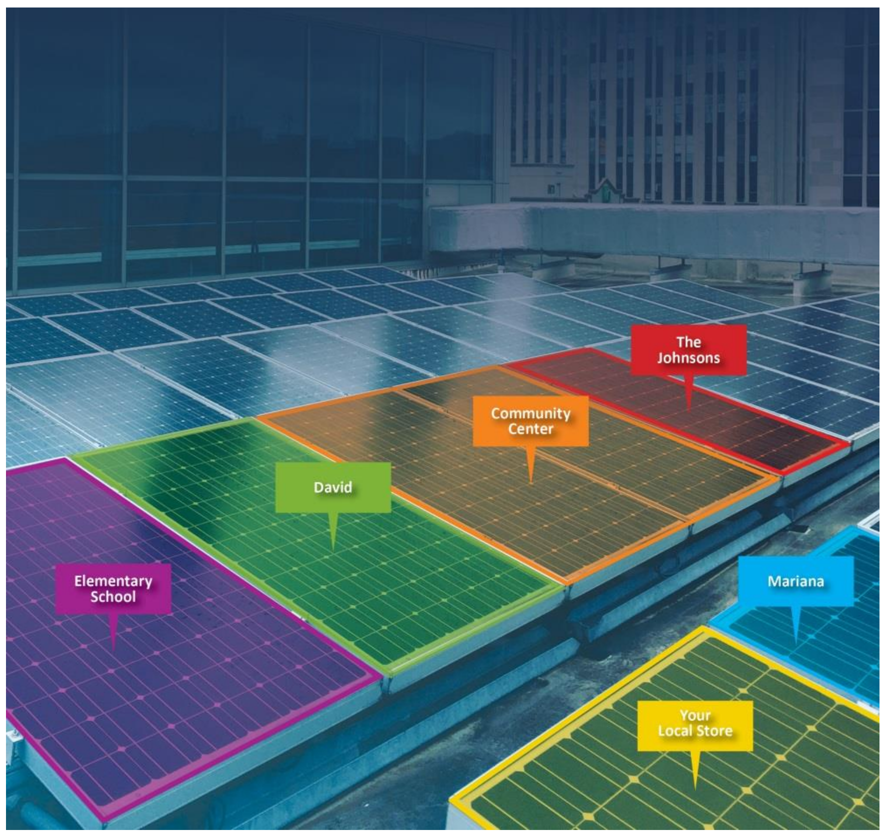
Community Solar Case Study Overview

Prepared for the Cook County Community Solar Project

September, 2017



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The Cook County Community Solar Project

Project Background

The Cook County Community Solar Project was launched in early 2015 with a grant from the Department of Energy's Solar Market Pathways Program. This two year project began on the premise that community solar was not only possible in our region, but has the potential to bring access and equity in renewables to the 80% of our population currently left out because of technical, structural or financial barriers. Community solar also has the potential to bring significant economic development to the region, with more than 600 MW of community solar development projected in Illinois through 2030 after the launch of the Future Energy Jobs Act in June of 2017.

Project Partners, including Cook County, Elevate Energy, the Environmental Law & Policy Center, The City of Chicago, ComEd and West Monroe Partners, have produced a series of reports, analyses and tools that are aimed at supporting stakeholders to grow the emerging community solar market in our region. Project deliverables include an opportunity assessment, policy analysis, best practices, value and economic impact analysis and a series of 15 site-specific project case studies, in which this document provides the overview and assumptions. More on the project and deliverables can be found here:
https://www.cookcountyil.gov/service/solar-energy

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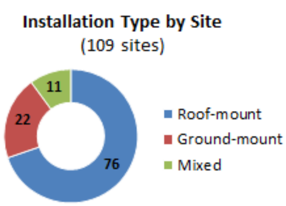
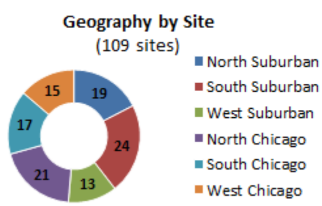
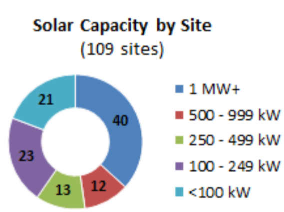
Site Selection Details

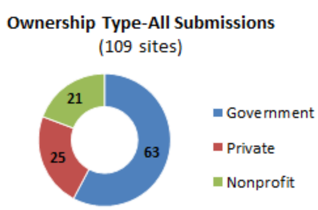
The Cook County Community Solar Project sought to develop case studies for community solar projects using sites submitted by Cook County property owners interested in hosting these systems. While the SunShot award could not be used to install solar systems, the project aimed to jump-start the community solar market in the region by showing through detailed business cases how community solar can work in a number of representative sites. Site selection was launched in November of 2015 via press releases and a targeted campaign to more than 10,000 individuals from nonprofit organizations, private ownership organizations and public agencies. During the 45 day submission period, 109 sites were submitted by Cook County property owners, representing a diversity of geographic, ownership and solar installation types. Initial requirements for properties submissions included:

- Rooftop properties with the potential solar capacity of 100 kW or more
- Ground sites with a potential solar capacity of 300 kW or more
- Rooftop properties with at least 10 years of roof life remaining.









34 properties did not meet this initial criteria at the time of submission, leaving 75 properties as potential case studies. Subsequent screening eliminated rooftop sites with less than 20 years life remaining and eliminating multiple property submissions from a single submitter. An interconnection pre-screen by ComEd did not eliminate any properties as possibilities. Of the remaining 44 sites, the project team selected 15 for a diverse set of case studies.

Case Studies

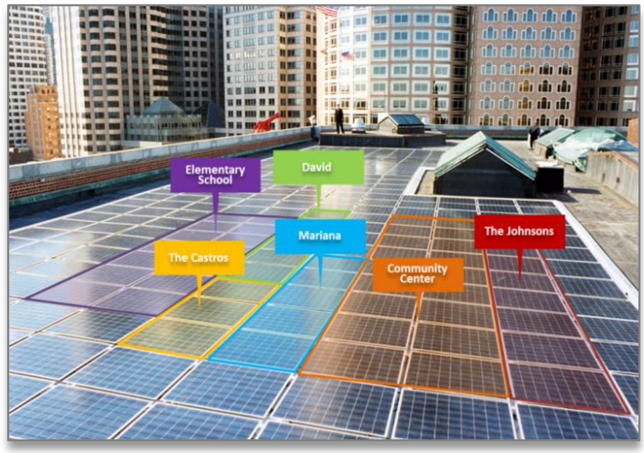
Using these 15 sites, a diverse set of business models were developed that include varying ownership structures and subscriber models. Engineering was completed for each site that included structural and solar capacity assessments, as well interconnection, system components and a complete site-specific system design. Market and outreach planning was conducted specific to each community and subscriber model. A comprehensive financial analysis was conducted for each case study using a model developed by this project team with the support of the National Renewables Energy Laboratory and other stakeholders. It is hoped that these case studies will provide insight and guidance in the development of community solar projects by providing realistic and practical project plans that can be easily replicated across the region.

15 Case Study Sites

1. Hill Arboretum Apartments, 2040 Brown Ave., Evanston
2. Des Plaines-Lake Landfill, 9800 E. Central Road, Des Plaines
3. Prairie State College, 202 S. Halsted St., Chicago Heights
4. United Airlines Training and Data Center, 1200 E. Algonquin Road, Des Plaines
5. Altgeld Gardens Homes, 134th St and Corliss Ave., Chicago
6. CTA Rail Heavy Maintenance Facility, 3701 W. Oakton St., Skokie
7. Housing Authority of Cook County vacant land in Chicago Heights, IL.
8. Rich East High School, 300 Sauk Trail, Park Forest
9. Taft High School, 6530 W. Bryn Mawr Ave., Chicago
10. Markham Courthouse, 16501 S. Kedzie Ave., Markham
11. 3057 N. Rockwell St., industrial redevelopment in Chicago
12. Our Lady of Perpetual Help, 1175 Grove St., Glenview
13. 4150 N Knox Ave., WBS Equities in Chicago
14. Warren Park Field House, 6601 N. Western Ave., Chicago
15. Theaster Gates' Studio and Residence/ Rebuild Foundation, 7200 S. Kimbark Ave., Chicago

Community Solar

Community solar is a solar photovoltaic (PV) installation that provides energy benefits to multiple participants. Participants, also called Subscribers, can buy or lease a share of the solar installation and receive credits on their electricity bill for their share of the power generated. Subscribers can be households, businesses or anyone with an electric bill. Community solar arrays can be installed anywhere in a community – on rooftops, on the ground or over a parking lot. Subscribers do not have to be located in the same place as the solar panels just in the same utility territory.



Stakeholders & Roles

There are many stakeholders that can be involved in the development of a community solar project. This will differ based on the business model, the location or the subscriber model. It will also differ based on the scope or size of the project and how the project needs to engage with the utility and local governments. Below are the stakeholders common to the development of community solar:

Host Site	The property where the solar array is installed. The property owner may or may not be the system owner or a community solar subscriber.
System Owner	The System Owner owns the solar array after installation. This is commonly the Solar Developer. But, ownership can be transferred and developers hired as third-party contractors.
Subscriber	A Subscriber buys or leases shares in a community solar array. They can be households, businesses or any entity with an electric bill.
Utility	The utility is the organization that supplies your electricity. They may just deliver electricity and not generate power and may be investor-owned, municipally-owned or cooperatives. They must be engaged for interconnection into the local grid.
Solar Developer	A Solar Developer designs and builds the solar development. The developer sometimes hires a third-party, local contractor to install the solar. Solar Developers may or may not own thee system they build after installation.
Solar Installer	A Solar Installer builds the solar system, installing it at the host site. The installer may be a part of the solar development company or may be hired as a third-party.
Financial Institution	This refers to the lending institution that finances the solar development for the system owner. They require sound financial modeling and business planning before offering financing for solar.
Investor	An private Investor is often in solar development. They provide the capital to finance the development and installation of the solar array. They usually take ownership of the system and require a return on investment.
Foundation	Foundations and other philanthropic organizations often fund solar development or provide incentives and technical assistance for solar development. These are typically provided for nonprofit solar developers.
Local Government	Local governments are engaged for zoning and permitting of the solar development. For community solar, local governments can be partners in outreach and marketing.
Subscriber Management Org.	A third-party subscriber management organization is often hired to perform customer acquisition, billing and customer service for subscribers. They will ensure community solar projects are fully subscribed and accurately billed.
Community	The community, broadly, are the households, businesses and institutions surrounding the solar array and/or the subscriber base. They should be engaged early, especially if the subscriber base is large or complex. They are your partner in project development.

Site Assessment

Overview

Ensuring that a site is suitable for solar requires a site assessment that evaluates the physical structures and determines whether solar can be installed safely and cost effectively. The Cook County Community Solar Project hired an independent engineering firm, Primera Engineers, Ltd., to conduct these assessments. Construction or interconnection-ready drawings were not produced for these case studies. But, a detailed engineering analysis provided a realistic assessment of the feasibility and costs associated with solar installation at each site. Several key areas were analyzed in the engineering reports. Microgrid Energy, a leading community solar project developer, provided pro bono technical assistance to support the development of solar designs case studies.

Structural Assessment

Analysis of the physical conditions of the property, like roof condition, weight capacity, mounting requirements, etc. This analysis ensures the structure is suitable for mounting solar panels and withstanding the weight requirements.

Photovoltaic (PV) System Design

The final system design incorporates the shading, irradiance and slope details into an optimized design, identifying projected solar capacity and annualized power generation. The design will also identify component parts, specifications and costs that inform the financial model.

Interconnection

This analysis requires working with the utility to determine whether the proposed system requires upgrades at the point of interconnection to facilitate the delivery of power generated to the grid. Any upgrades must be factored into the installation cost and could impact financial feasibility.

Site Preparation

This analysis looks at what physical requirements are needed to prepare the roof or ground for solar installation, including the roof replacement or repair, racking and mounting types, as well as environmental remediation requirements based on legislative or regulatory requirements.

Shading and Slope

This analysis considers the shading, irradiance and slope of the site to determine the optimal design parameters for panel placement, including angle, spacing and seasonal differences.

Site Preparation

Site preparation can be a significant cost component for most solar installations and will differ by installation type and the requirements for individual sites, as determined from civil and structural engineering assessments. Rooftop solar may require structural support measures to mitigate the additional weight and requirements for solar components. For rooftop solar, ballasted systems were used whenever possible, except, for example, a proposed installation on a bow-trussed roof. For ground mounted systems, penetrating racking with single-axis tracking was used unless penetration of the surfacewas not acceptable, for example on a landfill. For all ground mounted systems, the preferred site preparation design was to include the development of natural environments versus gravel and mechanical water management/retention. Introducing native species and pollinator habitats proved less expensive, provided better drainage and stormwater management and was overall better for the environment.

Environmental and Permitting

Permitting and zoning requirements can include approval for roof repairs, structural changes, tree removal or trimming and surface changes for parking canopies. Environmental requirements can include measuring impacts to soil, water and air resources; impacts to vegetation, wildlife and sensitive species; as well as socioeconomic and environmental justice impacts. Environmental requirements can be complex and will depend on the site, location, ownership and jurisdiction. While permitting and zoning requirements were reviewed and associated costs included in financial models, case studies did not analyze environmental issues or costs if unknown by the site owners.

Interconnection

Community solar interconnects to the grid on the utility's side of the meter, with the electricity being sent straight to the grid. This is distinct from distributed generation, which connects on the customer side of the meter and directly serves the customer's electricity needs. An interconnection pre-screen process was undertaken for the 15 case study sites by ComEd. Of these, two sites passed with no interconnection upgrade requirements, nine sites passed with needing only simple relay upgrades, four sites required further assessment to determine the extent of upgrades required. Formal interconnection applications were not undertaken for these proposed case studies. As such, costs and assumptions are representative and will vary once formal interconnection processes are undertaken. The assumptions and associated interconnection costs for each case study includes the following assumptions:

- All service to the point of interconnection would be 480V.
- Where relay upgrades were required, costs assume ComEd would incur the cost of the relay at the substation and the developer would incur the costs of the labor to install that relay.
- For relay upgrades, the developer would need to install the Schweitzer SEL-457 relay on the 480 volt service at the developer's cost. There would be no communication requirements for this relay. There may be exceptions based on location-specific grid requirements, like the HACC site.
- For transformers installed at the interconnection point, we have assumed pad mounted, compartmental 3-phase transformers which ComEd will install. Developers would incur a monthly fee on their bills for the cost of these transformers per the Nonstandard Rider (Rider NS).
- *Actual interconnection costs can change significantly upon outcomes of the ComEd Interconnection application and analysis process.*

System Design

The system design integrates the results of structural, interconnection, shading and seasonal irradiation assessments into a solar panel and component configuration that maximizes power output and minimizes costs. Microgrid Energy and Elevate Energy provided system designs, layouts and generation output data using the Helioscope software platform. Helioscope combines a 3D model of the proposed array based on useable rooftop or ground space and calculates the sun angle and sunlight at each hour of the year. The result is a panel layout that is optimized for annual production. In designs that used tracking technology,the PVsyst software was used to model generation output data. Specific modules, inverters and other system components are identified as examples of components in an optimized design to allow for specific system performance outputs and costs. They are not intended to be recommendations for specific models or manufacturers. Component costs, along with anticipated interconnection and structural upgrade costs are input into a financial model for this project.

Installation Type

System designs include a number of installation types individually or in combination, including ground mount fixed racking, ground mount single-axis tracking, rooftop ballasted and penetrated racking, solar carports and awning racking. Components and component costs vary for each of these installation types and are further varied by system size. Smaller systems are typically more expensive per installed watt than larger systems of the same type. However, cost variances by size may not be universal, as developers with larger volumes may not realize higher costs for smaller systems because of their ability to leverage volume in the supply chain. Case studies developed for this project, however, have included these cost variances to better represent a diversity of solar developers.

Business Model

Ownership Structure

The Ownership structure determines who owns the systems assets, who benefits from the incentives and power generated, and how construction is financed. While ownership structure determines how incentives, tax benefits and revenue flows to various stakeholders, more often, the availability of these financial benefits will instead likely determine the ownership structure. Access to capital is also a key factor in determining ownership for community solar. Regardless of how rich incentives and tax benefits may be, the ability to finance the installation upfront is critical in making the project work. Common models include solar developer-owned systems, utility-owned systems and nonprofit- or special entity-owned systems. In Illinois, utility-owned systems are limited and nonprofit-owned systems are at a disadvantage because they cannot access tax benefits. The new incentives for nonprofit/public sector entities will help change that. But, it is anticipated that solar developer-owned systems are likely to be the most common.

Subscriber Model

The subscriber model refers to the way in which participants (or subscribers) access their share of the power generated from the system. Subscribers can be households, business or anyone with an electric bill in the same service territory of the utility where the community solar array is sited. The most common ways in which subscribers access benefits is by 1) purchasing panels up front, 2) leasing panels monthly or 3) purchasing blocks of electricity (say 100 kWhs). Subscribers then get credited for their share of the power on their electric bills monthly. Panel purchase models typically offer more value over time to subscribers, but they require upfront costs that can be a barrier to many. Lease and block models can offer options with no upfront costs and easier access for most households and small businesses, especially low- and moderate-income households. In our models and case studies, the lease option is mostly used. This provides easier access to a wider universe of subscribers and it provides ongoing revenue and cash flow to system owners. Our target for this subscriber model is to allow subscribers to save 10% on their current electricity rate through subscription.

Financial Model

Inputs & Assumptions

Financial models were developed using the Community Solar Business Case Tool. This tool was developed by the Cook County Community Solar Project team and can be found here: http://www.elevateenergy.org/community-solar/communitysolarbusinesscasetool/. The Community Solar Business Case Tool provides a flexible financial model that projects the costs and benefits to the system developer and subscriber of a single community solar project. Detailed input options allow for flexible system design. While all inputs are pre-populated with industry averages, almost all inputs can be changed to reflect local conditions. These industry averages allow for users to predict the outcomes of the project once online. But, the inputs can vary based on a number of factors and a number of assumptions have been made in our models regarding the level of incentives. Changes in these assumptions based on actual market conditions can significantly impact the outcomes.

Most financial inputs are informed by the engineering assessment done for the property. System inputs are determined by the system design, equipment performance, as well as industry averages based on our irradiation zone. Construction costs were determined by the system design, engineering assessment, interconnection and permitting requirements, as well as industry data from National Renewable Energy Laboratory[1] and Lawrence Berkeley National Laboratory[2].

Business Case Tool Version: *The tool version used is a customized version of v1.21. All macros were removed and separate rate inputs were added for C&I/anchor subscribers. The PVWatts rate generator is disabled in this version. To adjust generation rate outputs, download the latest version here: https://www.elevateenergy.org/community-solar/communitysolarbusinesscasetool/*

Financial Metrics

A healthy community solar project must offer value to all stakeholders, including the system owner, the subscriber and the property owner hosting the system. System owners must see a return on their investment. The metrics for measuring this return can be complex and often balance a number of factors. These include Internal Rate of Return (IRR), Payback Period, Net Benefits over the life of the system, Net Present Value (NPV) and Cash Flow. Each of these financial metrics are calculated in the financial models. As a threshold for financial viability, our models targeted a 10% Internal Rate of Return for system owners. This was mostly achieved. Where this was impossible, parameters were changed or a lower IRR was accepted as a trade-off, typically for mission-driven reasons.

Subscribers typically measure the financial viability of a community solar program as a balance of upfront cost, the savings each year and the payback period; i.e. how long does it take for them to recoup their investment. Research[3] has shown that subscribers are no longer willing to pay a premium for solar or community solar, but need to see a clear financial benefit. Host sites typically see value from their involvement in community solar through lease payments for hosting the system, as well as energy savings as a subscriber. Our models and proposed business cases almost exclusively use the panel lease model and target a 10% savings from month-one, as is detailed further in the Subscriber Model section.

[1] *U.S. Solar PV System Cost Benchmark: http://www.nrel.gov/docs/fy16osti/66532.pdf*
[2] *Tracking the Sun quarterly solar price report: https://emp.lbl.gov/publications/tracking-sun-ix-installed-price*
[3] *Community Solar Program Design: https://sepapower.org/resource/community-solar-program-design-working-within-the-utility/*

Administrative and Transactional Costs

Administrative and Transactional costs make community solar distinct from other solar models. These costs include the acquisition of subscribers and associated marketing, outreach and transaction management. It also includes ongoing subscriber management, like billing and customer service. While ongoing payments from subscribers introduces revenue into the financial model, these administrative and transactional costs must be well managed for a community solar project to be successful.

Public data is difficult to find for these costs. However, through the development of the Community Solar Business Case Tool, industry data was captured through the National Renewable Energy Laboratory, the National Community Solar Partnership, as well as regional and national community solar developers and stakeholders. Stakeholders agreed that, while ranges could vary significantly based on project design, legislative framework and geography, a range of between $0.20 and $0.60 per watt was reasonable. Projects could have aggregate administrative and transactional costs outside of this range, but they would be anomalies. Flexible input and output parameters were built into this tool and our financial models.

Illinois Community Solar Incentives

The following incentives have been included in financial models based on ownership structures and subscriber models for individual case studies proposed. Some incentives, like the Investment Tax Credit (ITC), Modified Accelerated Cost Recovery System (MACRS) and the Illinois Capacity Rebate for community solar, have clear legislative and regulatory qualifications, applications and values. Several are being determined through the regulatory process after the Future Energy Jobs Act was enacted in June of 2017.

Federal and State Community Solar Incentives in Illinois

The Investment Tax Credit (ITC)	Modified Accelerated Cost Recovery System (MACRS)	Solar Renewable Energy Credits (SRECs)	IL. Solar For All Nonprofit/Public Sector Incentive	Capacity Rebate
30% federal tax credit on installation cost. The owner must 1) pay taxes, and 2) have a sufficient tax burden to enjoy this benefit. This tax credit is scheduled to sunset beginning in 2020, eventually dropping to 0% for residential and 10% for commercial systems.	Federal tax benefit that allows up to 35% of the cost of solar assets to be depreciated over an accelerated period of six years. Only commercial entities can take advantage of this tax benefit.	Utilities are mandated to purchase SRECs from new community solar projects to meet the requirements of the Future Energy Jobs Act. Community solar SRECs in Illinois will be 15 year contracts paid over 5 years.	A new Illinois incentive for Nonprofit and Public Facilities that serve low-income communities. Could be designed to fill the gap of ITC for tax-exempt entities. Will also be tied to SREC contracts.	A new rebate offered in Illinois for distributed generation facilities that use smart inverters will pay $250/ kW of solar capacity installed. This compensates for the energy-only bill crediting.

Solar Renewable Energy Credits (SRECs)

Solar Renewable Energy Credits, for example, will have values set by the Illinois Power Agency when the program is formally launched in early 2018. The Long-term Renewable Resources Procurement Plan developed by the Illinois Power Agency may include various blocks within the community solar adjustable block program that will provide different SREC values for various aspects of system design; i.e. system size, subscriber type or geography. As a key input to the financial model, the value of SRECs is critical to the financial performance and feasibility of any proposed design. Assumptions needed to be made that place consistent values on SRECs. While it is impossible to accurately predict these values in this interim stage, reasonable conclusions can be made based on market factors and the priorities communicated from the IPA during the stakeholder engagement process that was launched in May of 2017. Assumptions for our modelling include:

Base SREC Value

As part of the Value Proposition Analysis developed by the Cook County Community Solar project, an analysis of potential SREC values on the financial viability of system designs was conducted. A 1MW system was modelled, with a market based subscriber model. With all other model and financial parameters held constant, alternative SREC values and monthly panel prices were simulated to determine their impact on the developer's Internal Rate of Return (IRR) with the intent of identifying those values where the IRR was 10% or above (a critical threshold identified by solar developers in our stakeholder process). At $45/REC, a developer could charge $1.68/panel/month to obtain the target IRR (10%). Because this also produced a positive business case for subscribers, $45/REC was used as the baseline REC value.

Internal Rate of Return vs SREC Value Matrix

Monthly Panel Lease Price	SREC Values												
	$0	$5	$10	$15	$20	$25	$30	$35	$40	$45	$50	$55	$60
$1.54	-0.1%	0.6%	1.4%	2.3%	3.2%	4.2%	5.3%	6.4%	7.7%	9.1%	10.5%	12.0%	13.7%
$1.56	0.1%	0.8%	1.6%	2.4%	3.4%	4.3%	5.4%	6.6%	7.9%	9.2%	10.7%	12.2%	13.8%
$1.58	0.2%	1.0%	1.7%	2.6%	3.5%	4.5%	5.6%	6.7%	8.0%	9.4%	10.8%	12.3%	13.9%
$1.60	0.4%	1.1%	1.9%	2.7%	3.7%	4.7%	5.7%	6.9%	8.2%	9.5%	10.9%	12.5%	14.1%
$1.62	0.6%	1.3%	2.1%	2.9%	3.8%	4.8%	5.9%	7.0%	8.3%	9.6%	11.1%	12.6%	14.2%
$1.64	0.7%	1.4%	2.2%	3.1%	4.0%	5.0%	6.0%	7.2%	8.4%	9.8%	11.2%	12.7%	14.3%
$1.66	0.9%	1.6%	2.4%	3.2%	4.1%	5.1%	6.2%	7.3%	8.6%	9.9%	11.4%	12.9%	14.5%
$1.68	1.0%	1.7%	2.5%	3.4%	4.3%	5.3%	6.3%	7.5%	8.7%	10.1%	11.5%	13.0%	14.6%

Adjustable Blocks for System Size

An assumption was made that the IPA would include blocks for system size with varying SREC values within the Adjustable Block Program for community solar. It also assumed that smaller projects are more expensive to install and maintain. So, a subsequent analysis was done similar to the above analysis, with all system parameters staying constant, except system size and varying SREC values. The goal, again, was to determine the threshold for achieving a 10% developer IRR. This analysis did show that smaller projects modelled required a higher SREC value to achieve this baseline financial viability. The SREC values for each size established our base SREC values for all systems sizes based on a ranges of 1MW-2MW, 500kW-1MW, 250kW-500kW and <250kW.

Cost Comparison by System Size

	2 MW	1 MW	500 kW	250 kW	100 kW
Required SREC value for 10% IRR	**$43**	**$45**	**$50**	**$52**	**$73**
# subscribers	258	129	65	32	13
Installation cost	$1.98	$1.98	$2.06	$2.14	$2.14
25-Year Costs:	($5,487,867)	($2,756,007)	($1,424,321)	($748,763)	($332,467)
25-Year Revenues:	$6,460,793	$3,247,480	$1,687,063	$884,250	$381,034
25-Year Net Benefits:	$972,925	$491,473	$262,742	$135,487	$48,567
25-Year Net Present Value (NPV):	$131,886	$67,767	$40,461	$21,086	$7,769
Return on Investment (ROI):	17.7%	17.8%	18.4%	18.1%	14.6%
Payback Period:	4.1	4.1	4.0	4.0	3.8
Internal Rate of Return	9.9%	10.0%	10.2%	10.1%	10.0%
Cust Acquisition $ per subscriber	$563	$654	$835	$1,197	$2,284
Total subscriber mgt Costs	$862,867	$443,507	$233,571	$128,451	$65,622
Installed cost per watt	$1.78	$1.78	$1.85	$1.92	$1.92
Site lease cost	$7,500	$3,750	$1,875	$1,200	$1,200

Adders for Subscriber Type

We then learned that projects with Residential subscribers have more difficulty acquiring and managing the larger number of customers than commercial subscribers alone. By modelling identical projects with different subscriber models, we compared the metrics. These included 100% commercial subscribers, 100% residential subscribers and a mixed subscriber base with 40% anchor and 60% residential. The goal of this subsequent analysis was, again, to determine the threshold for achieving a 10% developer IRR.

The base value SREC of $45 is based on a mixed-subscriber model. The 100% commercial model shows that individual costs per subscriber are significantly higher, but because there so few subscribers, the model performs significantly better. A 100% residential subscriber model for the same project required significantly more SREC value to reach the 10% IRR threshold.

Cost Comparison by Subscriber Type

Comparison of 1 MW Model w/ $45 REC value	**Mixed (40% Anchor / 60% Residential)**	**100% Commercial**	**100% Residential**
First Year Admin and Customer Acquisition Costs	$84,386	$31,625	$125,067
Average Customer Acquisition cost per subscriber	$654	$12,647	$582
Number of C&I Subscribers	1	3	0
Number of panels per C&I subcriber	1,290	1,290	0
Number of Residential Subscribers	129	0	215
Number of panels per Residential subscriber	15	0	15
Ongoing Admin and Customer Acquisition Costs	$359,121	$122,803	$598,185
Total Admin and Customer Acquisition Costs for 25 years	$443,507	$154,427	$723,251
Total Admin and Customer Acquisition Costs as % of lifetime costs	16.1%	6.2%	23.8%

25-Year Costs:	($2,756,007)	($2,493,911)	($3,035,751)
25-Year Revenues:	$3,247,480	$3,210,527	$3,483,866
25-Year Net Benefits:	$491,473	$716,615	$448,115
25-Year Net Present Value (NPV):	$67,767	$93,433	$73,631
Return on Investment (ROI):	17.8%	28.7%	14.8%
Payback Period:	4.1	4.4	3.9
Internal Rate of Return	9.9%	10.1%	10.2%
SREC value required for 10% IRR	**$45**	**$34**	**$50**
SREC Adder value	**0.0%**	**0.0%**	**11.1%**

Adders for 100% Low-income Projects

Similarly, projects with subscriber models that are 100% low-income require more effort in customer acquisition and subscriber management. Our model allows for the subscriber acquisition effort to be adjusted by a toggle of Easy, Moderate or Difficult. By adjusting the subscriber management level from moderate to difficult, the resulting cost differences can provide an assumption of an Adder value for a 100% low-income project. These projects allow for anchors that are nonprofit or public sector entities that serve low-income communities.

Cost Comparison by Subscriber Type

	Market Rate/Mized	Low-income/Mixed
First Year Admin and Customer Acquisition Costs	$84,386	$95,833
Average Customer Acquisition cost per subscriber	$654	$743
Number of C&I Subscribers	1	1
Number of panels per C&I subcriber	1,290	1,290
Number of Residential Subscribers	129	129
Number of panels per Residential subscriber	15	15
Ongoing Admin and Customer Acquisition Costs	$359,121	$477,912
Total Admin and Customer Acquisition Costs for 25 years	$443,507	$573,745
Total Admin and Customer Acquisition Costs as % of lifetime costs	16.1%	19.9%

25-Year Costs:	($2,756,007)	($2,886,245)
25-Year Revenues:	$3,247,480	$3,315,815
25-Year Net Benefits:	$491,473	$429,570
25-Year Net Present Value (NPV):	$67,767	$67,550
Return on Investment (ROI):	17.8%	14.9%
Payback Period:	4.1	3.9
Internal Rate of Return	9.9%	10.0%
SREC value required for 10% IRR	**$45**	**$49**
SREC Adder value	**0.0%**	**8.9%**

IL. Solar For All Nonprofit/Public Sector Incentive

The IL. Solar For All Nonprofit/Public Sector incentive will provide an incentive for these entities that serve low income communities. This incentive helps to fill a gap in the solar market for entities that have not been able, to this point, to take advantage of federal tax benefits like the ITC and MACRs, which have catalyzed the growth of solar in most markets. This incentive is also in the regulatory stage and will not be determined until program launch in early 2018. We have assumed the value of this incentive to be identical to the ITC; i.e. 30% of the cost of installation. We have also assumed this incentive can be applied to the installation of distributed generation and community solar systems, as well as to community solar subscriptions.

IL. Solar For All Low-income Community Solar Incentive

An incentive was mandated in the IL. Solar For All program to subsidize subscription to community solar for low income families in Illinois (defined as households at or below 80% of the Area Median Income). Again, the incentive level will not be determined until the regulatory process is complete. We have assumed, based on the IPA stakeholder process to date and recommendations from advocacy organizations, that the incentive level will aim to reduce electricity costs by 50%. We have applied this as a direct subsidy for 50% of the subscription cost for qualifying subscribers. This incentive will not impact the system owner metrics.

Other model assumptions

Many of the assumptions made in our modelling are based on the default values in the model described above. Some of those that are common to all business cases are as follows:

Financial assumptions

- All financial outcomes and metrics are before taxes
- No system financing costs are included in the models
- System owner Net present Value discount rate is set at 8%
- Energy escalation is assumed to be 2.75%

Incentive assumptions

- The IL Solar For All Nonprofit/Public Sector incentive is modelled at 30% of the installation cost
- The IL Solar For All low-income community solar incentive is modelled to subsidize 50% of the household's subscription cost

All other inputs and assumptions can be found in individual business case models.

Subscriber Management

Marketing and Outreach

The Cook County Community Solar Project facilitated a working group for Marketing and Outreach to subscribers. This working group identified five primary subscriber segments, as well as potential associated messaging and outreach channels, outlined below. These segments are common to the subscriber models for many of the 15 case studies. In addition, many sites have constituencies based on how and where they serve their communities. Each of these segments may require a distinct approach in the outreach process and will impact the planning, timeline and costs. While some developers have experience in subscriber management for community solar, many developers and potential system owners do not. Independent Subscriber Management Organizations have emerged to help entities with customer management and can help manage the subscriber relationship from marketing, sales and through the ongoing bill management over the life of the system.

Premium

Middle and higher income households and well established businesses and institutions that are willing to pay a premium for clean energy

Business/Commercial

Any business or institution (nonprofits, schools, municipal buildings, etc.) that pay for their electricity.

Messaging:

- Community solar is a good investment.
- Reduce your operating expenses while supporting your community.

Channels:

- Hyperlocal news outlets
- Local environmental organizations

Energy Aware

Households that have undertaken sustainability initiatives through public or private programs; i.e. energy efficiency, recycling or other efforts.

Messaging:

- Would you like to go solar but can't install panels on your roof?
- Help bring clean energy to your community with community solar.

Channels:

- Local newsletters
- Community organizations
- Hyperlocal news outlets

The development and implementation of a customer acquisition plan can require a significant investment during the first year, depending on the scope of the project, the location of the system and the subscriber segments targeted. A key distinction in customer acquisition planning is the mix of residential or low-income residential households and commercial or institutional subscribers, as indicated in the analysis above in the Financial Model section. The tasks associated with customer acquisition can include developing marketing materials, media planning and website design, as well as implementing sales, billing and customer service procedures.

Technology can be an important part of customer acquisition and subscriber management, as well. A number of commercially available platforms cater to the needs of community solar management by helping with marketing, sales, system management and ongoing billing management. These systems often integrate with the utility customer management systems to more seamlessly manage the overall customer experience for the community solar subscriber.

Ongoing Subscriber Management

Ongoing subscriber management includes monthly billing management, bill reconciliation, customer service and managing subscriber turnover. For commercial and institutional subscribers, while initial customer acquisition costs are significantly higher per subscriber, these ongoing costs are typically much less. While commercial customer acquisition is more difficult, there are fewer subscribers and they turnover less quickly. Managing subscriber turnover can be a critical part of subscriber management. Typical community solar projects see less than 2% of their subscribers retire their subscriptions annually. Higher turnovers can be costly and problematic for the long term financial health of a community solar project.

Development Timeline

Development timelines for solar are fairly well established. Community solar adds some complexity because of customer acquisition and establishing sales transaction and bill crediting procedures. Below is a timeline that can serve as a starting point for the development cycle for most projects.