, and only one of these typically did so under an ownership model. Generally speaking, most vendors used a power-purchase agreement or lease agreement, which is typical of similar income eligible small residential solar programs.

The payment delay was considered a non-starter for small installers and even larger installers, as they typically receive upfront and after construction payments from market rate customers and would not self-finance a customer’s installation even with a full reimbursement as they allow the RECs to flow directly to the customer. Interviewee #6 suggested a low interest loan program for consumers would potentially help, as current financial options are costly.

No interviewees mentioned pricing as an issue. One approved vendor can use leases along with the RECs to do significant upgrades on homes to enable solar (Interviewee #3). Another approved vendor reported “ILSFA RECs easily cover the project. [We] want to do them” (Interviewee #7).

However, the program administrator noted that one of the most common questions they receive is related to invoicing and when payments are received for projects, as cash flow of projects has been cited as a common concern. The program administrator is aware of this issue and reported that some ILSFA approved vendors have said the REC price is not high enough to make the program work, while other larger vendors have used leases to extend revenue.

Approved vendors cited issues with paperwork as a major barrier.

All interviewees described the paperwork requirement for completing projects in the program as difficult or onerous. One interviewee described the paperwork time for a job as “7 - 8 hours per project”, including “uploading photos, calling out mitigations, developing the site suitability report, getting the customer to sign and approve, breaking down the shading study, making sure the capacity factor is aligned, and submitting the paperwork into the portal,” pointing out that “often [the program administrator] will come back with questions” (Interviewee #3). Interviews with the program administrator indicated that often paperwork corrections are necessary to ensure that project applications and tracking information are correct. They also noted that approved vendors do not always respond in a timely manner. However, both the program administrator and vendors indicated that paperwork could be further streamlined, with the program administrator in the process of making improvements.

Interviewees also shared that they use software that does not align with the way that the program administrator requires system designs for unconnected arrays to be separated, where they are combined in their internal software. Interviewee #7 provided an anecdote that “our installers are now installing faster than we do the paperwork”, that on “one 12kW project was done in 5 hours, and three people took 6 hours to fill out the paperwork.”

Interviewees did share that they understood the need for rigorous paperwork and requirements to prevent fraud. Interviewee #7 described their experience in an adjacent state as “super simple” but had “lots of problems with fraud” and “glad Illinois didn’t go that route.”

Interviewees contrasted their experience with Illinois Shines paperwork, which, “though sometimes pedantic in the rules and exactitudes” has “been very efficient” and “takes 45 minutes to complete an application after collecting all of the documents,” but are “not sure why they need all of this information” and “could probably figure out how to make it simpler” (Interviewee #4).

One ILSFA approved vendor cited the inability to meet the job trainee requirements and the paperwork as being too difficult to overcome. The same approved vendor also expressed frustration at previously providing feedback and feeling like it wasn’t always taken.

Nonparticipating installers are currently focused on Illinois Shines and have adequate demand.

Interviewees that participated in both programs identified Illinois Shines as easier to service customers in and found the demand of the program to be adequate to serve their current growth and strategy. For small companies who are aware of ILSFA, branching out to the ILSFA program involved reaching out to installers about participating in ILSFA (Interviewee #2) after they have become familiar with Illinois Shines. Multiple interviewees reported turning away income eligible inquiries either because they do not or cannot service a program region, because they are no longer interested in serving the ILSFA program, because the installers they work with are not interested in serving the ILSFA program, or because they perceive income eligible customer projects to be more difficult and time consuming than readily available market rate customers.

Approved vendors and nonparticipating installers cited issues with site suitability as a potential barrier, but one that can be overcome by some contractors that finance with long term leases or with alternative fixes such as renewable meter adapters.

Electrical issues cited by installers included main panel replacement requirements, code compliance necessitating cloth wire and aluminum feeder replacements, cold water ground location changes, and installing renewable meter adapters to avoid service panel upgrades. Interviewees shared some of their concerns with code compliance in some locations with some upgrades, with Interviewee #7 sharing a general dislike of using meter adapters.

Some installers cited roof issues as a barrier. For example, interviewee #5 does not do flat roof projects, while other installers noted that roof issues were more common with income eligible customers, and that if roofs were over 10 years old, patched, or otherwise had quality issues they may not move forward with a project.

Site suitability issues such as roofs and electrical upgrades were not cited as an issue for Interviewee #3, as they pay for upgrades as part of a long-term lease with a buyout option.

Educating customers about the program and the technology is important for overcoming customer concerns and misinformation.

Interviewee #1 cited customer concerns as a potential barrier, as customers asked about the effect of panels on roof lifespan, or the emission of electromagnetic field (EMF) radiation with solar as questions they had fielded in the past. Some people “think they are going to print money” by putting solar on their roof (Interviewee #1).

Multiple companies reiterated the importance of customer education to helping to close sales and cited the complexities of the program as a possible deterrent. ILSFA approved vendors that have installed projects did not report a difference between selling to an income eligible participant in terms of solar PV understanding. Interviewees made no distinction between general education or education about the particulars of the program.

Some grassroots educators also noted the challenges around educating customers and building trust through comments in their reports that noted:

- Technical challenges relating to explaining the benefits of solar to participants.
- Mistrust of energy providers, scams are preventing participants from participating.
- Consumer data collection/trust is causing friction to collect information on participants.
- Inadequate consumer education on solar (suspect about no upfront cost) causes mistrust.

The program administrator also cited the customer acquisition process as sometimes challenging, as customers are not often well versed in the benefits of solar and may be confused about how the program works. For PY6, the disclosures have been simplified and revamped to address some of the friction in this part of the process.

Some approved vendors find the job trainee requirements to be difficult to meet.

In general, job trainee hiring requirements were cited as a major barrier despite the ability to file for a waiver. Job requirements are particularly acute for Residential (Small) projects, as they are not calibrated or weighted to consider revenue versus number of projects. This makes it especially hard for small installers to meet requirements. One approved vendor suggested that “about 20% of their job is spent trying to find trainees” and that “most people don’t stick, as they don’t meet the standards at [business]” relaying that this was “usually a soft skills issue” and that they can “learn the technical skills” (Interviewee #3). The interviewee relayed an anecdote that “one time there was a graduating class and one company hired up all the trainees.” They reported that they did meet both percentage requirements on several jobs, but internally they “do not target jobs with ILSFA trainees, that “[you stick with] the crew you’re on and may not be doing an ILSFA job”. Another large, approved vendor identified “employee requirements [as] the biggest hangup. Anybody in any industry will tell you it is impossible to find employees, period.” (Interviewee #7). The same interviewee could not name any approved vendors that provide their own training programs as another line of business were able to hire individuals from those programs (Interviewee #5).

The program administrator reported that the two or three approved vendors that do substantial work in the Residential (Small) subprogram have not had difficulty meeting the job training requirements and are encouraged to reach out if they have a hard time recruiting trainees. Approved vendors have used the same job trainees on multiple projects, and paperwork tends to have the same trainees used until the term of the trainee’s eligibility is expired (trainees cannot be considered eligible if they have completed a training more than three years prior to being hired). Most trainee hours reported on jobs are slightly above the minimum

requirements, and the program administrator reports that approved vendors may not be seeing growth in project demand to meet the requirements consistently and may not have interest from trainees if they cannot offer full time employment. Waivers are rarely used (< 10 -12 have been applied for in the past few years for all programs combined), and the majority are approved provided there is sufficient evidence of effort (e.g., outreach emails, phone call logs).

The program administrator is continuing to improve program experience and processes and is piloting different outreach and program delivery models in PY6.

The program administrator works with approved vendors and makes minor adjustments to the Portal and processes throughout the year, with major changes being rolled out at the beginning of each program year. Recent and in-progress changes to make the program easier to access include:

- Elimination of the 50kW batch minimum
- Improvements to the Portal, adding front-end validation, where needed.¹³
- Moving forms away from Form Assembly, a web app that is designed for form-based input and management, to the Salesforce-based Portal, which provides one seamless interaction for participants and approved vendors.

The onboarding process is not a barrier for approved vendors and designees.

Approved vendors described onboarding to ILSFA either as easy, “a one-time thing that isn’t an issue” (Interviewee #7) or did not remember having difficulties with doing so. The program administrator is responsible for maintaining and updating onboarding and project approval processes, working closely with approved vendors to ensure projects are meeting consumer protection requirements and installation standards. The architecture of the Residential Solar (Small) subprogram is very similar to the design of the other subprograms, with the exception that due to the available budget, the Residential Solar (Small) subprogram currently has a rolling application process. Onboarding of vendors is the same for all subprograms. As vendors must first be Illinois Shines-approved, most have no difficulty being approved for the ILSFA program. Some vendors report a learning curve to get up-to-speed on the program’s paperwork, required documentation, and vendor portal. The program administrator schedules an hour-long meeting with approved vendors to orient them to program processes. One-on-one training was cited by the program administrator as being advantageous in reducing process time due to errors. The program administrator has also begun having onboarding meetings with multiple approved vendors, as they often have similar questions and can help each other navigate potential project challenges. Designees are trained along with approved vendors when an approved vendor plays an aggregator role. The program administrator is also working to set up regular office hours where approved vendors can meet with program administrator staff to ask questions or provide feedback.

General Findings Regarding Program Evolution

The Residential (Small) subprogram does not exist in a vacuum and is undergoing constant change and improvement. Previous inquiry into the subprogram uncovered barriers that are still perceived to be present

¹³ An example cited involved the DC/AC multiplier reported by approved vendors as a percentage when the form field expected a decimal, causing the calculated revenue estimate to be many times its actual price.

in the program by approved vendors. Additionally, program requirements that separate the ILSFA program from Illinois Shines such as job placement requirements and cash-flow/reimbursement are acute enough to inhibit new installer interest. This is coupled with the existing and growing demand for Illinois Shines that currently serves growth goals for some of the installers interviewed. To mitigate these barriers, IPA and the program administrator should continue to simplify the program offering, expand its pilot programs to reduce customer barriers and drive program interest, and continue to explore partial or full vertical integration for this subprogram as a solution to consistently spending the budget to meet the Residential Solar (Small) installation and energy sovereignty goals.

The 2022 Long Term Renewable Energy Resources Procurement Plan addresses increasing program uptake in PY6 and beyond.¹⁴ Though the program is consistently underspent, it has gained traction. The program administrator has made previous efforts to improve uptake by adding a referral process, making income verification more streamlined (and will do income verification by request). Additionally, efforts have been made to clarify disclosure timeline requirements to reduce customer touchpoints, expand engagements with energy efficiency program administrators and community-based organizations, remove batch requirements, and align the Illinois Shines and ILSFA portal experiences, including redesigning disclosure forms. Expansion of program offerings includes the Pilot Program on Home Repairs and Upgrades. The program has also reviewed a vertically integrated approach that provides the program administrator with more control over all aspects of program delivery such as participant acquisition through the Bright Neighborhoods Pilot. These changes are positive and may provide the program with avenues for expansion as the program continues to mature in its current design should the pilot prove successful. Additional funding may be needed to continue aspects of the pilot from other sources, especially for the Home Repairs pilot, as home repairs are costly, sometimes exceeding the average project incentive, and are also outside the core mandate of the subprogram.

¹⁴ Illinois Power Agency, 2023. Modified Long Term Renewable Energy Procurement Plan Upon Reopening.

DISCUSSION & RECOMMENDATIONS

This section provides additional discussion on key findings and considerations to improve the program to serve a larger number of income eligible participants and expand the program to a greater number of installers.

What are opportunities to generate greater interest in the Residential Solar (Small) subprogram?

Our estimates of the SOM analysis suggest the market is sufficient to spend the budget over approximately 10 years if the demand is consistent. Anecdotally there is interest in the program from participants, as multiple approved vendors have reported turning participants away, and grassroots educators are reporting some positive outreach activity and inquiries. Additionally, multiple interviewees reported little to no advertising in Illinois Shines. Illinois Shines approved vendors reported word of mouth as the main method of acquiring new customers. This suggests that for the early market word of mouth may be adequate to generate enough interest to exhaust program budgets if other barriers are addressed.

The ILSFA program appears to have difficulty generating interest from Illinois Shines vendors and designees to engage with the program. Nonparticipating installers (in ILSFA) reported having adequate Illinois Shines demand and, though interested in serving income-eligible customers in principle, did not suggest that it was worth the perceived difficulty in the near term to engage with the program. Non-participating installers did not rule out doing so if perceived barriers are addressed.

The greatest opportunity to expand the' subprogram appears to be addressing the approved vendor and designee concerns around process, financing, and job placement requirements. Other identified barriers may be reduced as the program matures or may be addressed in pilot programs.

What are barriers to entry and participation for small installers in the program?

Small installers may opt to become an ILSFA approved vendor or may work with an ILSFA approved vendor to complete projects in the ILSFA program. To date, a limited number of approved vendors have completed more than a few projects, and many approved vendors have not completed any. The three main barriers identified by approved vendors and installers interviewed are financing projects, meeting the job placement requirements, and completing the paperwork properly and in a timely manner.

Financing

The program has begun to pilot providing funding for home repairs and upgrades in the Residential Solar (Small) subprogram for a limited number of owner-occupied housing units in order to test this barrier to scale for the program. However, there is still a requirement for someone, often the approved vendor, to cover the carrying cost of a project (labor and materials) while awaiting reimbursement via RECs, including the costs of the home repairs pilot, which is paid out via an adder to the REC incentive. Most projects completed in the program according to the program administrator are leases, which allow an approved vendor to install a project with their own funding and get paid back over many years (often up to 20) through a lease agreement, often with a significant profit on the back end of the lease. Buyouts are available to the participant starting at year 5 – 7 for some agreements, though there is no evidence these have been taken advantage of by participants to date. Leases with buyout options are also available from outside financiers, but these options can have heavy broker fees (Interviewee #6) that are at some point borne by the customer.

The Illinois Finance Authority created and released funding for the Illinois Climate Bank in 2023 to endow a revolving loan fund for residential retrofits among other projects. This and other financing options may enable projects to be pre-developed to be ready to take advantage of the Residential (Small) subprogram. Note that new financing options may require enabling legislation.

Two alternatives to consider are:

1. Offer low-interest loan financing with approved lending partners. These options would reduce the interest rates that may be present in national programs by creating a small loan loss reserve and covering borrowers with moderate credit ratings (down to 650). To maintain program rules that protect consumers (e.g., the No Upfront Cost and Tangible Benefit requirements), the projects could primarily target customers that need upgrades to take advantage of solar, such as roof or electrical replacements that may be preventing a project from moving forward. In this case, a lump REC payment can be provided to the lender as a balloon payment on the loan principal, allowing interest payments that are manageable to be part of the original loan and a payment of the principal on the back of the loan directly from the program. In many cases, the savings from solar would cover the interest payment, and a REC payment would be applied directly to loan principal within 12 to 18 months. Fees for these loans may include one-time origination costs payable on the back end to make it worthwhile for the lender while maintaining the Tangible Benefit rules of the program. Additional protections, such as a loan-loss reserve, can provide the lenders with coverage to meet regulatory requirements. Lenders can also benefit from customer acquisition and offer additional services.
2. Provide small installers with program sponsored bridge loans or lines of credit to cover the cost gap that may be present with REC reimbursement. This option avoids requiring homeowners to take loans or lines of credit, which may be a non-starter for many projects, and this could be provided after Part I approval to help approved vendors demonstrate the pipeline of projects to a lending partner for a loan or line of credit.

Ultimately, working to eliminate delays in review to allow a quick reimbursement process may be enough to assist small installers that can operate on 60–90-day payment windows.

Job Placement Requirements

Job placement requirements are another hurdle that needs to be addressed to allow small installers to participate in the program. As reported, there are not enough qualified trainees, especially in less populated areas such as the Southern program region, to allow approved vendors or designees to meet program requirements. These requirements are not specific in the statute. The program should review its requirements based on the placements to date and identify alternatives to compliance or make the waiver process easier to document. For example, putting a threshold of jobs on the total number of projects in the program rather than tenure with the program may provide small installers with the ability to get acclimated with program processes before adding a potentially burdensome program requirement that is currently identified as a significant barrier to entry.

Paperwork Requirements

The program was praised by several interviewees for its thoroughness and consumer protections while at the same time being lamented as being difficult, cumbersome, onerous, and time consuming to the point that some approved vendors have left the program, and nonparticipating installers have avoided it. The review of the backend processes in this research confirms that a large portion of the lift for documenting compliance with the program is outsourced to the approved vendor.

There are some strategies that can be executed that may reduce or eliminate friction preventing approved vendors and designees from more fully participating in the program. The program has eliminated some barriers, such as removing batch size requirements, but much more can be done to reduce the paperwork burden of the program.

An opportunity to address this can be undertaken by the program administrator by conducting usability testing with approved vendors on its existing program processes to identify friction points and abstract these away from approved vendors as much as possible. The program relies on approved vendors almost exclusively to provide its performance data, and in some cases makes this a chore to do so.

In its training documentation, the program administrator provides examples of common missing paperwork for eligibility testing, such as:

1. Not capturing all household members on the Certification & Consent Form.
2. Not including income for all adults (over 18 years of age).
3. Not uploading necessary support documentation.
4. Not redacting Personally Identifiable Information (PII).
5. Uploading site documentation separately, incompletely, or with file sizes that are too large.

While these fields are too important to capture to maintain program integrity, use of software and automation may ease the burden of meeting these requirements.

Many or all these issues may be eliminated by moving fillable PDF forms to the Salesforce application used for project submission, which is being done incrementally, and using third party web services to conduct means testing. Similarly, as many approved vendors do not work primarily in an office environment and are often on the road, providing native application-friendly forms where possible can make paperwork much

easier. This includes using digital signatures for disclosures and providing form fields for specific photographs with descriptions instead of requiring batches of photographs for a project.

To go even further, user research with approved vendors to discover what software is used for their internal processes and offering connections would eliminate duplication of paperwork. For example, many contractors share photos with customers, manage documentation, and provide chat capabilities using CompanyCam, which has integrations with Salesforce that can allow inputs to be directly uploaded to projects.¹⁵ These integrations are generally simple to set up and require little code experience through each company's respective APIs. This can be taken further with system design tie-ins.

Approved vendors also reported using standard design software, such as Aurora Solar, which may provide opportunities to auto-populate tangible benefit calculations and other hand entered calculations to reduce mistakes that cause delays in approval. Where possible, these calculations should be automatic, and interactions with the software should be focused on providing raw data and abstracting calculations and logic away from the user.

One additional area of opportunity lies in providing designees with Portal access, as they are, in many cases, the primary provider of project documentation. To enable this more fully, the program administrator should review its database architecture to create referential connections between the approved vendor information tables and the project information tables. Currently, there are multiple duplicate installers, as evidenced by the database containing multiple records in projects of approved vendor and installer names. Cleaning this up can enable an approved vendor to have a single sign on authentication for the Portal, choose designees they associate with from a dropdown, and have all their projects associated with a designee. Doing so can then provide the Portal with the ability to share projects with designees and allow designees to provide paperwork directly without having to first pass through the approved vendor, allowing an approved vendor to review projects for completeness.

How might the program increase the geographic reach of the program?

Most of the approved vendors interviewed were willing to do projects throughout the state provided installers were available. Southern Illinois was identified as the most difficult program region to operate in.

Providing mentorship opportunities to established contractors, such as electrical contractors, in sparsely populated parts of the state may help develop some consistent supply to meet emerging demand. Furthermore, providing additional outreach focus, particularly to Southern Illinois, will help develop demand. This can be accomplished through more direct engagement with emerging providers and partnering Illinois Shines designees in Southern, East Central, and West Central Illinois with established ILSFA approved vendors. Efforts by the program administrator to begin doing so have been reported to be underway for PY6.

Approved vendors have identified ways to increase demand through partnerships with community development corporations. Interviewee #7 identified partnerships with Christian County in central Illinois and Montgomery, a small municipality outside of Aurora, to upgrade County-owned and operated housing.

Additionally, counties also provide Low-Income Heating & Energy Assistance Program (LIHEAP) and IHWAP funding through local partnerships with Community Action Agencies (CAA) and Local Administrative Agencies (LAAs). CAAs and LAAs often do intake and could add solar PV to programs offered with assistance from

¹⁵ https://companycam.com/integrations#all_integrations

grassroots educators. Though half of the budget for this program is for Cook County through the Community & Economic Development Agency (CEDA), each county in the state has allocations and has served low-income households for years. These previously weatherized homes are valuable targets for outreach, as they may already be familiar with and comfortable with subsidized energy programs. Approved vendors have reported similar partnership efforts with community-based organizations that provide these services, such as the Chicago Bungalow Association (Interviewee #3). This could be reviewed as a hybrid market rate approach along with a more hands on vertically integrated approach that is being piloted by the program administrator or could ultimately be a pipeline for new projects under a fully integrated program.

Finally, community solar projects may already be providing services in more rural communities in the state, as the land available to develop these projects is more readily available. To date, successfully developed projects have all been outside of the city of Chicago, which is correlated with the reduced uptake of Residential Solar (Small) projects. However, locations of subscribers are the clearest indicator of which communities receive benefits from these installations, and that was not explored for this mid-year report. The locations of subscribers to community solar will be explored through the ILSFA evaluation annual reports. If community solar subscribers are more frequently located in rural areas, the program may choose to increase REC prices in other service territories to encourage program growth in this subprogram like how it provides bonuses for ownership.

APPENDIX

Appendix A. Definitions

Alternating Current (AC) - The generation of a solar photovoltaic system after losses, usually 20%, due to inverting the waveform. This provides an accurate representation of the power provided and is used in calculating the renewable energy credit production of a project.

Approved Vendor - A contractor that has been approved by the ILSFA program to manage, document, and complete project installations. Approved vendors must meet specific criteria that are more stringent than Designees.

Direct Current (DC) - The nominal generation of a solar photovoltaic system before the waveform is inverted to provide alternating current power to a structure. System sizes are often identified by this gross number.

Designee (Designated Installer) - A contractor that is used on an ILSFA project to install the system that does not carry the risk of the performance of the project nor is primarily responsible for submitting and managing documentation.

Environmental Justice Community (EJC) - A designation given to a community area that has historically been affected by environmental health hazards and/or has been left out of dialogues that have direct impact on the quality of life of the community due to potential environmental and public health effects.

Income Eligible - A participant who meets a means test for eligibility for the ILSFA program, either through an income verification or a geographic determination.

Illinois Power Agency (IPA) - The state of Illinois agency established in 2007 to procure electricity for eligible retail customers in the state. The IPA is charged with developing long term renewable energy procurement plans and is the owner of the ILSFA and Illinois Shines programs.

Illinois Shines – Also known as the Adjustable Block Program (ABP), Illinois Shines is the market rate program administered by the Illinois Power Agency to provide incentives for non-Income Eligible customers in the State of Illinois to install solar photovoltaic on their homes and businesses.

Participant - A customer who receives services from the ILSFA program.

Program Administrator - The organization responsible for overseeing and executing the ILSFA program on behalf of the Illinois Power Agency.

Program Region - Regions codified by the program administrator that designate and separate counties in Illinois into regional divisions.

Photovoltaic (PV) - A renewable electricity generation technology that provides electricity by converting photons from sunlight into electrical potential.

Renewable Energy Credit (REC) - A subsidy for renewable energy generation installations that is determined by the alternating current generation of a project and sold as a financial instrument in a market administered by the Illinois Power Agency in Illinois.

Serviceable Obtainable Market (SOM) - The Serviceable Obtainable Market is the subset of the Total Serviceable Market that is willing to purchase a product or service.

Small Installer - For this report, a small installer is defined as a contractor that has installed less than 45 small residential solar projects to date. This cutoff is the 3rd quartile of the number of installs in the Illinois Shines program.

Total Addressable Market (TAM) - The Total Addressable Market is the total lifetime value of a product or service in its target market. Also often expressed as several customers.

Total Lifetime Value (TLV) - The total lifetime value of a product or service is the revenue a product or service can expect to generate for a customer if that customer remains a customer. This may be a single sale, or a subscription amount for a reasonably expected period.

Total Serviceable Market (TSM) - The subset of the Total Addressable Market that can purchase a product or service after taking into consideration their absolute ability and any non-starter barriers to consideration.

Appendix B. Additional Demographic Analysis

We conducted additional demographic analysis that may be of interest to researchers.

Population Patterns

The population density in the state of Illinois is concentrated in the Northeast and Cook County program regions and corresponds with current program demand as expected (see Figure 7 and Figure 8).

Figure 7. Population density by program region
Northeast Illinois and Cook County.

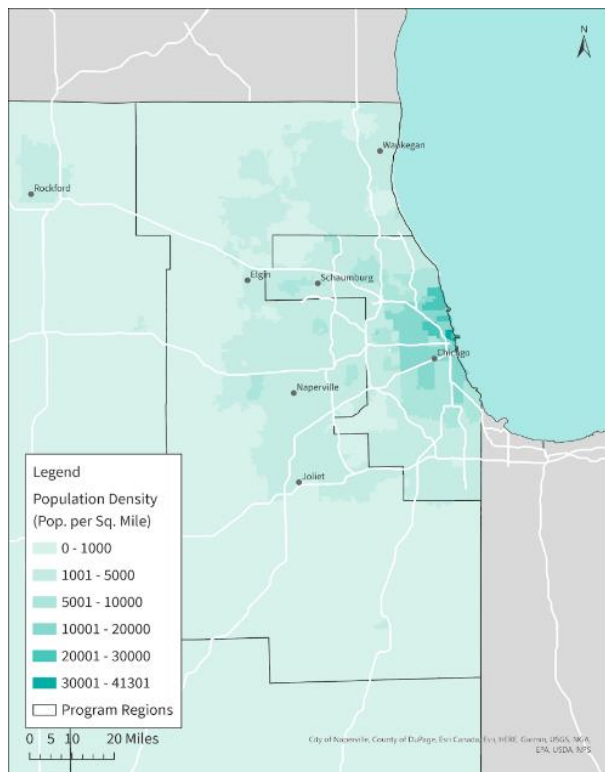
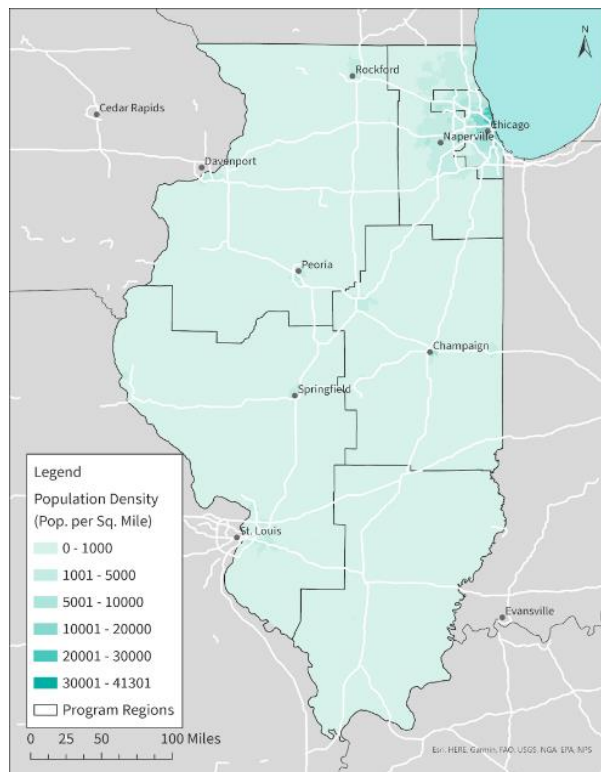


Figure 8. Population density by program region.



Illinois Shines Approved Vendor/Designee Analysis & Patterns

Like the ILSFA program, the distribution of vendors in Illinois Shines correlates with higher population density and is heavily concentrated in the Northeast program region and Cook County (Figure 9 and Figure 10). When normalized by population, Illinois Shines projects are distributed more densely in suburban and rural areas in the Northeast region and more evenly distributed throughout the state (Figure 11 and Figure 12). This may be impacted by the difference in population in Cook County relative to the total number of projects or differences between the housing stock and rates of renting between Cook County and suburban and rural areas. These patterns tell an interesting story of clustering in certain less populated parts of the state. Pockets of density are centered around regional population centers, and Illinois Shines projects do occur in areas with EJC's (see Figures 14 and 15 for EJC's in the state). The distribution does not show any geographic reason for ILSFA approved vendors to not be active in equal measure as the Illinois Shines, indicating that barriers may be more related to serving the income eligible segment.

Figure 9. Illinois Shines Number of Installed Projects by Zip Code.

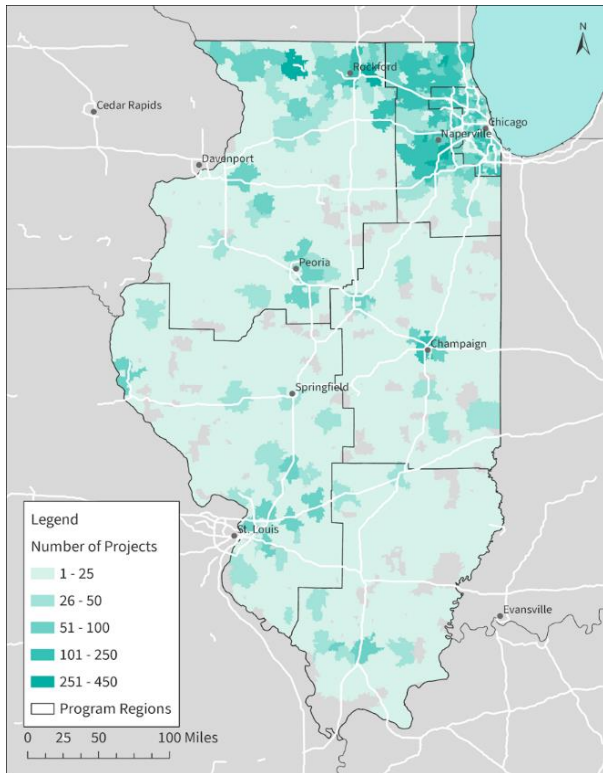


Figure 10. Illinois Shines Number of Installed Projects by Zip Code in Northeast Illinois and

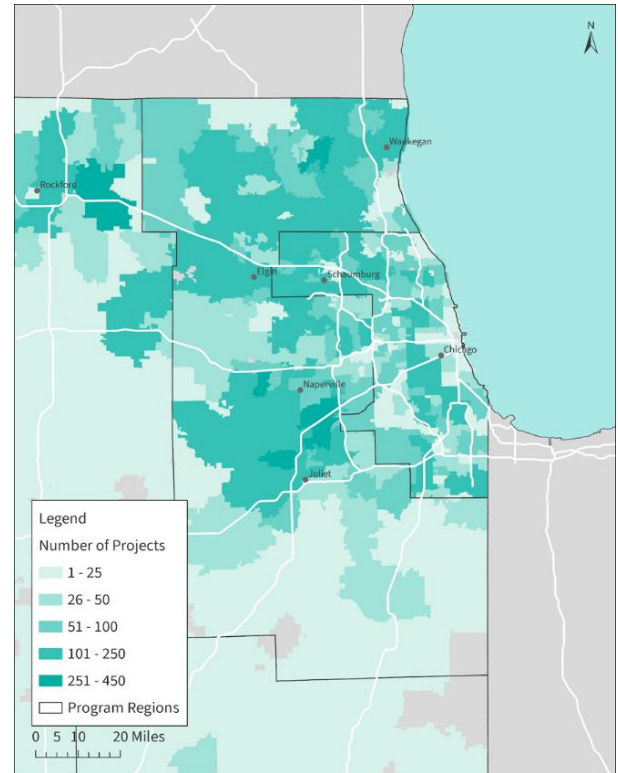


Figure 11. Illinois Shines Number of Installed Projects Normalized by Population (Zip Code)

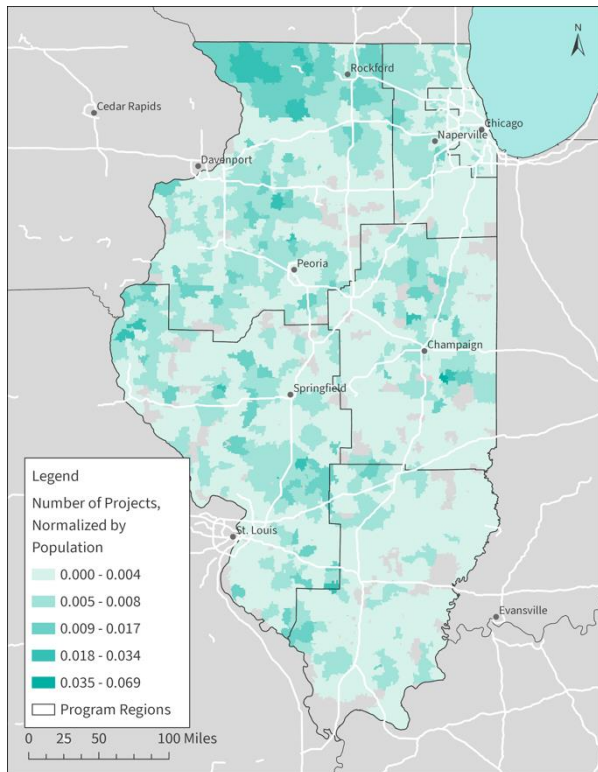
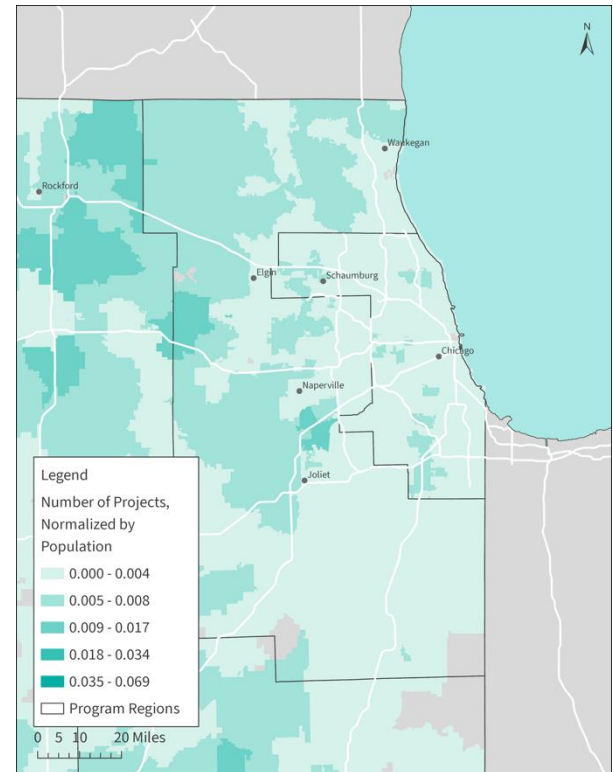


Figure 12. Illinois Shines Number of Installed Projects Normalized by Population (Zip Code) in



Income Eligibility

Figure 13 shows the maximum household income levels by county outside of the Chicagoland Metropolitan Statistical Area (MSA) as defined by the United States Census Bureau (Census). Eligibility for the program may be first determined by county, their eligibility criteria may be applied to demonstrate eligibility. These include living in an income-eligible census tract or EJC (see Figure 14 and Figure 15). EJs are distributed throughout the state, with concentrations in Cook County, Peoria, East St. Louis, Kankakee, and Rockford (see Figure 14). Concentrations of distressed communities that may have higher percentages of income eligible participants can be seen in Figure 16 and Figure 17 when mapping census tracts against the Centers for Disease Control's Social Vulnerability Index (SVI) criteria. The SVI provides a nationally uniform approach that provides a uniform and easily updatable proxy for both income and EJC metrics on a continuous variable. Higher numbers indicate higher vulnerability. This avoids some issues with the Boolean approach of the EJC metric and allows edge cases to be more clearly identified. For example, Figure 17 shows high SVI where there are no high concentrations of EJs in rural areas on the Wisconsin border, while Figure 16 shows high SVI communities in the Southern service territory where EJs are all but absent.

Approved Vendor Availability

Approved vendor availability is shown in Figure 18 and Figure 19, though discussions with approved vendors suggest some will travel to install projects almost anywhere in the state, although willingness to travel may be constrained by staff and material availability and volume of potential projects. This suggests that EJs have adequate access to approved vendors and are seeing installations in their area from a geographic perspective. When normalizing for population (Figures 20 and 21), Chicago appears to have inadequate representation relative to other areas in the Northeast. However, this is not likely an issue based on the current demand of the program and is an artifact of the data.

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Figure 13. Maximum household income by county.

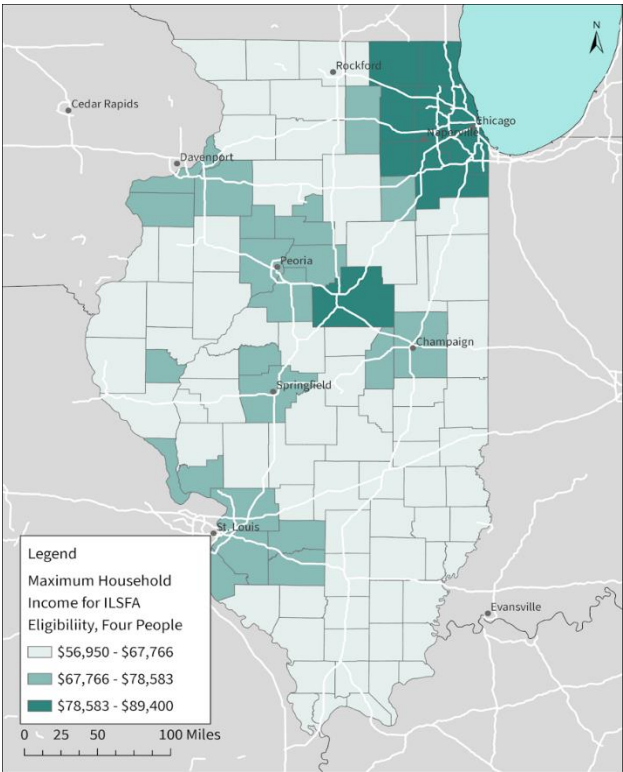


Figure 14. Environmental justice communities (EJCs), Illinois.

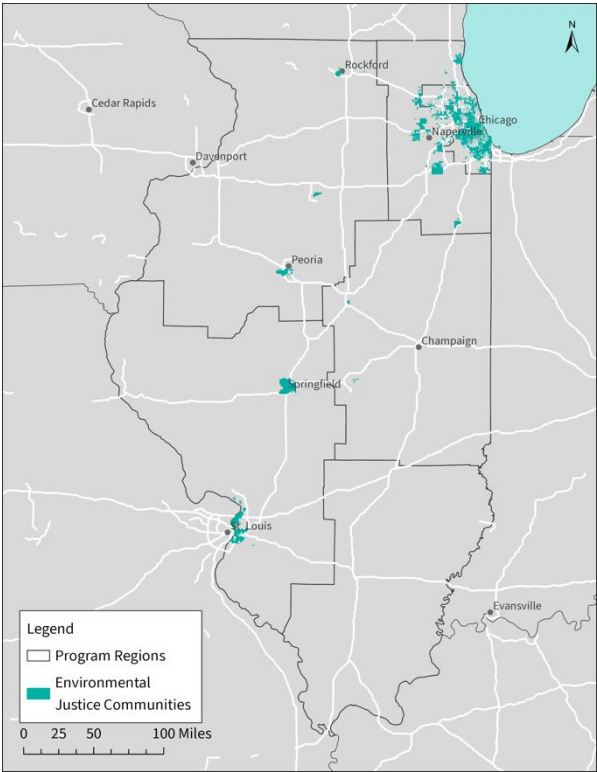


Figure 15. Environmental justice communities (EJCs), Northeast Illinois & Cook County.

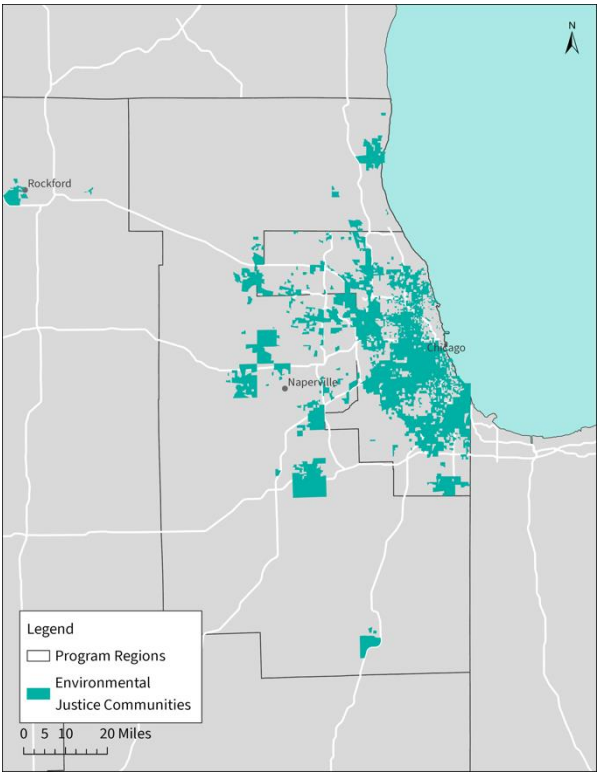


Figure 16. Social vulnerability index (SVI) Illinois.

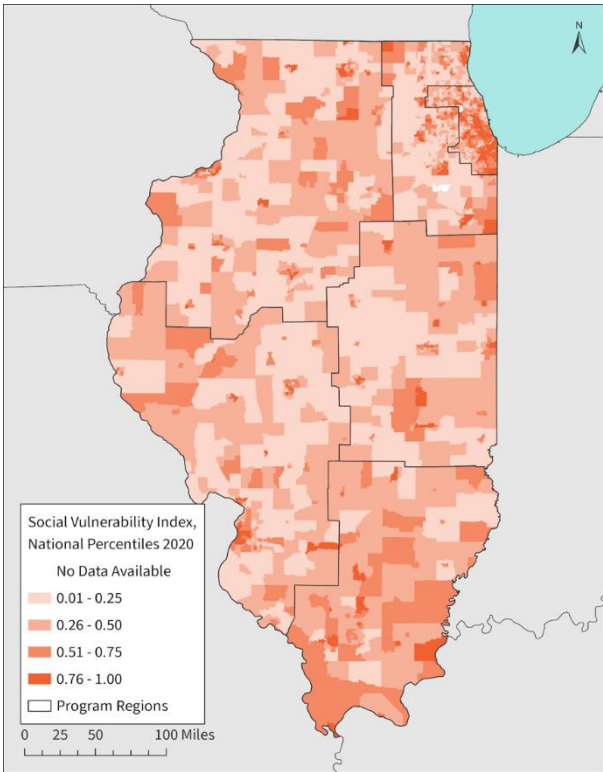


Figure 17. Northeast Illinois and Cook County social vulnerability index (SVI).

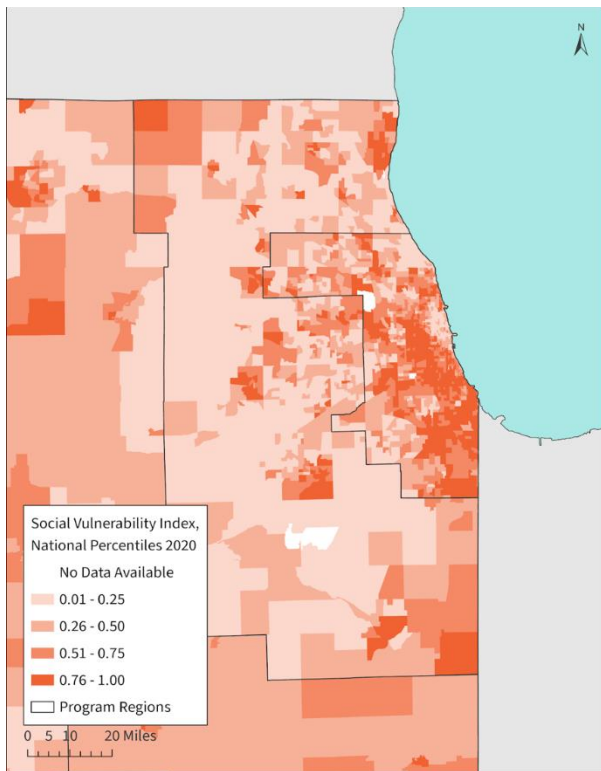


Figure 18. Residential Solar (Small) subprogram vendor count by program region.

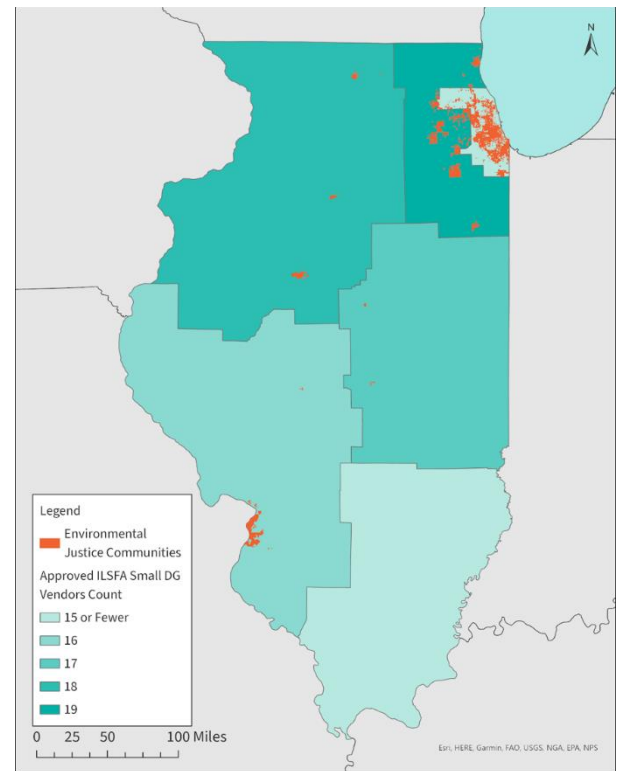


Figure 19. Small subprogram vendor counts Northeast Illinois and Cook County.

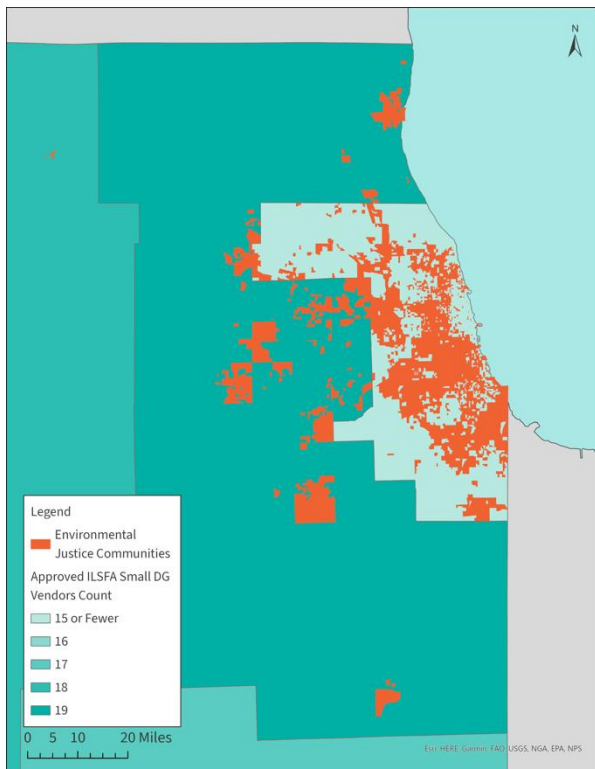


Figure 20. ILSFA number of Residential Solar (Small) installed projects by zip code Northeast Illinois and Cook County.

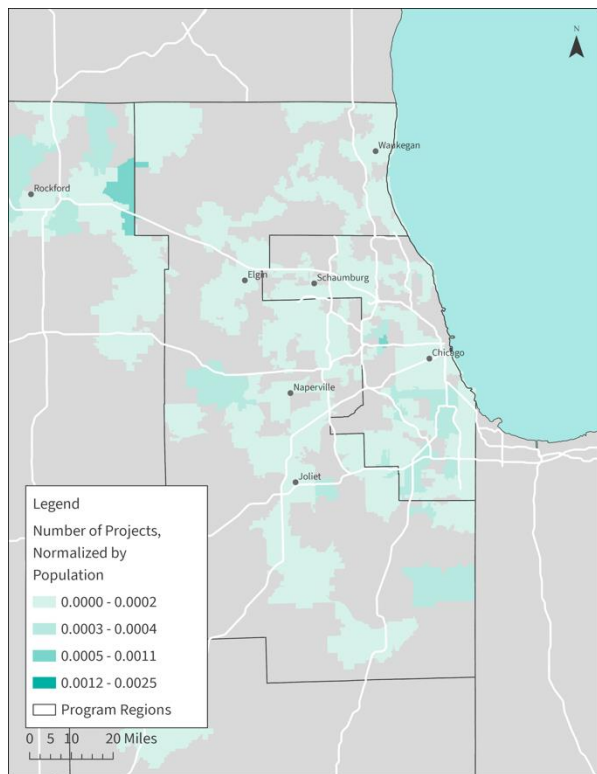
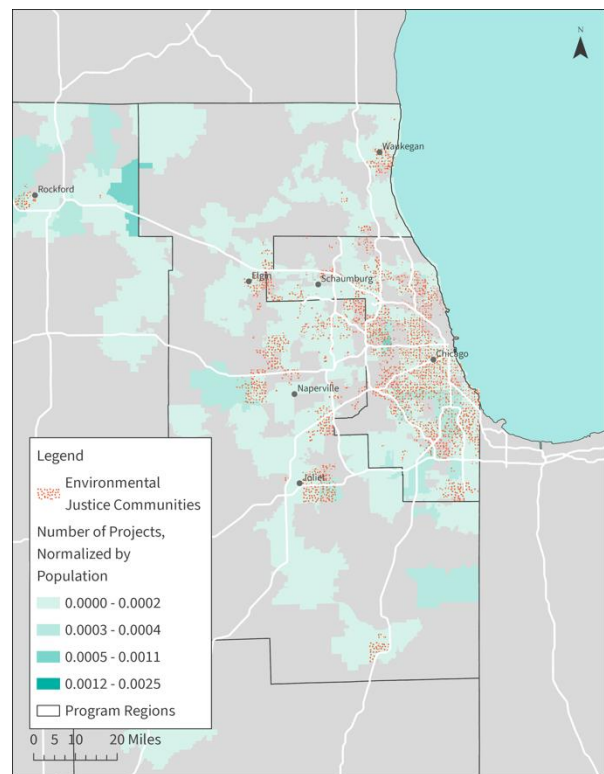


Figure 21. ILSFA number of Residential Solar (Small) installed projects Northeast Illinois and Cook County with EJC Projects.



Appendix C. Detailed Addressable Market Method and Results

An Addressable Market for a product or service is defined by the dollar value, usually annual revenue value and sometimes lifetime value (LTV), of the target customer group. This can be easily calculated as the number of customers multiplied by the price of the product or service paid annually. Additionally, profit can be calculated by determining the average unit cost of the product or service, though this may be affected by economies of scale. However, not everyone who is eligible to purchase a product or service will buy it, and a market analysis is conducted to determine what realistic percentage of the total market of customers will purchase a product. There are several aspects of the subsidized solar PV market in Illinois that can benefit from market analysis to help identify and set long term goals, and to determine how best to serve the market. Utilizing secondary research and information from approved vendor and designee interviews conducted during this research, we have developed a market analysis that provides a conservative estimate of the total number of participants that may be reasonably expected in the Residential Solar (Small) subprogram over its life.

Total Addressable Market

The Total Addressable Market (TAM) is the identified customer for a particular product or service. Based on the program rules for the Residential Solar (Small) subprogram, the service is installation of solar PV on single family attached, single family detached, or 2–4-unit multifamily buildings owned or leased by householders that are income eligible for the program.

Total Serviceable Market

A subset of the Addressable Market is the Total Serviceable Market (TSM) which consists of homes suitable for a solar PV system. We defined the total serviceable market as homes that have adequate insulation to take advantage of a PV system, regardless of whether their home has other site suitability issues. Results of Project Sunroof, a project of Google that uses the Google Maps Application Programming Interface (API) to calculate insolation on rooftops in the United States and estimate DC solar PV system size, were used to determine the conservative TSM for Residential Solar (Small) projects utilizing a 5kW DC system size limit.^{16,17} Project Sunroof's published methodology provides more detail on how residential generation potential is determined.¹⁸

Serviceable Obtainable Market

Finally, after determining the TSM, the subset of this group is the Serviceable Obtainable Market - who is realistically going to install solar on their home. To qualify for the program, in addition to being income eligible, a participant must pass the Site Suitability requirements. During interviews with approved vendors and through secondary research to determine insolation availability, we determined that common factors that prevent suitability include:

¹⁶ Project Sunroof Cook County Estimate <https://sunroof.withgoogle.com/data-explorer/place/ChIJdRNDZqqxD4gRPOAOIwnX2Yo/>

¹⁷ Project Sunroof Illinois Estimate <https://sunroof.withgoogle.com/data-explorer/place/ChIJGSZubzgtC4gRVlkRZFCCFX8/>

¹⁸ Project Sunroof Methodology <https://sunroof.withgoogle.com/data-explorer/place/ChIJGSZubzgtC4gRVlkRZFCCFX8/>

- Roof age and condition (i.e., roofs over 10 years old with missing or damaged shingles or other components, insufficient load bearing, or construction that requires additional structural support).
- Major electrical service upgrades (e.g., panel age and suitability, cloth/knob and tube wire, code compliance).
- Shading (e.g., buildings, trees, or other obstructions on the roof).
- Roof shape or obstructions (e.g., dormers that create multiple arrays, fire code compliance difficulty due to insufficient clearance).

These conditions are more likely to occur in a population with less money to conduct preventive maintenance or upgrade building systems. After accounting for the limits identified in the TAM and TSM, SOM limits must be calculated. We can apply an upper limit based on a review of mature solar PV markets. First, a home is almost certainly only going to purchase a solar PV system once every 25 years, so repeat customers can be ruled out effectively. Second, only a subset of the population of eligible households with suitable sites will be interested in the installation, even if it is at no cost. The West Census Region of the United States has many mature solar PV markets and had a penetration rate for residential solar of 8.9% in 2020 (EIA).¹⁹ This is an acceptable proxy for an upper bound of penetration in the market in the near term, even if it can continue to grow more slowly in the mid and long term.

According to one approved vendor, 70% of installations required some kind of upgrade (Interview #3). These were most commonly meter adapters, electrical upgrades, structural improvements and finally roof replacements. In many cases, interviewees indicated that major upgrades were a non-starter, but at least one approved vendor paid for major upgrades as part of a long-term lease or Power Purchase Agreement (PPA), which rolled the cost of the upgrade into the financing of the project over a long term, usually 20 years (Interviewee #3). If we assume this is not the case, these projects become ineligible for solar PV for all intents and purposes. Conservatively, if we apply the data point that 70% of these projects will be ineligible without some kind of upgrade that may or may not require out of pocket costs to the homeowner, we can determine the lower bound of the ILSFA SOM.

Detailed Project Review Process

The program follows two phases, pre- and post-construction, that require program review, named Part I and Part II respectively. The ICC, IPA, and utilities must also review Part I reviewed projects for REC availability and interconnection suitability. Categories of review include administrative review of Participant Verification, Site Suitability, System Design including project size and expected production.

Delays in approval are often paperwork related and are sometimes significant in the Part I approval process. These delays are often due to incomplete submissions. The Program Administrator reported providing clarification requests that are not answered promptly and cause a pause in the approval process. Issues were reported to be due to several areas, most notably site selection. These issues were not formally categorized and tracked, but efforts to educate approved vendors on proper paperwork have been open and available, with posted video training on parts of the process (e.g., photo submission).

¹⁹ Homes and buildings in the west and northeast have the largest share of small-scale solar. Homepage - U.S. Energy Information Administration (EIA). (2020). Retrieved from <https://www.eia.gov/todayinenergy/detail.php>

The program administrator reviews all paperwork for each project for completeness, making sure consumer protections are being followed and system designs are following requirements. Program administrator staff will liaise directly with approved vendor staff to make sure projects are complete in Part I before approving Part II.

Part of the Part I process involves submitting all paperwork-complete and reviewed projects at one time to the ICC. Once approved, the program administrator notifies the approved vendor that projects are approved to build and must be installed within a required time. Approved vendors do not typically do any part of a project until the ICC approval is through, regardless of the program administrator's Part I paperwork approval. Once the project is complete, approved vendors submit for a Part II approval and make sure that the project meets the specifications. If there are changes, they are documented to monitor the impact on the RECs.

Netting statements, a summary document of the projects that are ready to be invoiced by an approved vendor for the quarter, are used to invoice the IPA or utilities to pay the contracted REC amount. RECs are then paid out to the contracted party. Ongoing reporting is then provided to the program administrator. Approved vendors are responsible for customer acquisition and working with them to move through the process. This process is consistent for both Illinois Shines and ILSFA Residential (Small) projects.

Grassroots educators may make connections between approved vendors and potential customers at any time and are encouraged to do so. The program administrator provides administrative support by fielding inquiries from program actors (participants, vendors, installers, approved training program providers, and grassroots educators) and providing support for income verification, and maintains a publicly available list of interested projects that approved vendors may inquire about to be connected to participants.

Approved vendors complete declaration documentation with the participant and complete the site assessment and system design documentation. This is then uploaded for program administrator review through a Salesforce portal provided to each approved vendor as part of their program onboarding process.

All projects that the approved vendor has in their pipeline must be submitted during a set submission window every year per the program rules, however this has become a rolling application since the subprogram budget is never exhausted during the initial submission window. Previously, these needed to meet a batch size requirement (i.e., all projects had to add up to a total kW size), but this requirement has been changed to allow smaller contractors to participate. The program administrator then prioritizes projects that are most aligned with program goals and manages the subscription process. The Residential Solar (Small) subprogram has never been oversubscribed, and program budgets may be rolled over to the following year, or the submission window may be reopened to allow rolling submissions.

ILSFA Project Life Cycle for Residential Solar (Small) Subprogram

A summary of the life cycle and documentation requirements for approved vendors is listed below. Figure 5 and Figure 6 visualize the process from the perspective of the approved vendor.²⁰ Process maps for the approved vendors include an additional actor, the Installer, for some approved vendors that do not install their own projects.

²⁰ ILSFA Program (2022), Illinois Solar for All Approved Vendor Training October 2022 retrieved from https://www.illinoissfa.com/app/uploads/2022/10/ILSFA-PY5-Residential-and-Non-Profit-Public-Facilities-Submission-Window-Training_20221025.mp4

This is absent from the program administrator process map but may be an area of focus for improving processes.

1. Customer acquisition
2. Disclosures
3. Part I - Project Submission
 - a. ILSFA Disclosure (PPA, Lease, Purchase)
 - b. Participant Eligibility
 - c. Contract Agreement
 - d. ILSFA Savings Calculator, if applicable
 - e. System Design Documents
 - i. Site Plan
 - ii. Single Line Diagram (SLD)
 - iii. Shading Study
 - iv. Mounting Details
 - f. Site Suitability Report
 - g. Photo Documentation²¹
 - i. Requirements
 1. Site Suitability (Includes roof assessment internal and external, structural roof photos, condition of electrical panel)
 2. Shading (obstructions design and as-built)
 3. Inverters (Information label, disconnect, combiner box)
 4. Other Electronics (module information and install, revenue grade meter with generation reading, gateway or other electronics tracking)
 5. General Electrical (grounded and bonded, safety labels, etc.)
 6. Interconnection (load side, supply side, main service panel)
 7. Pitched Roof (mounting, anchoring, flashing, tilt angle)
 - h. Proof of Property Ownership
 - i. Customer Utility Bill
 - j. Interconnection Agreement (likely not applicable as it is for >25kW AC)
 - k. MWBE Subcontractor contract, if applicable
4. Part I - Project Approval
5. Project Selection
6. REC Contracting
7. Project Development
8. Part II - Project Submission
9. Part II - Project Approval
10. Invoicing
11. Ongoing Reporting

²¹ ILSFA Program, Illinois Solar for All Approved Vendor Photo Guide (2022) retrieved from <https://www.illinoisfa.com/app/uploads/2022/10/2022-ILSFA-Approved-Vendor-Photo-Guide-Published.pdf>