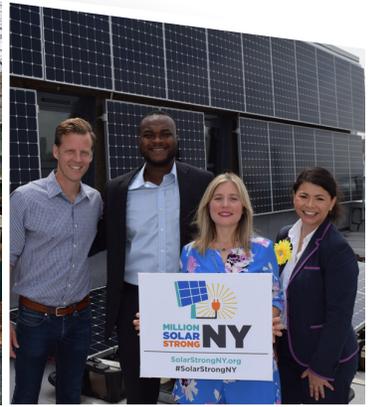


INCLUSIVE SOLAR FINANCE FRAMEWORK



PREPARED BY
Sustainable Capital Advisors



**SUSTAINABLE
CAPITAL ADVISORS**

FOR
Vote Solar



VOTE SOLAR

AUGUST 2018

ABOUT THIS REPORT

Vote Solar engaged Sustainable Capital Advisors (“SCA”) to develop a framework for inclusive solar finance with the goal of identifying interventions (policy, market and others) that can expand access to solar products for all customers, particularly low-income and/or low credit score customers (“target customers”). In constructing this report, SCA conducted approximately 60 hours of interviews with thought leaders and expert practitioners in the solar and finance sectors to identify barriers, solutions and overall perspectives related to increasing solar access. Interviewees represented the entire solar ecosystem including developers, installers, financiers (commercial, investment, community and green banks), impact investors, foundations, policymakers, housing agencies, utilities and consumers. In addition to the interviewees, the research team reviewed publicly available information including articles, journals and documents produced by professors, economists, private banks, state agencies, not-for-profits, and others in order to develop a comprehensive view of the solar finance market.

Based on the collective research, SCA has developed this framework report which identifies barriers that contribute to limiting access to low-income and/or low credit score customers for solar products, while proposing potential market and policy interventions that will expand opportunities for our target customers. The report is meant to reflect a broad “how-to” guide for implementing inclusive solar finance projects, outlining how all members of the ecosystem can contribute to expanding solar access. Solar policy and market economics vary dramatically across the United States. As a result, it is nearly impossible to find solutions that will perfectly transfer everywhere, so this report focuses on the broadest set of barriers and interventions that could be applied throughout the country. While there is interest in tackling issues related to increasing diversity of stakeholders and participants (customers, employees, and businesses) in the solar industry, the report focuses solely on the market and policy interventions related to making financing options available to our target customers residing in all communities including, urban, suburban, rural, tribal and other. Lastly, this report is not intended to be exhaustive in its content and insights but rather should be viewed as a tool to further the conversation and accelerate opportunities on the ground.

This report would not have been possible without the various experts and stakeholders, from the following organizations, who provided their insights to SCA throughout the research process.

| | | |
|--|---------------------------|--|
| Abell Foundation | Connecticut Green Bank | LEAN |
| Acadia Center | Denver Housing Authority | Michigan Saves |
| Amalgamated Bank | Dividend Solar | National Association for the Advancement of Colored People |
| Binghamton Regional Sustainability Coalition & Energy Democracy Alliance | East Bay Community Energy | National Consumer Law Center |
| Boston Community Capital | Elevate Energy | New York City Environmental Justice Alliance |
| California Clean Energy Fund | Energy Foundation | New York Green Bank |
| Citi | Erie County, NY | NYSERDA |
| City and County of Maui, HI | Georgia Watch | Philadelphia Energy Authority |
| Clean Energy Collective | Green Mountain Power | PosiGen |
| Clean Energy Works | GRID Alternatives | Reinvestment Fund |
| Cohn Reznick LLP | Groundswell | |
| | High Noon Advisors | |

Renew Financial

Rhode Island Housing Finance Authority

Rocky Mountain Institute

Rural Renewable Energy Alliance

Solar Energy Industries Association

Self Help Credit Union

Sol Systems

Solar Energy Loan Fund

Solar One

Solstice

The Solutions Project

Turning Point Energy

Finally, special thanks go to my well-esteemed past and present colleagues Erika Simmons, Collin Smith, Isabel Malcolmson and Catherine Morgan, who have contributed significantly to this report. A very special thank you to Melanie Santiago-Mosier and the entire Vote Solar team for their commitment to actively engage on this critical topic of expanding access to solar for all. Thus, ensuring that policies developed in statehouses and commission chambers across the country are designed with inclusion and equity at its core.

Sincerely,



Trenton Allen

Managing Director and CEO

Sustainable Capital Advisors



About Sustainable Capital Advisors

Sustainable Capital Advisors (SCA) is a consulting and financial advisory firm focused on developing and implementing innovative finance solutions for the sustainable infrastructure sector. Since 2012, SCA has provided clear, concise, and unbiased advice based on the realities of the financial markets to our clients. As an active market participant, SCA professionals have executed over \$35 billion in financings, primarily for infrastructure projects. SCA has experience executing projects for the full range of sustainable infrastructure activities including energy, water, transportation, sustainable agriculture and built environment.

For more information, visit www.sustainablecap.com.



VOTE SOLAR

About Vote Solar

Since 2002, Vote Solar has been working to lower solar costs and expand solar access. A 501(c)3 non-profit organization, Vote Solar advocates for state policies and programs needed to repower our electric grid with clean energy.

Vote Solar's Access & Equity Program is dedicated to expanding access to solar technology, savings and jobs to the approximately 22 million low-income households nationwide, and in doing so accelerate clean air and climate progress for all.

Table of Contents

| | | |
|------|--|----|
| I. | Introduction | 1 |
| II. | Overview of Inclusive Solar Finance | 3 |
| III. | Customer Access Methods and Barriers | 8 |
| | I. Group A: Cash | 8 |
| | II. Group B: Securitized Products | 10 |
| | III. Group C: Community Solar | 17 |
| | IV. Group D: Passive Participation | 20 |
| IV. | Interventions | 24 |
| | 1. Refundable Tax Credits | 24 |
| | 2. Reprogram Existing Energy Funds | 25 |
| | 3. Credit Enhancement | 26 |
| | 4. Alternative Credit Scoring | 27 |
| | 5. Community Solar | 28 |
| V. | Observations from the field | 29 |
| | 1. Trust Deficit | 29 |
| | 2. Property Seizure | 29 |
| | 3. Consumer Protection | 29 |
| | 4. Ownership | 30 |
| | 5. Savings Threshold | 30 |
| | 6. Diversify Loan Portfolios | 30 |
| | 7. Community Solar Is Popular | 30 |
| VI. | Conclusion | 31 |
| VII. | References | 32 |

I. Introduction

Over the past decade, the solar energy industry has experienced significant growth from 36 MW of installed residential capacity in 2006 to 2,583 MW in 2016. During this time there has been a significant transformation in how customers receive, interact, use and generate the clean energy that powers our homes and businesses. Dramatic reduction in the price of solar photovoltaics (PV) and advancement of solar-friendly policies have allowed significant numbers of customers to decide to install solar systems on their roofs and nearby properties to generate their own electricity. Not only does the installation of solar PV have the potential to save on energy costs, but it also empowers customers to recast their relationship with their utility in an entirely unique way. By exercising options available (lease, power purchase agreements, PACE, community solar and others), customers are no longer passive participants in this clean energy revolution but are free to choose how, what, and when they transact in these evolving energy markets. As technologies continue to improve, policies adjust, and markets evolve, all customers now have a greater voice in how and when they consume and produce electricity.

However, this clean energy evolution and revolution has not been equally accessible to all customers in every community across the United States. By and large, low-income customers have faced disproportionately greater obstacles in implementing projects that have the potential to produce much needed economic benefits. Many of these barriers are not new: cost (up-front expenses associated with solar PV installations), credit restrictions, policy challenges, and federal incentives provided through the Investment Tax Credit (“ITC”), collectively have the impact of limiting the options available for more customers to actively participate in the solar marketplace. Not to mention that quite often low-income and/or low credit score customers are not prioritized in business development efforts of solar installers and developers.

So, why is developing an inclusive solar market for all so essential? First, the inability for our low-income and/or low credit score neighbors to access solar energy endangers the ability of the low-carbon revolution to deliver the environmental and societal benefits it promises. Second, across the country states utilize system benefits charges, carbon taxes, renewable energy credits and others to fund economic incentives for customers to adopt new energy technologies, including energy efficiency, storage, solar and others. When customers who pay into these funds, through their energy bills, are unable to access both traditional and innovative PV technologies due to market and policy barriers, inequities develop, which can eventually have a destabilizing effect. Lastly, low-income and/or low credit score customers represent a significant portion of the United States population. Identifying opportunities for our target customers to participate is paramount to the continued growth of the solar market. Finding ways to make financing more inclusive has the potential to make participation in solar energy more expansive, by breaking down some of the more challenging barriers that have prevented our target customers from participating.

Providing a suite of inclusive solar finance solutions will necessitate changes to the status quo. State, local and federal policies will need to be adjusted while new market tools and approaches will need to be supported by governments, foundations, capital providers, solar industry participants, utilities and others interested in providing greater access to solar for more customers. It is crucial that policy and financial

market tools are developed with knowledge and consideration of each other. The goal is to establish an environment where all actions and interventions work efficiently together to expand much needed access to low-income, low credit score and low-income/low credit score customers. Policy changes at the legislative and regulatory levels will serve to create a stable enabling environment conducive for market actors to develop, test, and prove novel yet adequate solutions. Not only is inclusive solar finance the right thing from a policy, social and environmental justice lens, but it is also advantageous from a business standpoint for solar companies, technology providers, utilities and capital providers alike. By combining innovative financing approaches with supportive policies, we can ensure that equity is at the center of the next chapter of the continued expansion of our nation's solar economy.

In this report, we outline a framework that policymakers, advocates, the solar industry, community groups, and financial organizations can use to think more broadly about ways to achieve greater equity as the nation transitions to a cleaner energy economy. Section II of the report presents a brief overview of the Inclusive Solar Finance Framework. Section III discusses the Customer Access Methods we have identified that relate to finance for solar and examines the barriers that target customers face with each. Section IV goes on to explain the interventions that may be undertaken to break down the barriers. The report concludes with several observations and cautions when pursuing financing options for our target customers.

We hope that this report is a useful tool to start a broader and action-oriented discussion about how to make solar more inclusive for all.

II. OVERVIEW OF INCLUSIVE SOLAR FINANCE

In the world of finance, all potential counterparties (borrowers) are evaluated based on their **capacity** and **ability** to repay loans and/or investments. This is true for governments, corporations and consumers alike. For consumers, the **capacity** to repay a loan is often measured by the level of annual income (historical, current, and projected). While absolute income level is important, the goal is to evaluate the ability of a borrower to absorb fluctuations, notably decreases, to annual cash flow while still being able to meet all of its current obligations. Debt-to-income ratio is the most commonly used metric to assess the capacity of a borrower. For corporations and governments, credit ratings assigned by Standard & Poor's, Moody's Investor Services, Fitch Ratings and Kroll are used to assess their **ability** to repay their obligations. For the consumer, credit score is often used to measure their ability to repay. The credit score includes historical repayment history and credit rating. This combination is essential because it provides more data to assess the likelihood that the counterparty honors its future obligations.

Taken together, capacity (income) and ability (credit score) are critical components of the consumer's credit underwriting process. When the income and/or credit score is low, the perceived and real risks to a capital provider increase. Whether the increased risk is negligible or significant is determined by each provider, but the goal of inclusive solar finance is to identify specific interventions that can address these particular concerns (risks). To clarify, not all policy and market interventions will impact the capacity and ability of a borrower in the same way. For example, an intervention that addresses and enhances the credit risk profile associated with a counterparty's capacity (income) may be insufficient to address the potentially longer-term concerns related to the customer's ability to repay its obligation on time, which is reflected in the low credit score. Likewise, taking measures to improve a customer's credit score may have little to no impact on the review of customer's ability to withstand fluctuations in its capacity (income) to make payments in the short- and long-term. While income and credit score are not the only criteria for evaluating a counterparty's underlying credit, understanding the capacity and ability to repay obligations provides a very useful lens to view the potential effectiveness and applicability of potential policy and market interventions for the inclusive solar finance market.

A. INCLUSIVE SOLAR FINANCE

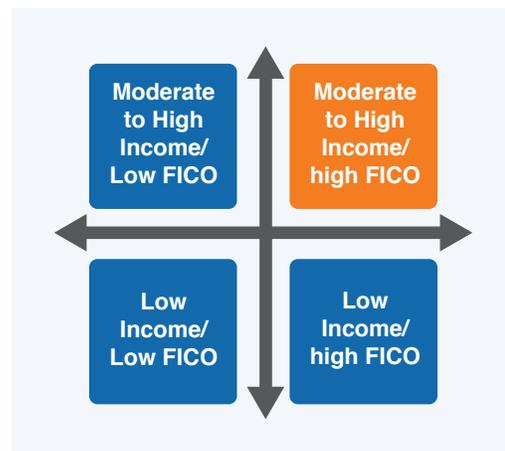
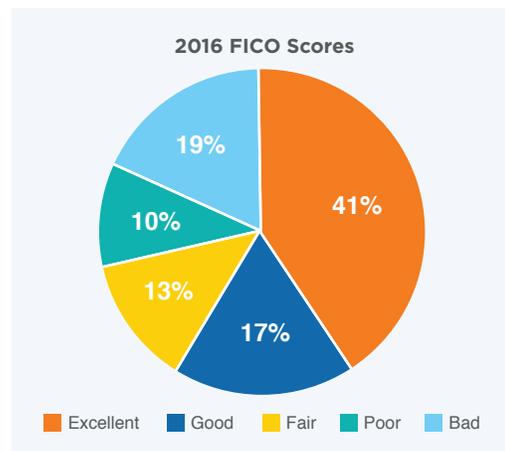
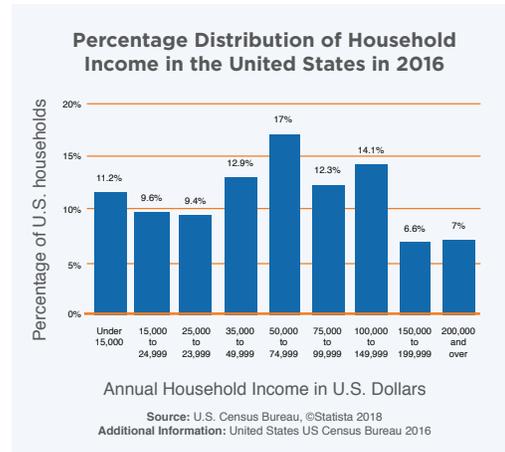
Historically, lower levels of annual income and/or low credit scores have provided significant barriers for solar PV adoption at the consumer level. The Inclusive Solar Finance Framework seeks to expand the universe of eligible consumers by identifying and implementing intentional interventions – market, policy and other. Either by developing additional data points to be considered during the credit underwriting process, alternative repayment structures not reliant solely on credit score or income, specific credit enhancements that support the consumers, or other interventions, the goal is to expand solar participation by eliminating, reducing or minimizing barriers.

Before we discuss the specific interventions that can be made to expand solar access to all, it is important to define the target customers for whom we seek more inclusive financing options – Low-Income, Low Credit Score, and Low-Income/Low Credit Score.

Low-Income: According to the US Census Bureau America Community Survey, the area median household income (“AMI”) for the United States was \$57,617 in 2016. Area median income can vary quite significantly by state, with Maryland, highest AMI at \$78,945 and Mississippi, lowest AMI at \$41,754. Low-Income (“LI”) is defined by the Department of Housing and Urban Development (“HUD”) as household income less than 80% of the area median income. In 2016, the maximum annual income for a household to be considered low-income was \$46,094 nationally. ***In 2016, over 35% of all US households qualified as low-income, representing over 43.750 million households.***

Low Credit Score: The most popular credit score in the United States, with 90% of the market share, is the FICO. FICO is a measure of consumer credit risk calculated by combining data gathered from the major credit reporting agencies (Equifax, Experian and TransUnion) and predictive analytics. The FICO score consists of five primary factors: payment history (35%), debt/amounts owed (30%), age of credit history (15%), new credit/inquiries (10%), and a mix of accounts/types of credit (10%). The FICO score ranges from 300-850, and scores are tiered into five categories: Excellent (+ 750), Good (700-749), Fair (650-699), Poor (600-649) and Bad (below 600). ***In 2016, the average score in the United States was 695 with nearly 30% of all consumers in the bad and poor categories.***

Target Customers: The Inclusive Solar Finance Framework focuses on interventions that impact customers in the low-income, low credit score and low-income/low credit score categories. While there might be overlap, there is not a 100% correlation between low credit scores and low-income levels. Similarly, not all high-income earners retain a high credit score. Based on historical census and credit score data, ***the number of households that comprise the inclusive solar finance target customers, for which policy interventions may be required, range from 44 million to 78 million households.***



B. CUSTOMER ACCESS METHODS

We identified 12 primary financial methods available for customers to access solar products. These access methods range from cash to community solar to utility participation, including both active and passive access opportunities. While all access methods are theoretically available to all customers, low-income, low credit score, and low-income/low credit score customers often face higher barriers that require specific interventions. By identifying interventions, we recognize that intentional actions can and must be taken to address specific barriers and overcome perceived and real market risks. Similarly, we recognize that without such interventions, the markets could be slow to “de-risk” these access methods for our target customers.

A surprising conclusion arose from our research: of the 12 customer access methods we identified, only 5 are accessible to customers that do not own their home. In fact, only single-family homeowners have access to all 12 methods. Thus, not even multi-family homeowners, such as condominium owners, can take advantage of all the customer access methods. While this report does not address issues related to home ownership, we emphasize that housing options, - and the lack thereof - particularly for low-income customers, have an impact on the ability to access various inclusive solar finance products.

This report focuses on the interventions required to make each identified customer access method more inclusive for our targeted customers. Increasing the number of options available to customers also increases the likelihood that a customer can choose a solution that meets their overall goal of acquiring solar. For instance, if a single-family homeowner prefers rooftop solar, then presenting a community solar or virtual net metering as the only inclusive solar financial product is not ideal, even if it yields a significantly greater economic benefit.

Below is an overview of the 12 identified customer access methods:

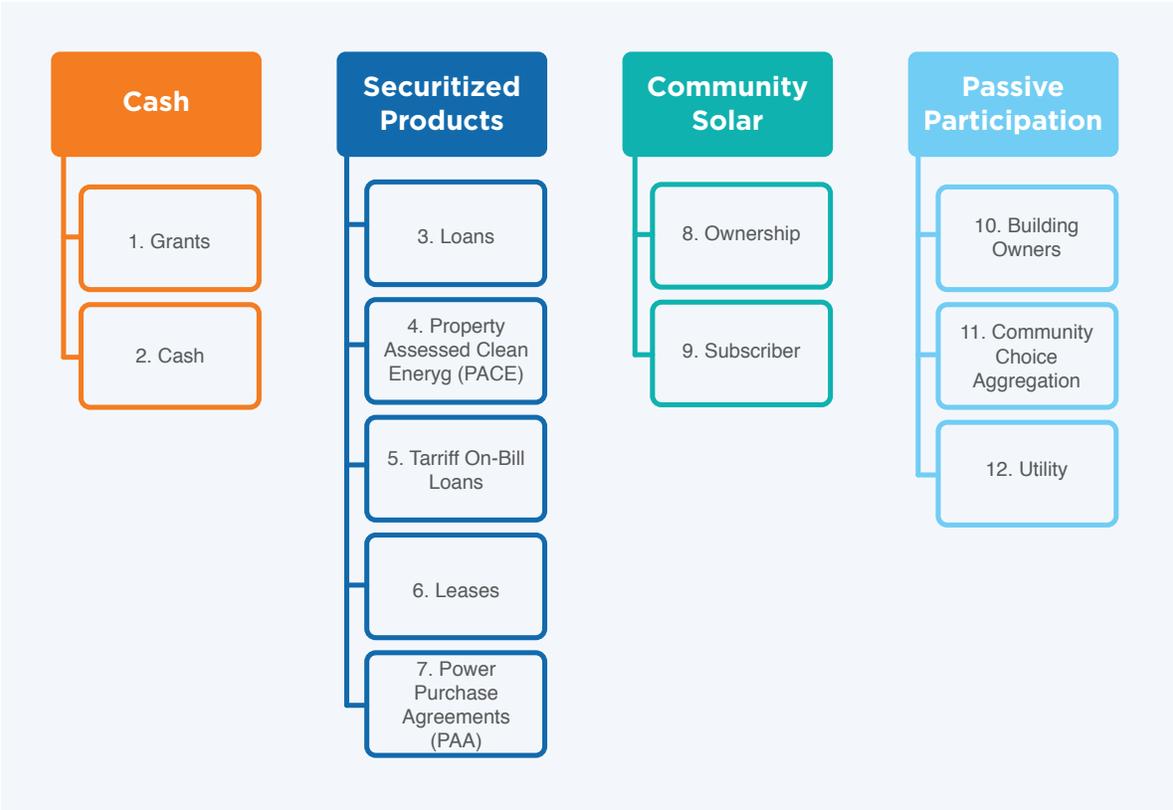
| # | Customer Access Method | Description |
|---|---|--|
| 1 | Grants | Customers are provided a solar system free of charge or at reduced cost, likely funded by the government, a nonprofit or a philanthropic source. |
| 2 | Cash | Customers utilize their own cash (non-loan) proceeds to pay for the upfront costs of solar systems. |
| 3 | Loans | Customers receive a loan from the installer, bank or other entity and pay costs over a period of time. |
| 4 | Property Accessed Clean Energy (“PACE”) Loans | Customers receive a PACE loan secured by their property and utilize the proceeds to pay for the upfront costs of solar systems. The loan is repaid via the customer’s property tax bill. |

6 OVERVIEW OF INCLUSIVE SOLAR FINANCE

| # | Customer Access Method | Description |
|----|---|---|
| 5 | Tariff On-Bill Loans | Customers receive a loan secured by a utility tariff on the meter and utilize the proceeds to pay upfront costs of solar installations. |
| 6 | Leases | Customers enter into a leasing arrangement and agree to a fixed payment schedule over a specified term to pay for use of the system. |
| 7 | Power Purchase Agreements ("PPA") | Customers enter into a long-term agreement to pay for solar energy as delivered at a specified rate. |
| 8 | Community Solar – Ownership | Customers jointly own a portion of a locally sited PV system. Individual subscribers can utilize cash, loans, or other sources to finance upfront system costs. |
| 9 | Community Solar – Subscriber | Customers subscribe to a portion of the energy generated by a remotely sited PV system. |
| 10 | Building Owners | Customers receive access by virtue of actions taken by building management or ownership. |
| 11 | Community Choice Energy Aggregation ("CCA") | Customers remain in the CCA and participate in solar generation projects sponsored by the CCA. |
| 12 | Utility | Customers pay for electricity provided by their utility, who is responsible for procuring solar resources. |

While there are specific challenges for each customer access method, there is some commonality in the barriers, opportunities and interventions identified for a range of access methods. As a result, the 12 customer access methods have been arranged into 4 Customer Access Groups. These groups include cash, securitized products, community solar and passive participation:

Customer Access Groups



In the next section of the report, we analyze the respective customer access groups and each customer access method to understand the access method and review the barriers that make it difficult for target customers. Later in the report, we identify and discuss the most promising potential policy and market interventions.

III. Customer Access Methods and Barriers

I. GROUP A: CASH

The customer access methods of Grants and Cash are both included in the “Cash” group based on the use of an upfront (cash) funding source which removes the need for solar financing. Eliminating the need to finance the installation of a solar system significantly reduces the barriers for target customers (low-income, low credit score, and low-income/low credit score) to access solar. Moreover, for Cash and Grants, a common barrier exists for low-income customers in the potential inability to fully monetize the ITC. The IRS regulation relating to the ITC¹ states that the owner of a qualified solar electric system is entitled to “A credit of 30 percent of the expenditures made by a taxpayer during the taxable year”. Although the remaining tax credit can be carried forward for a period of time, a customer with a low annual income (less than \$41,094 nationally) is likely to have limited taxable income to fully offset the available ITC. The inability to fully monetize the ITC can significantly decrease the projected financial benefit for a low-income customer even in a case where the upfront capital was provided from another source in the form of a Grant.

CUSTOMER ACCESS METHOD #1: GRANTS

In some cases, a customer may be provided a solar system free of charge or at a reduced cost, with funds provided by a government, nonprofit or philanthropic source. Under this scenario, the customer is the owner of the system immediately and responsible for all upkeep and maintenance of the solar PV system. In addition, as owner, the customer is responsible for monetizing the ITC.

GRID Alternatives

GRID Alternatives is a national leader in making clean, affordable solar power and solar jobs accessible to low-income communities and communities of color. GRID’s vision: a successful transition to clean, renewable energy that includes everyone. GRID leverages multiple funding sources, including government programs, manufacturer partnerships and philanthropy to bring the benefits of solar to underserved communities. GRID partners with affordable housing organizations, job training groups, government agencies, municipalities, utilities and local communities to make solar a win for everyone.

Key program areas include:

- No-cost solar installations for households qualifying as low-income
- Hands-on solar training to connect people to clean energy jobs
- Community/shared solar project development and implementation
- Low-income solar policy and program design and implementation
- Energy access projects internationally and in U.S. tribal communities
- Technical assistance and solar installation for multifamily affordable housing providers



FOR MORE INFORMATION:

- <https://gridalternatives.org>
- Solarindustrymag.com/energy-for-all-grid-alternatives-announces-new-brand-for-solar-program
- gridalternatives.org/what-wedo/energy-for-all
- Gridalternatives.org/regions/midatlantic/news/10000-down-10000-go

¹ Title 26 U.S. Code § 25D – Residential Energy Efficient Property Credit

Grants: Key Customer Access Method Barriers

| Barrier: Lack of Sufficient Funding Sources | |
|--|---|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | The financial resources of governments and nonprofits to provide access to heavily subsidized or free solar systems for target customers is insufficient as a long-term sustainable solution for increasing access. |
| Why it Matters: | According to the Solar Energy Industries Association (“SEIA”), in 2016, 2,583 MW of residential solar was added in the United States. In order to meet the needs of the targeted customers through grants on an annual basis, between \$1 to \$4 billion will need to be mobilized. It is unlikely there are sufficient governmental and philanthropic funding sources available to meet this need today. |
| Potential Interventions: | <ul style="list-style-type: none"> • Reprogram existing energy funds • Expand fundraising |

| Barrier: Full Monetization of Tax Incentives | |
|---|---|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The inability of low-income customers to fully monetize the ITC due to limited annual taxable income. |
| Why it Matters: | Based on annual income and the current tax structure, it is unlikely that a low-income customer can absorb the full ITC in the first year, if ever. As a result, a sizeable portion of the projected economic benefit of solar system is diminished. The inability to fully monetize the tax credit creates an inequitable relationship between low-income and moderate to high income customers. |
| Potential Interventions: | <ul style="list-style-type: none"> • Make the Investment Tax Credit Refundable • Make the Investment Tax Credit Assignable |

CUSTOMER ACCESS METHOD #2: CASH

Instead of receiving a free solar system, or full subsidy, the customer utilizes his or her own cash resources to pay for a solar system upfront without financing. As an owner of the system, the target customer would be eligible to receive the ITC but may not have enough taxable income to take full advantage of it. In addition, the customer is responsible for all operations and maintenance requirements for the system. While the lack of a financing requirement removes any concerns related to the customer’s ability (credit score) to repay any loans, the inability to fully monetize tax credits still negatively impacts low-income customers. In addition, low-income customers are less likely to have the financial resources available for the upfront payment.

Cash: Key Customer Access Method Barriers

| Barrier: Full Monetization of Tax Incentives | |
|---|--|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The inability to fully monetize the tax benefits associated with ownership of a solar system significantly reduces the economic benefit to low-income customers. |
| Why it Matters: | Based on annual income and the current tax structure, it is unlikely that a low-income customer can absorb the full tax credit in the first year, if ever. As a result, a sizeable portion of the projected economic benefit of solar diminishes. The inability to fully monetize the tax credit creates an inequitable relationship between low-income and moderate to high-income customers. |
| Potential Interventions: | <ul style="list-style-type: none"> • Make the Investment Tax Credit Refundable • Make the Investment Tax Credit Assignable |

II. GROUP B: SECURITIZED PRODUCTS

The five customer access methods - Loans, PACE, Tariff On-Bill, Leases and PPA's - are grouped together because of the role that securitizations play in accessing long-term capital for solar financings. For most of the access methods, the initial capital provider, which may include the developer, installer or financier, is generally not the long-term counterparty to the financing. As such, the customer enters into an individual financing arrangement with a capital provider who is likely to aggregate, package and sell the pool of loans to investors looking for larger tranches (transaction sizes) and a diversified credit risk pool. Securitizations are quite common in the marketplace for different purposes including mortgages, automobiles, credit cards, student loans and other consumer products, accounting for over \$2.2 trillion in capital provided in 2016. In general, securitizations mitigate risks, access broader pools of capital, improve financing terms, and allow for market growth opportunities.

Solar securitizations are important tools for developers, installers, primary capital providers, warehouse line providers, and customers. By securing access to longer term and cost competitive capital from institutional investors, the cost of solar financing is reduced for all customers. However, the challenge for our target customers is that the securitization pools are generally designed from back to front largely to minimize the risk for the institutional investors. In other words, the transactions and underwriting process for the customer are informed, influenced and even mandated by the credit concerns and needs of the institutional investors on the back end. Often this results in more stringent credit underwriting criteria that establishes limits on "eligible" customers by placing constraints on the minimum capacity (income) and ability (credit score) of customers. For low-income, low credit score, and low-income/credit score customers, this often results in denials of financial applications at worst or higher interest costs at best.

Access methods in Customer Access Group B - Securitized Products are only available to customers that own their property; renters are excluded. Only homeowners can agree to install panels on their property.

In the case of shared building ownership, such as condominiums and cooperatives, individual unit or shareholders – non-exclusive owners – cannot encumber the building without obtaining the approval of the oversight board to initiate such a project.

CUSTOMER ACCESS METHOD #3: LOANS

Under this access method, the target customer secures a loan from a capital provider that is used to fund the installation of the solar system. The customer and capital provider establish a fixed repayment schedule that will likely be repaid over an 8 to 20-year period. During this period, the customer owns the system, receiving all available tax incentives while maintaining full responsibility for the system’s upkeep. In most cases, the loan is secured by a combination of personal credit and lien on the solar PV asset. As a result, the target customer’s capacity (income) and ability (credit score) to repay the loan is central to the underwriting process given the long-term, single asset contract by the capital service provider.

As described in Customer Access Group A (Cash), the inability to fully absorb the ITC and receive the economic benefits in the first year reduces the economic performance of the project. Additionally, the customer will likely need to fund the ITC portion of the project cost (30%) with either equity (cash) or debt (additional or increased loan proceeds). If the debt option is chosen, the increased debt service could further impact the customer’s capacity to repay the loan while also further reducing the economic benefit to the customer.

Loans: Key Customer Access Method Barriers

| Barrier: Full Monetization of Tax Incentives | |
|---|---|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The inability to fully monetize the tax benefits associated with ownership of a solar system significantly reduces the economic benefit to low-income customers. |
| Why it Matters: | The target customer may need to borrow to make up for the ITC portion of the project cost, due to uncertainties regarding timing of full realization of tax benefits. The increased interest costs incurred by the additional loan (up to 30% of system costs) reduces the overall economic benefits of the solar project |
| Potential Interventions: | <ul style="list-style-type: none"> • Make the Investment Tax Credit Refundable • Make the Investment Tax Credit Assignable |

| Barrier: Insufficient Consumer Credit | |
|--|---|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | The target customer has income and/or credit score data below traditionally acceptable loan underwriting criteria. |
| Why it Matters: | The customer's capacity and ability to pay are among the first criteria analyzed during a credit review process. Specific interventions will need to be made that either improves the customer's credit profile (capacity and/or ability) or reduces the capital providers risk profile by utilizing targeted credit enhancement. |
| Potential Interventions: | <ul style="list-style-type: none"> • Alternative Credit Scoring • Down Payment Support • Credit Enhancement • Expand solar loans to finance energy conservation measures • Support for On-Bill Repayment programs and structures |

CUSTOMER ACCESS METHOD #4: PACE

Under this access method, the target customer obtains financing from a Property Assessed Clean Energy (PACE) capital provider to install a solar system on premises. The PACE loan is usually added to the customer's property tax bill and is secured by the property, not the personal credit of the customer; thus, a PACE loan remains attached to the property through any change in ownership. As the owner of the property, the customer retains ownership of the system, receiving all the federal tax credits and benefits.

From the customer's perspective, PACE offers the following primary benefits:

1. Limited or no down-payment;
2. Light financial underwriting, if the property tax bill is current;
3. Covers a variety of energy efficient and renewable energy improvements;
4. Long-term financing with 10- to 20-year loans; and
5. Improvements exempted from the assessed value of the property.

PACE: Key Customer Access Method Barriers

| Barrier: Full Monetization of Tax Incentives | |
|---|--|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The inability to fully monetize the tax benefits associated with ownership of a solar system significantly reduces the economic benefit to low-income customers. |
| Why it Matters: | Target customer may need to borrow for the ITC portion of the project cost due to uncertainties regarding timing of full realization of tax benefits. As a result, the economic benefit will be reduced by the interest payable on the associated ITC portion of the loan. |
| Potential Interventions: | <ul style="list-style-type: none"> • Make Investment Tax Credits Refundable • Make Investment Tax Credits Assignable |

| Barrier: Maximum Borrowing Capacity | |
|--|--|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The customer's borrowing capacity is often constrained by the value of the home. Typically, the maximum PACE loan amount is limited to 20% of the assessed value of the property. |
| Why it Matters: | Home values vary widely across the United States. In 2016, the median home value was \$537,950 in California, \$199,950 in Florida and \$131,400 in Missouri. It is quite likely that the median home value for a low-income homeowner is significantly less, which will constrain the capacity to fund a solar system. Compounding this is the fact that the cost of a solar installation is fairly consistent across the country and discounts for low-income solar installations are short in availability. Once again, low-income customers may unintentionally be disadvantaged by well-meaning program underwriting guidelines. ² |
| Potential Interventions: | <ul style="list-style-type: none"> • Make Investment Tax Credit Refundable |

² It is important that interventions are tailored to the underlying economic conditions of each state including average median income, median home values, solar installation costs, rate structures and other factors that impact the economic benefit analysis for target customers.

| Barrier: Lack of Universality | |
|--------------------------------------|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | Currently 33 states and the District of Columbia have PACE enabling legislation enacted, with 20 states plus District of Columbia operating active programs. Only California, Florida, and Missouri offer residential PACE programs. |
| Why it Matters: | With only three states offering residential PACE, this financing vehicle, which doesn't rely chiefly on credit score, has limited implementation capability. For target customers living in the three states, PACE can be effective at surmounting credit concerns for customers with low credit scores. |
| Potential Interventions: | <ul style="list-style-type: none"> • Enact More Residential PACE Programs |

CUSTOMER ACCESS METHOD #5: TARIFF ON-BILL LOANS

Tariff On-Bill (TOB) financing structures allow customers to enter into an agreement with their utility for funding to implement a solar project in exchange for a tariff placed on the meter. The tariff is repaid through a cost recovery charge for a period of time (up to 15 years). Since the tariff is tied to the meter, not the property or the customer, TOB provides an opportunity for our target customers to access funding not based on the customer's capacity and ability to pay. Under a TOB structure, the customer remains the owner of the project, retaining the ability to monetize the ITC while being responsible for the maintenance and upkeep of the system. In addition, if the customer sells the property, the new owner will continue making payments for the solar system while also benefitting from the energy generated. The tariff structure allows for the long-term alignment of the cost of system with its benefit.

Tariff On-Bill: Key Customer Access Method Barrier

| Barrier: Insufficient Consumer Credit | |
|--|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low Income/Low Credit Score |
| Description of Barrier: | The target customer has income level and/or credit score below traditionally acceptable underwriting criteria. |
| Why it Matters: | The customer's capacity and ability to pay are among the first criteria analyzed during a credit review process. Specific interventions are needed to either improve the customer's credit profile (capacity and/or ability) or reduce repayment risk to the capital provider. |
| Potential Interventions: | <ul style="list-style-type: none"> • Alternative Credit Scoring • Down Payment Support • Credit Enhancement • Reprogram Existing Energy Funds |

CUSTOMER ACCESS METHOD #6: LEASES

In a typical solar lease structure, the customer leases a solar system from the lessor (capital provider) for the rights to the electricity output from the solar assets in exchange for a fixed payment schedule. The typical lease is a long-term agreement lasting up to 20 years. Unlike a loan (CAM #3) and PACE (CAM #4), under a lease the customer does not own the system and is not responsible for maintenance or upkeep of the system. The lessor (capital provider) receives the available tax benefits and is responsible for efficiently monetizing their value. Under this scenario, even though the tax credit monetization barrier has been eliminated, our target customers could still face concerns related to capacity and ability to repay the long-term obligation.

At the end of the lease, the customer will have an option to purchase the system from the lessor, request system removal or renew the agreement. For our target customers, if ownership of the system is desired, any payment required at the end of lease payment might be difficult to afford. Any steps that can be taken to provide transparency and cost certainty for any end of lease payment will increase the attractiveness of this method for both the lessor and the customer.

PosiGen

PosiGen is a clean energy company based in Louisiana that combines energy efficiency and solar PV installations to provide affordable clean energy to low income communities. PosiGen provides customers a standardized offering that ensures 6.2 kW solar installation paired with certain energy efficiency upgrades. Customers pay a flat monthly fee averaging \$65, which typically saves the customers over \$40 per month. PosiGen maximizes the economic benefits of energy efficiency and solar power for customers by aggregating various funding sources (ITC, backleverage, private equity, and state incentives). As a result, PosiGen provides financing to low income, low credit score, and low income/low credit score customers without consideration of individual credit scores. The overall performance of the PosiGen portfolio is comparable to the general market for similar loans with a default rate of 0.4%.

FOR MORE INFORMATION:

- www.greentechmedia.com/articles/read/posigen-brings-solar-to-the-working-class-with-a-unique-twist-on-a-lease#gs.afure5g
- www.bloomberg.com/news/articles/2018-01-18/one-solar-installer-targets-low-income-homes-ignored-by-rivals



Leases: Key Customer Access Method Barrier

| Barrier: Insufficient Consumer Credit | |
|--|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low Income/Low Credit Score |
| Description of Barrier: | The target customer has income level and/or credit score below traditionally acceptable underwriting criteria. |
| Why it Matters: | The customer's capacity and ability to pay are among the first criteria analyzed during a credit review process. Specific interventions are needed to either improve the customer's credit profile (capacity and/or ability) or reduce repayment risk to the capital provider. |
| Potential Interventions: | <ul style="list-style-type: none"> • Alternative Credit Scoring • Down Payment Support • Credit Enhancement • Reprogram Existing Energy Funds |

CUSTOMER ACCESS METHOD #7: POWER PURCHASE AGREEMENT

Similar to leases (CAM #6), the PPA provides the customer with solar electricity in exchange for regular payments, usually under a long-term contract and usually with no down payment. In many cases, the PPA payment is based on the system production multiplied by the kilowatt-hour (“kWh”) pricing that is outlined in the agreement and likely structured as a fixed rate schedule. In this structure, the PPA provider owns the system, monetizes the tax benefit and provides all the operations, maintenance and replacements required over the life of the contract. At the end of the agreement, the customer can elect to renew the agreement, purchase the system, or request removal of the solar system.

Power Purchase Agreement: Key Customer Access Method Barriers

| Barrier: Insufficient Consumer Credit | |
|--|---|
| Customers Impacted: | Low Income, Low Credit Score, Low Income/Low Credit Score |
| Description of Barrier: | The target customer has income and/or credit score data below traditionally acceptable underwriting criteria. |
| Why it Matters: | The customer's capacity and ability to pay are among the first criteria analyzed during a credit review process. Specific interventions are required that either improve the customer's credit profile (capacity and/or ability) or reduces the repayment risk to the capital provider. |
| Potential Interventions: | <ul style="list-style-type: none"> • Alternative Credit Scoring • Down Payment Support • Credit Enhancement |

III. GROUP C: COMMUNITY SOLAR

The customer access methods of Community Solar – Ownership (CAM #8) and Community Solar – Subscription (CAM #9) are bound by the customer’s ability to access solar projects that typically are not constructed onsite, but remotely. Under community solar, renters and multifamily tenants are no longer excluded by the primary tools available to implement residential rooftop solar projects. Removing homeownership as a key barrier dramatically improves access to low-income customers. Community solar projects have the greatest potential for the development of customized structures and solutions that expand solar access to low-income and/or low credit score customers. However, a significant challenge remains in that only 18 states and the District of Columbia have passed legislation enabling community solar.

CUSTOMER ACCESS METHOD #8: COMMUNITY SOLAR – OWNERSHIP

Under a Community Solar – Ownership model, the customer agrees to purchase an interest in a remotely sited solar system. The customer utilizes Cash (CAM #2), Loans (CAM #3) or other sources to provide the upfront acquisition payment required to participate. The customer receives all the benefits of ownership, including ITC, maintenance requirements, and utility bill credits³ from the utility for the customer’s share in the facility. The acquisition payment will likely cover 70-100% of the cost of the system depending on the amount of equity that a customer has available to invest upfront. The equity investment will be used to bridge the receipt of ITC that the customer will be able to claim during the next tax period. Although the locational barrier has been removed, our targeted customers still face similar financing concerns related to their capacity (income) and ability (credit score) to repay their obligation. Unlike Securitized Products (Customer Access Group B), in the event of a customer default, the capital provider does not need to physically remove the solar PV system and seek to salvage as much remaining value as possible. Instead, the capital provider can immediately sell the defaulted participation in the remotely sited solar system to another customer. The ability to more easily replace a defaulted customer can lead to an overall reduction in the risk profile for the capital provider thereby increasing access to our target customers.

³ In most cases, customers receive credits to their utility bill based on participation in a community solar project. Unfortunately, there is not a common definition or calculation of the community solar utility bill credits for active programs. For most of the programs, the utility credits range from current wholesale generation rates to full retail rate. As such, the economic value of community solar is very much dependent on the design in each state and service territory.

Community Solar – Ownership: Key Customer Access Method Barriers

| Barrier: Full Monetization of Tax Incentives | |
|---|---|
| Customers Impacted: | Low-Income |
| Description of Barrier: | The inability to fully monetize the tax benefits associated with ownership of a solar PV system significantly reduces the economic benefit to low-income customers. |
| Why it Matters: | Instead of solely financing the non- ITC portion of the project, the target customer may need to seek additional funds to bridge the receipt of the ITC benefits as well. The increased interest costs incurred by the additional loan (up to 30% of system costs) will likely reduce the overall economic benefits of the solar PV project |
| Potential Interventions: | <ul style="list-style-type: none"> • Make Investment Tax Credit Refundable • Make Investment Tax Credit Assignable |

| Barrier: Insufficient Consumer Credit | |
|--|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | The target customer has income level and/or credit score below traditionally acceptable underwriting criteria. |
| Why it Matters: | The customer's capacity and ability to pay are among the first criteria analyzed during a credit review process. Specific interventions must either improve the customer's credit profile (capacity and/or ability) or reduce repayment risk to capital providers through targeted credit enhancement. |
| Potential Interventions: | <ul style="list-style-type: none"> • Alternative Credit Scoring • Down payment Support • Credit Enhancement • Reprogram Existing Energy Funds |

CUSTOMER ACCESS METHOD #9: COMMUNITY SOLAR – SUBSCRIPTION

Unlike Community Solar – Ownership (CAM #8), under a Community Solar – Subscription model the customer does not own the system nor have a capital/financing requirement to participate but instead subscribes to the project for an allocated portion of the system's energy output, which is credited to the customer's bill by the utility in the form of bill credits. Depending on the solar project developer's subscriber model, contract terms can vary from monthly upto 20 years. The community solar project sponsor, whether community- or privately-owned, absorbs the risks of acquisition, installation, operation and maintenance. Under this model, the credit analysis can be based on the overall project economics and value proposition to the customer: if the value proposition is high enough, the customer will have an incentive to pay the subscription cost. However, the underlying credit strength of the individual participating customer may still present a perception of risk to a project financier. For some subscriber managers and capital providers, the utility payment history could be an important proxy for determining the likelihood that the customer will fulfill his or her obligations on a timely basis. In addition, the liquidity that exists from the ability to replace subscribers for non-payment is the true credit strength of the project.

For the low-income, low credit score, and low-income/low credit score customers, the Community Solar - Subscriber model can eliminate significant barriers with the inclusion of effective policy, regulatory interventions and program design elements.

Community Solar – Subscription: Key Customer Access Method Barriers

| Barrier: Insufficient Consumer Credit | |
|--|---|
| Customers Impacted: | Low Income, Low Credit Score, Low Income/Low Credit Score |
| Description of Barrier: | The target customer has income level and/or credit score below traditionally acceptable underwriting criteria. |
| Why it Matters: | Some community solar subscription models may still require income and credit score information to underwrite low-income, low credit score and low-income/low credit score customer participation. Given the shorter terms available and inherent liquidity of community solar, over time the underwriting process could consist of a review of only the customer’s utility payment history. |
| Potential Interventions: | <ul style="list-style-type: none"> • Credit Enhancement • Alternative Credit Score • Standby Purchaser • Anchor Tenant • Community Solar Credit Bank • Timely Subscriber Updating |

Groundswell

Groundswell builds community power. A 501(c)(3) nonprofit based in the District of Columbia, Groundswell develops community solar projects and subscriber management programs to connect solar power with economic empowerment.

Groundswell is driving inclusive and equitable consumer-facing energy innovations, treating community solar projects like small utilities instead of big rooftops to eliminate conventional financial barriers to low and moderate-income (LMI) household participation. In addition, their “Share Power™” subscriber management model engages market rate customers as partners in energy equity. Instead of providing a small discount to market rate subscribers, Groundswell aggregates the total available electricity cost discount for each community solar project and assigns 100% of the discount to “Empowered” LMI household subscribers.

Market rate subscribers pay a rate comparable to their current energy bill, and “share power” with their low-income neighbors by sharing the available discount. For an upcoming project, the participation of market rate subscriptions will enable Groundswell to offer a projected 25% of available subscriptions to low and moderate-income households at no cost. This model also vastly simplifies the customer experience for both market rate and LMI subscribers.



FOR MORE INFORMATION:

- www.lagrangenews.com/2018/05/16/nonprofit-talks-saving-by-going-green/
- www.theatlantic.com/business/archive/2016/04/why-poor-americans-have-some-of-the-highest-electricity-bills/478551/
- www.greenbiz.com/article/where-clean-energy-and-community-empowerment-meet
- www.csmonitor.com/Environment/Inhabit/2017/0209/Panels-to-the-people-Community-solar-aims-to-democratize-the-sun

IV. GROUP D: PASSIVE PARTICIPATION

Unlike the other Customer Access Groups – Cash (CAG A), Securitized Products (CAG B), Community Solar (CAG C) - the customers in this group access solar passively, either dependent on their building manager or electricity providers. For customers in this group, there is likely no reliance on an individual's capacity and ability to pay specifically for the solar project. As a result, these methods provide access to solar for target customers whose building manager or electricity provider engage in solar. Perhaps the most significant barrier resides not in credit concerns but in location. Passively participating in solar projects requires that other entities – building owners, municipalities and utilities – actively pursue and

implement projects on their behalf. The active pursuit of solar projects can vary widely across the United States as policies, institutional interest, economics, and other criteria come into play.

Denver Housing Authority

Since 2015, the Denver Housing Authority (DHA) has executed over 4.5 MW of solar for on and off premise installations. DHA's initial project was a rooftop solar system that utilized a third-party ppa financing which enabled over 2.5 MW of installations on the roofs of 660 public housing units owned by DHA. In 2017, DHA executed a 2 MW community solar project located 30 miles away to meet its internal mandate. These projects demonstrate DHA's commitment to making solar accessible to its tenants and our target customers. DHA was able to "share" the economic benefits with their residents, through either direct bill savings or reinvesting the savings into the property or resident services.



FOR MORE INFORMATION:

- www.solarpowerworldonline.com/2017/10/denver-housing-authority-develops-low-income-community-solar-garden/
- solarmagazine.com/denver-housing-authority-landmark-gains-solar-power-affordable-accessible/
- denver.cbslocal.com/2017/10/27/solar-power-garden-affordable-housing/

CUSTOMER ACCESS METHOD #10 - BUILDING OWNERS

For this Customer Access Method, the customer gains access to solar by virtue of residing in a property in which the building owner has implemented either an onsite or community solar project. In this case, the customer does not pay the electric utility directly as it is included as part of the overall lease or rental payment. Examples of this type of arrangement include multi-family affordable housing (mastered and sub-mastered) properties and student housing. As such, the financial benefits of the solar installations accrue primarily to the building owner, who can choose if and how to distribute any electricity savings to residents, including reductions in lease/rental payments, property assessment fees or other arrangements required by the US Department of Housing and Urban Development ("HUD").

For our target customers (low-income, low credit score, and low-income/low credit scores), passive solar participation eliminates all the individual credit related barriers while potentially improving project economics. For example, the project scale increases from individual (4 kW) to building size (+150 kW) which directly reduces implementation costs by achieving economies of scale. In addition, the overall financing costs can be improved by combining the ITC with Low-Income Housing Tax Credits ("LIHTC")) or by gaining access to municipal bonds.

Building Owner: Key Customer Access Method Barrier

| Barrier: Available Building Stock | |
|--|---|
| Customers Impacted: | Low Income, Low Credit Score, Low Income/Low Credit Score |
| Description of Barrier: | A customer's ability to passively participate in solar PV installations is directly related to the level of interest by participating building properties. |
| Why it Matters: | Often, the housing options available to low-income, low credit score, and low-income/low credit score customers are limited. As a result, it will be important to educate building owners and develop structures that utilize all allowances and programs available from the federal and state governments. |
| Potential Interventions: | <ul style="list-style-type: none"> • Refundable Tax Credits • Credit Enhancement • Utilization of HUD funding for solar installations • Repurpose Existing Energy Funds |

CUSTOMER ACCESS METHOD #11 – COMMUNITY CHOICE AGGREGATION

For this method, customers must reside in a municipal area (county and/or city) that is interested in increasing the amount of solar in the overall electric generation mix. Municipalities can utilize a number of tools, including regulatory intervention, franchise agreement negotiation, municipalization and CCA to achieve their goal. CCAs represent a unique opportunity to control the generation decisions for a community while utilizing the existing utility infrastructure to continue to deliver electricity services. Given the scale of current and proposed CCAs (East Bay Clean Energy (Alameda County), Sonoma Clean Energy (Sonoma County), Los Angeles County), there is substantial opportunity to establish programs or procurements that eliminate any income and credit concerns by spreading risk across the CCA's income-diverse customer base.

Community Choice Aggregation: Key Customer Access Method Barrier

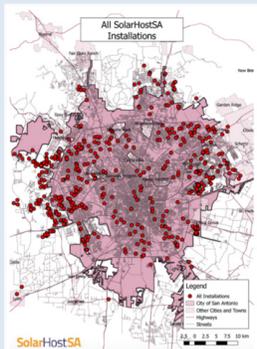
| Barrier: Enabling Legislation | |
|--------------------------------------|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | State enabling legislation is required for a municipality to establish the CCA entity |
| Why it Matters: | In the US, only 7 states have active CCA legislation (Massachusetts, Ohio, California, Illinois, New Jersey, New York, and Rhode Island). In 2014, approximately 1300 municipalities encompassing 5% of US population were served by a CCA. However, there is tremendous expansion in the active states. For our target customers, CCAs provide a unique platform to indirectly support solar activity, but it is completely contingent on where the customers reside. |
| Potential Interventions: | <ul style="list-style-type: none"> • Pass enabling legislation in additional states |

CUSTOMER ACCESS METHOD #12 – UTILITY

The final customer access method is through the customer’s utility. Across the country, many utilities (municipal, rural electric cooperative and investor-owned) have developed, acquired and implemented solar projects. In some cases, the “green” energy is a premium product and part of a special customer tariff, typically referred to as a “green pricing program” or “green tariff.” As the price of solar has continued to drop along with robust Renewable Portfolio Standards (“RPS”) and demand from customers (residential, municipal and corporate), utilities have executed large-scale PPAs for projects ranging from 2 to 200 MW. In these cases, the renewable energy, specifically solar is just added to the overall generation mix. As a result, the increased solar energy is spread across the entire rate base without regard to customer income or credit score.

City Public Service

In 2015, CPS Energy launched a pilot program called SolarHost in San Antonio, TX. SolarHost provides participating homeowners with a 3-cents per kilowatt/hour utility bill credit for hosting a solar PV project on their rooftop for 20 years. The solar installations are designed not to hinder the property and if any roof repairs are required, CPS pays the cost for removal and reinstallation. SolarHost has been a success, reaching its goal of 5 MW installed by February 2017. To date, 8,000 applications were received with over 600 systems installed across San Antonio. Without income or credit score requirements, SolarHost can be categorized as an Inclusive Solar Finance product by increasing access to solar for low income and/or low credit score customers by establishing a long-term arrangement that creates economic value derived from the installation of solar PV.



FOR MORE INFORMATION:

- statisticalatlas.com/place/Texas/San-Antonio/Household-Income#data-map/tract
- www.solarhostsa.com/post-1/
- www.solarhostsa.com/wp-content/uploads/2017/08/Screen-Shot-2017-08-09-at-2.49.28-PM.png
- www.bizjournals.com/sanantonio/news/2018/02/26/solarhostsa-program-reaches-5-megawatt-goal.html

For our target customers, this method can be effective in increasing the percentage of solar generation per customer while potentially providing some level of economic benefit. Utility provided solar can be useful in cases where the various customer access methods and proposed interventions are simply not enough to address all of a customer’s capacity and/or ability concerns. In addition, not every customer is attracted to the long-term risk profile for solar participation. In those cases, programs such as the CPS by SolarHost can be an exceptional option for homeowners looking to monetize their property for solar. However, the downside of this model is that individual customers are limited to solar participation according to how much solar energy their utility procures.

Key Customer Access Method Barrier – Utility

| Barrier: Location | |
|--------------------------|--|
| Customers Impacted: | Low-Income, Low Credit Score, Low-Income/Low Credit Score |
| Description of Barrier: | State policies and regulations along with strong utility leadership are essential to providing increased “access” to solar for all customers, particularly our target customers. |
| Why it Matters: | The utility provides the solar “access” safety net for all customers. As a result, it is important that utilities are given the tools and targets to ensure that the net is as strong as possible. |
| Potential Interventions: | <ul style="list-style-type: none"> • Increase State Renewable Portfolio Standards with Solar Carveouts |

IV. Interventions

Overcoming the barriers to inclusive solar finance that were outlined for each of the customer access methods requires intentional policy and market interventions. Based on our research and numerous interviews, the five most commonly discussed interventions were:

1. Refundable Tax Credits
2. Reprogram Existing Energy Funds
3. Credit Enhancement
4. Alternative Credit Scoring
5. Community Solar

In this section, we dive into the recommended interventions. For these, we assume that a basic policy environment is in place and includes state renewable portfolio standard with solar carveout, net metering and a mechanism for crediting customers' bills for energy generated from their community solar array (remote net-metering).

1. REFUNDABLE TAX CREDITS

The inability to capture the full economic value of the ITC significantly reduces the economic benefit for low-income customers and results in the need for more complicated financing structures and arrangements. This often requires the involvement of investors that can monetize the ITC and other tax incentives.

| Name | Intervention Type | Description | Why it Matters | CAM Impacted |
|-----------------------|-------------------|---|--|---|
| Refundable Tax Credit | Policy | Owners of solar systems can elect to continue to receive federal tax credits (Section 25D) or submit a request similar to previously available Section 1603 US Treasury to receive benefits as cash paid no more than 90 days after the commercial operation. | Making the ITC and any state tax credits refundable allows low-income customers to receive the full value of the federal tax incentives without having to utilize a multi-year carry forward to offset future taxable income. In addition, this intervention would benefit municipalities, nonprofits and other nonfederal taxpaying entities that resort to less efficient structures to monetize the tax benefits. | Tariff On-Bill, Community Solar -Ownership, Building Ownership |
| Assignable Tax Credit | Policy | Owners of solar systems can elect to continue to receive federal tax credits (Section 25D) or assign the tax credits to a third-party in exchange for a cash payment from the third party. | It allows customers to monetize the value of the ITC without having to enter into third-party finance structures that convey ownership. | Cash, Grant, Loans, PACE, Community Solar Ownership, Building Ownership |

2. REPROGRAM EXISTING ENERGY FUNDS

Identifying existing financial resources that can be reprogrammed to meet the needs of low-income customers can create significant flexibility to support grants, credit enhancements and other strategies to expand access.

For example, the Department of Energy recently authorized Colorado, through the Colorado Energy Office (“CEO”), to be the first state to integrate rooftop solar into its Weatherization Assistance Program (“WAP”). CEO moved forward in 2017 with a pilot leveraging eligible WAP funding and matching incentives from Xcel Energy Colorado, aiming to comprehensively address energy burden through weatherization and solar for 300 low-income households by 2019.

| Name | Intervention Type | Description | Why it Matters | CAM Impacted |
|---|-------------------|--|--|---|
| Weatherization Funds and other energy funds | Policy | Allow customers, housing authorities and housing managers to utilize HUD payments, weatherization dollars, or other funds to be redirected to solar projects that bring down the reduce long-term energy costs for low-income customers. | Additional funds can be utilized to reduce upfront system costs, provide credit enhancement or support ownership initiatives and investment. | Cash, Grant, Loans, PACE, Tariff On-Bill, Community Solar – Ownership, Community Solar – Subscriber, Building Ownership |

3. CREDIT ENHANCEMENT

Governments, Foundations, Investors and others can be extremely valuable in providing long-term credit support for Low-Income, Low Credit Score, and Low-Income/ Low Credit Score customers.

| Name | Intervention Type | Description | Why it Matters | CAM Impacted |
|--------------------------------|-------------------|---|---|---|
| Loan Loss / First Loss Reserve | Policy and Market | Governments, Foundations and Investors set aside a reserve fund to be used to support payment losses, due to customer delinquency, default or other conditions. | In the event of a repayment interruption, the reserve will be accessed immediately to make the capital providers whole. As a result, the reserve should expand the standard underwriting criteria for the capital provider to be more inclusive of low income, low credit score, and low income/ low credit score customers. Exact criteria and ranges will be part of any negotiation. | Cash, Grant, Loans, PACE, Tariff On-Bill, Community Solar – Ownership, Community Solar – Subscriber, Building Ownership |
| Interest Rate Buy Down | Policy and Market | Government and Philanthropic capital enhance individual loans or portfolios through either an upfront or over-time contribution. The additional capital is made available to reduce the interest rate on loans for target customers. | Reducing the annual interest costs should expand the underwriting criteria by improving the capacity and ability for target customers to repay its loan. In addition, the lower interest costs will improve project economics which in turn improves the benefit to the borrower, increasing the likelihood of repayment. | Loans, Leases, PACE, Tariff On-Bill, PPA, Community Solar – Ownership, Community Solar – Subscription |
| Guarantee/ Insurance | Policy and Market | Governments, Foundations and/or investors agree to serve as a guarantor, making payments to capital providers for a period of time or up to a certain amount in the case of a payment interruption for either the loan or portfolio. Guarantors do not fund on day one but will likely reserve/allocate future payments internally, effectively allowing the trading of the guarantor's creditworthiness for the target customers. ⁴ | With access to a guarantee from a "higher" rated counterparty, capital providers should expand access to target customers since the ability to repay the loan is improved by the guarantor's financial commitment. | Loans, Leases, PACE, PPA, Tariff On-Bill, Community Solar – Ownership, Community Solar – Subscription |

⁴ The U.S. Department of Housing and Urban Development through its Title I Home Improvement Loan product insures private lenders against loss for eligible home improvements including, solar PV. https://www.hud.gov/program_offices/housing/sfh/title/ti_about

4. ALTERNATIVE CREDIT SCORING

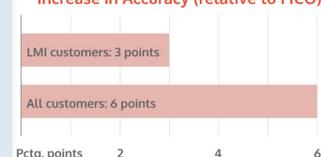
The use of alternative credit scoring methods that expands the data points (utility bills, telephone, HOA dues and others) available to evaluate credit should provide more access to solar finance products for target customers.

| Name | Intervention Type | Description | Why it Matters | CAM Impacted |
|--------------------------------|-------------------|---|---|---|
| Alternative Credit Score (New) | Market | Companies develop new methodologies for evaluating personal credit profiles. This may include existing data and new sources including utility or rent payment history, social media profiles and others that expand the customer profile. | The new credit score may improve the correlation between the customer's repayment history and individual credit data. The goal is to prove that the expanded underwriting for target customers does not increase the risk profile of the overall portfolio. | Loan, PACE, Lease, PPA, Tariff On-Bill, Community Solar – Ownership, Community Solar – Subscription |
| Alternative Credit Score | Market | Expand allowable ⁵ data points for existing credit review companies to include utility data. Encourage utilities to make access to information more accessible. | By providing a fuller picture of the potential borrower, the ability of target customers to pay increases, which expands access to inclusive solar finance products. | Loan, PACE, Lease, PPA, Community Solar – Ownership, Community Solar – Subscription |

Solstice

Founded in 2016, Solstice offers subscriber aggregation and management services to solar developers, utilities, and other providers of shared solar energy. Realizing that solar financiers typically require high credit score minimums that have disproportionately excluded low-to-moderate income Americans from participating in community solar, Solstice developed the EnergyScore as a scalable way to increase the inclusivity of community solar farms. Leveraging utility payment history and other customer data, the EnergyScore aims to provide solar developers with a metric that is more accurate and inclusive than FICO credit scores in predicting the rates at which subscribers default on their bill. If it continues to fulfill these goals, solar developers will be motivated to adopt the EnergyScore because it expands their customer pool and lowers customer turnover rates—and more importantly, a higher proportion of LMI individuals will be qualified to save with community solar and participate in the renewable energy economy.

Increase in Accuracy (relative to FICO)



Increase in LMI Inclusion (relative to FICO)

| 30 days past due | | 90+ days past due | |
|------------------|----------|-------------------|----------|
| FICO equivalent | Increase | FICO equivalent | Increase |
| 650 | +3.9% | 650 | +2.7% |
| 680 | +15.0% | 680 | +1.6% |
| 700 | +12.6% | 700 | +9.6% |

FOR MORE INFORMATION:

www.solstice.us

⁵ The Fair Credit Reporting Act calls for the Federal Trade Commission, Office of the Comptroller of the Currency and the Consumer Financial Protections Bureau to oversee the consumer reporting agencies and the data provided to them.

5. COMMUNITY SOLAR - SUBSCRIPTION

The Community Solar – Subscription model is both a customer access method and intervention as it provides policy and market opportunities to significantly expand access and opportunities for low-income, low credit score and low-income/low credit score customers.

| Name | Intervention Type | Description | Why it Matters | CAM Impacted |
|--------------------------|-------------------|---|--|--------------------------------|
| Standby Purchaser | Policy and Market | Allow purchaser (municipality, nonprofit, corporations and others) for the unsubscribed portion of community solar project to exceed limits on single customer participation. | Standby purchasers can provide balance of subscriber bases, this can minimize disruption in project cash flow, allow for a shorter subscriber contract, and support participation by target customers. | Community Solar – Subscription |
| Anchor Tenant | Policy and Market | Allow certain types of users (non-profits, government, and corporate) to be large anchor subscriber (50+ %) | Minimize subscriber risk by having a long-term contract with a credit counterparty. May allow for longer-term loans based on anchor tenant and credit. | Community Solar – Subscription |
| Net Metering Credit Bank | Policy | Allow community solar projects to bank unallocated bill credits for a significant period of time (up to 2 years) and reallocate to new customers when they come online. | Provides flexibility for subscriber managers to manage unsubscribed capacity and align cash flow with bill credits. | Community Solar – Subscription |
| Timely Subscriber Update | Policy | Allow for real-time adjustment of subscriber list with a utility. | Creates liquidity for subscriber managers to minimize disruption in cashflow by replacing terminated or transitioned customers with new customers from the actively managed waitlist. | Community Solar – Subscription |

V. Observations from the field

With over 60 hours of interviews and meetings with some of the most knowledgeable and experienced minds in the solar, finance, environmental justice, and policy world, there were several enlightening and challenging discussions. Together we, and our interviewees, imagined a more inclusive solar market, confirmed the limits of the capital markets, railed at the status quo, embraced technology changes, and identified new financing structures. We also recognized the humanity of our low-income, low credit score, and low-income/low credit score neighbors living in urban, suburban, rural and tribal communities across the United States. Many are seeking to participate in the solar market because they want to save money, benefit the environment, invest locally, be self-sufficient and embrace technological changes. The interviews provided context to not only historical concerns and barriers to inclusive solar finance but also on how the interventions will need to be structured to meet the needs of our target customers. The observations below provide a reminder that while the intentions behind the prospective interventions are well-meaning and positive, it is important to be mindful of the potential for unintended consequences. Below is a summary of some of the key “Observations from the Field”:

1. TRUST DEFICIT

Unfortunately, low-income, low credit score, and low-income/low credit score customers across the United States have a shared history of empty promises and “too good to be true” sales pitches. These actions have left our neighbors with a healthy skepticism for products that promise savings not only today but over the next 20 years with little to no effort on the customer’s part, sort of like a “Set it and Forget it”. As a result, inclusive solar finance must seek collaborative approaches instead of extractive and overly prescriptive in its options. We must endeavor to provide our neighbors with the full range of information and widest array of options (customer access methods), so they can choose an approach that best fits their risk profile, not just the risk profile of potential capital providers.

2. PROPERTY SEIZURE

Several consumer advocates expressed caution and skepticism concerning solar finance products that are tied to the customer’s property. The concern centers on a risk that the property could be seized for “non-performance” at some point in the future. The views are an extension of the overall trust deficit that exists in many communities. While a solar project might not have been the cause of a prior seizure, some of our neighbors recognize the script and are fearful of a similar ending. As a result, community solar has been touted as a preferred implementation structure for inclusive solar projects.

3. CONSUMER PROTECTION

It is likely that pursuing inclusive solar finance goals will require customers to execute financial arrangements including loans, leases, PPA’s or other products. While financing is necessary, precaution must be taken to ensure that new obligations do not contain unexplained risks or place an undue financial burden on our target customers. Great steps must be taken to provide total transparency and the necessary education so that customers can make well-informed decisions. To be clear, consumer protection is not the exclusive domain of low-income customers, but as discussed earlier, low-income customers have smaller margins of error and the inability to absorb significant changes to the underlying economic value proposition, so caution should be exercised.

4. OWNERSHIP

For some, ownership is equated with control over economic decision making such as technology, vendors, customer value proposition, sites, etc. Others equate ownership with retaining the title to the solar assets, even if that means a third party makes all decisions related to the installation, including vendors and technology. Yet for others, the debate is centered on individual versus collective control and ownership models. It is essential to ask specific questions of low-income community members to illicit feedback to ensure that there is a shared definition, so all solutions and interventions developed have the best chance of delivering the outcomes intended by all parties.

5. SAVINGS THRESHOLD

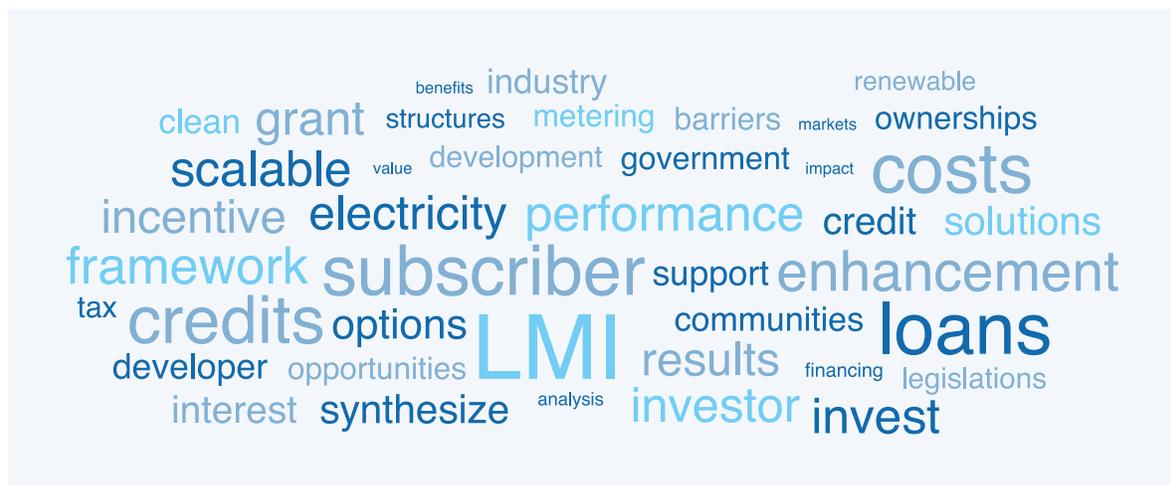
How much electricity savings is sufficient? It varies. While some nonprofits, CDFI's and developers initially targeted 10-20% monthly savings, there has been a trend of concentrating the economic benefits of solar more deeply (savings per customer) versus broadly (number of customers). Some solar providers serving low-income customers achieve 50-100% electricity savings for our targeted customers. Market conditions and policy are critical to delivering this level of savings which means this result will not be uniformly available.

6. DIVERSIFY LOAN PORTFOLIOS

While the goal is to increase access to financing for our target customers, attention must be taken not to create highly concentrated portfolios of low-income and/or low credit score financial products. High concentration portfolios will likely require a greater need for credit enhancement, result in higher interest rates for customers and carry an overall higher risk profile for capital providers. A strong preference would be to expand underwriting criteria for existing solar finance products by approving and adding more low-income and/or low credit score customers into the existing portfolios.

7. COMMUNITY SOLAR IS POPULAR

As visually represented in the word cloud below, terms related to community solar came up frequently in our discussions. In fact, the subscriber model was referenced significantly more often than the ownership model. In addition, credit enhancement was often cited as a critical intervention for inclusive solar finance.



VI. Conclusion

In this report, we explored the various methods, from grants to loans to community solar to utilities, by which low-income, low credit score, and low-income/low credit score customers access solar. We identified key barriers including, tax credit monetization, insufficient creditworthiness, and location, that limit available options for participation. We also outlined five primary interventions, refundable tax credits, reprogram existing energy funds, credit enhancement, alternative credit scoring, and community solar - subscription, that can be incorporated into existing or new policy efforts that establish the enabling environment for 'Inclusive Solar Finance'. Lastly, we summarized important themes that arose from our discussions with experts and leaders in this space that touched on issues related to trust deficits, consumer protection, concentration of low-income/low credit score customer risk, community solar, and a few others.

However, our major takeaway is that the key ingredient for developing an 'Inclusive Solar Finance Framework' is intentionality. The success that organizations such as GRID Alternatives, Posigen, Groundswell, Denver Housing Authority and CPS Energy among others, are achieving is not by chance. It is a direct result of their hard work and the intentional design of products or programs with equity and inclusion at its core. For these organizations, low-income, low credit score, and low-income/low credit score customers are not an afterthought but central to their overall business strategies to serve the solar industry.

The continued success and expansion of the solar market will depend, in large part, on Inclusive Solar Finance becoming just 'Solar Finance', no longer treated as a specialty but a full participant at the table seeking financial solutions to increase access to solar for all customers. Recall that the estimated size of the "inclusive" solar finance market lies between 44 to 78 million households. As a result, there is a sizable market opportunity for those developers and capital providers that prioritize the current and future needs of all customers. Our hope is that by being intentionally inclusive, we create policies and markets that from day one are designed to maximize participation. While we are not here today, we are fully confident that we will get there tomorrow.

VII. REFERENCES

Cover Photo Credit: Camille Seaman & Stephen Yang / Solutions Project

- Amalgamated Bank.** *Solar Heloc - Turning Sunshine into Savings*. 20 December 2017. Webpage. 20 December 2017. <<https://www.amalgamatedbank.com/turning-sunshine-savings>>.
- Banks, Darryl and Ben Bovarnick.** *State Policies to Increase Low-Income Communities' Access to Solar Power*. 23 September 2014. Article. 01 December 2017.
- Board of Governors of the Federal Reserve System.** *Community Reinvestment Act*. 12 May 2014. Website. 20 December 2017. <<https://www.federalreserve.gov/consumerscommunities/craloansurvey.htm>>.
- Boyce, Dan and Jordan Wirfs-Brock.** "High Utility Costs Force Hard Decisions For The Poor." 08 May 2016. *Inside Energy*. Podcast. 15 December 2017.
- Bridger, Jeffrey C. and A. E. Luloff.** "Building the Sustainable Community: Is Social Capital the Answer." *Sociological Inquiry* October 2001: 458-472. Article.
- California Housing Partnership Cooperation; National Housing Law Project.** "An Affordable." Guide. 2016. PDF. <https://chpc.net/wp-content/uploads/2016/04/UA-Guide_April-2016Web.pdf>.
- Cavanagh, Ralph and Terry Sobolweski.** "Why Is America Wasting So Much Energy?" *The New York Times* 7 November 2017. Op-Ed. <<https://www.nytimes.com/2017/11/07/opinion/bipartisan-energy-efficiency.html>>.
- Center for Social Inclusion.** *Energy Democracy: Co-op Power - A Profile in Cooperative Ownership*. 25 February 2016. Review. 1 December 2017.
- Chacon, Felipe.** *Covert Costs: Utilities Are the Hidden Cost of Housing*. 26 October 2016. Blog. 20 December 2017. <<https://www.trulia.com/research/covert-costs-utilities/>>.
- Climable.org.** *A Look at Three Community Choice Aggregation Systems in the US*. 7 June 2016. Website. 20 December 2017. <<http://climable.org/blog/2016/6/6/a-look-at-three-community-choice-aggregation-systems-in-the-us>>.
- Climate Bonds Initiative.** *Climate Bonds Initiative*. n.d. Website. 20 December 2017. <<https://www.climatebonds.net/>>.
- Coleman, Kieran and Jeff Waller.** "Financing Community-Scale Solar." Report. 2017. Document. <<https://www.rmi.org/news/report-release-financing-community-scale-solar/>>.
- Community Preservation Corporation (CPC).** "Underwriting Energy Efficiency A Lender Handbook." Report. 2017. PDF. <http://communitycp.com/wp-content/uploads/2017/05/CPC_Underwriting_Efficiency_Handbook_Full_Interactive_FINAL.pdf>.
- Connecticut Energy Efficiency Fund.** *Energy Efficiency Board: 2015 Programs and Operations Report*. 1 March 2016. PDF. <<https://www.energizect.com/sites/default/files/Final-ALR-2015-Full-030316.pdf>>.
- Drehobl, Ariel and Lauren Ross.** *Lifting the High Energy Burden in America's Largest Cities*. Snapshot of Energy Burden in cities across the US. Washington, DC: ACEEE, 2016. Document.

- Empower Energies; WGL Energy Systems.** *Empower Energies and WGL Energy Launch Fund for Distributed Solar Expansion.* 29 November 2016. Website. <<https://www.prnewswire.com/news-releases/empower-energies-and-wgl-energy-launch-fund-for-distributed-solar-expansion-300369792.html>>.
- Energize Connecticut.** *Domino Energy Concierge.* n.d. Website. 20 December 2017. <<https://www.energizect.com/domino-energy-concierge/>>.
- Energysage.** *How Much Do Solar Panels Cost in the U.S. in 2017?* 4 June 2017. Website. 20 December 2017. <<https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/>>.
- Extensible Energy, LLC.** *Community Solar Value Project.* n.d. Website. 20 December 2017. <<https://www.communitysolarvalueproject.com/>>.
- FICO.** “FICO Research Brief: Impact of the CRAs’ Enhanced Public Record Standards on FICO Scores.” Executive Brief. 2017. PDF. <<http://www.fico.com/en/node/8140?file=12280>>.
- FICO.** *Overview - Expanding Credit Opportunities.* n.d. Website. 20 December 2017. <<http://www.fico.com/en/products/fico-score-xd#overview>>.
- Fisher, Sheehan & Colton Public Finance & Federal Economics.** *Home Energy Affordability Gap.* n.d. Website. 20 December 2017. <<http://www.homeenergyaffordabilitygap.com/index.html>>.
- Freehling, Joel.** *Energy Efficiency Finance 101: Understanding the Marketplace.* August 2011. White Paper. <<http://aceee.org/sites/default/files/pdf/white-paper/Energy%20Efficiency%20Finance%20Overview.pdf>>.
- Gaffney, Jacob.** *Christopher Whalen: The death of mortgage lending.* 14 April 2014. Blog. <<https://www.housingwire.com/blogs/1-rewired/post/29650-christopher-whalen-the-death-of-mortgage-lending>>.
- Gardiner, Beth.** “Energy Efficiency May Be the Key to Saving Trillions.” *The New York Times* 30 November 2014. Website. <<https://www.nytimes.com/2014/12/01/business/energy-environment/energy-efficiency-may-be-the-key-to-saving-trillions.html>>.
- Graham, Kevin.** *How Solar Panels Affect Getting a Mortgage.* 29 November 2016. Blog. <<https://www.quickenloans.com/blog/solar-panels-affect-getting-mortgage>>.
- GRID Alternatives; Vote Solar; Center for Social Inclusion.** *Low-Income Solar Policy Guide.* 7 March 2017. Website. 20 December 2017. <<http://www.lowincomesolar.org/>>.
- Harmonay, John.** *Insurance Claims and the Solar Energy Trend.* 26 August 2014. Blog. <<http://www.genre.com/knowledge/blog/contributors/john-harmonay.htm>>.
- Henderson, Rachel.** *Community choice aggregation: How far can it push energy sector transformation?* 8 June 2017. Blog. <<https://sepapower.org/knowledge/community-choice-aggregation/>>.
- Independent We Stand.** *Baltimore’s Second Chance, Inc. Creates Green Collar Jobs for the Community.* 30 October 2017. Blog. <<https://www.independentwestand.org/second-chance-inc-creates-green-collar-jobs/>>.
- Kinnear, John.** *How Much Does it Cost to Install Solar on an Average US House?* 25 April 2016. Website. <<https://www.solarpowerauthority.com/how-much-does-it-cost-to-install-solar-on-an-average-us-house/>>.

- Kirschen, Daniel, Ahlmahz Negash and Zeyu Wang.** “Assessing the financial impacts of distributed energy on load serving entities.” *Energy Policy* (2015): 380-392. Article.
- Lowder, Travis and Michael Mendelsohn.** *The Potential of Securitization in Solar PV Finance*. 1 December 2013. PDF. <<https://www.nrel.gov/docs/fy14osti/60230.pdf>>.
- Massachusetts Clean Energy Center; Massachusetts Department of Energy Resources.** *Mass Solar Loan*. 13 December 2017. PDF. <<http://files.masscec.com/solar-loan/MassSolarLoanProgramManual.pdf>>.
- Meister Consultants Group.** *Pathways to 100: An Energy Supply Transformation Primer for U.S. Cities*. 8 May 2017. PDF. <http://www.mc-group.com/wp-content/uploads/2017/08/MCG-Pathways-to-100_Energy-Supply-Transformation-Primer-for-Cities.pdf>.
- Miller, Lucia N.** *Energy Concierge Services: Analysis of a Public-Private Partnership Model for Commercial Energy Efficiency*. 1 May 2012. PDF. <https://scholarworks.umass.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1006&context=cppa_capstones>.
- National Association of State Energy Officials (NASEO).** *U.S. State Energy Program (SEP)*. n.d. 20 December 2017. <<http://www.naseo.org/sep>>.
- National Consumer Law Center.** *Access to Utility Service*. 20 December 2017. Digital Library. <<https://library.nclc.org/aus>>.
- National League of Cities.** *New EPA Webcast Series on Funding & Financing Government Clean Energy Programs*. Washington, DC, 20 December 2017. Webinar. <<http://www.nlc.org/article/new-epa-webcast-series-on-funding-financing-local-government-clean-energy-programs>>.
- National Renewable Energy Laboratory (NREL).** *Using Power Purchase Agreements for Solar Deployment at Universities*. Denver, January 2016. PDF. <<https://www.nrel.gov/docs/gen/fy16/65567.pdf>>.
- NHS Brooklyn Community Development Corporation, Inc.** *Landlord Training Course*. New York, 2017. Website. <<https://www.nhsbrooklyn.org/landlord-training>>.
- NYC’s Mayor’s Office of Sustainability.** *Solar Panel Tax Abatement*. 20 December 2017. Website. <<http://www.nyc.gov/html/gbee/html/incentives/solar.shtml>>.
- NYSERDA.** “2017 LIFE Regional Meetings.” April & May 2017. Meetings.
- NYSERDA.** *REVitalize*. n.d. Website. 20 December 2017. <<https://www.nyserdera.ny.gov/All-Programs/Programs/REVitalize>>.
- Office of the Comptroller of the Currency, U.S. Department of the Treasury.** “Community Developments Investments.” July 2011. *Investing in Solar Energy Using the Public Welfare Investment Authority*. PDF. 20 December 2017. <<https://www.occ.gov/publications/publications-by-type/other-publications-reports/cdi-newsletter/cdi-investing-solar-energy-2011.pdf>>.
- OnCourse Learning Real Estate.** *Energy Efficient Mortgages build green upgrades into loans*. 20 December 2017. Website. <<http://www.oncoursere.com/energy-efficient-mortgages-build-green-upgrades-loans/>>.

- OPIC; International Trade Administration; USAID; U.S. Trade and Development Agency.** *Important Features of Bankable Power Purchase Agreements for Renewable Energy Projects*. 20 December 2017. PDF. <<https://www.opic.gov/sites/default/files/files/10%20Elements%20of%20a%20Bankable%20PPA.pdf>>.
- O’Sullivan, Francis M. and Charles H. Warren.** *Solar Securitization: An Innovation in Renewable Energy Finance*. Boston, 2 July 2016. PDF. <<https://energy.mit.edu/wp-content/uploads/2016/07/MITEI-WP-2016-05.pdf>>.
- Paulos, Bentham.** *Should Investor-Owned Utilities Be Worried About Community Choice Aggregation?* 1 May 2017. Blog. <<http://www.powermag.com/should-investor-owned-utilities-be-worried-about-community-choice-aggregation/>>.
- Pennsylvania Department of Environmental Protection; Reinvestment Fund.** *Pennsylvania Green Energy Loan Fund*. 20 December 2017. Website. <<https://www.reinvestment.com/GELF/PAGELF.html>>.
- Pickrel, Kelly.** *3 misconceptions of PACE financing*. 14 February 2017. Website. <<https://www.solarpowerworldonline.com/2017/02/3-misconceptions-pace-financing/>>.
- Prosperity Now (formerly CFED).** *Asset-Building for Low-Income Homeowners: Leveraging Financing Solutions for Energy Efficiency Home Improvements*. August 2017. Report. 20 December 2017. <<https://prosperitynow.org/resources/asset-building-low-income-homeowners-leveraging-financing-solutions-energy-efficiency>>.
- Public Service Enterprise Group (PSE&G).** *PSE&G Solar Loan Program Requirements*. 20 December 2017. PDF. <https://www.pseg.com/home/save/solar/pdf/SLIII_Credit%20Requirements_081613.pdf>.
- PV Solar Report.** *Solar+Storage Is Cheaper than Proposed California Gas Plants*. 13 September 2017. Website. <<https://pvsolarreport.com/solar-plus-storage-cheaper-than-california-gas-plants/>>.
- Renewable Choice Energy (now Schneider Electric).** *Energy Attribute Certificates*. 20 December 2017. Website. <<https://www.renewablechoice.com/services/energy-attribute-certificates/>>.
- Residential Energy Services Network (RESNET).** *Energy Efficiency Financing Overview*. 20 December 2017. Website. <<http://www.resnet.us/professional/lenders/overview>>.
- Rocky Mountain Institute (RMI).** *Reviewing the Sustainable Finance Landscape*. October 2015. PDF. <https://d231jw5ce53gcq.cloudfront.net/wp-content/uploads/2017/04/Sustainable_Finance_Insight_brief_2015.pdf>.
- SIFMA.** *US Securitization 2016 Year in Review*. 20 December 2017. PDF. <<https://www.sifma.org/wp-content/uploads/2017/05/us-securitization-2016-year-in-review.pdf>>.
- Smart Electric Power Alliance.** *SEPA Report Provides Models for Community Solar Success*. 3 November 2015. Website. <<https://sepapower.org/knowledge/sepa-report-provides-models-for-community-solar-success/>>.
- Smart Electric Power Alliance.** *the 51st State Initiative*. 20 December 2017. Website. <<https://sepapower.org/our-focus/51-state-initiative/>>.

- Solar Action Alliance.** *What Is the Actual Cost of Residential Solar Panels?* 20 December 2017. Website. <<https://solaractionalliance.org/residential-solar-panel-cost/>>.
- Solar Power Rocks.** *State-by-state guides to investing in home solar power.* n.d. Website. 20 December 2017. <<https://solarpowerrocks.com/>>.
- Spector, Julian.** *How to Expand Solar Access to New York's Affordable Housing Community.* 29 December 2016. Website. <<https://www.greentechmedia.com/articles/read/barriers-to-solar-access-for-new-york-affordable-housing-low-income#gs.pO7lzcw>>.
- Sunnova Energy Corporation.** *EZ Own Plan.* 20 December 2017. Website. <<https://www.sunnova.com/service/solar-as-a-service/our-plans/ez-own/>>.
- Sunnova Energy Corporation.** *Sunnova Expands Zero-Money-Down Solar Ownership Program.* Houston, TX, 9 December 2017. Website. <<https://www.sunnova.com/newsroom/sunnova-expands-zero-money-down-solar-ownership-program/>>.
- Sunnova Energy Corporation.** *Sunnova Secures \$80 Million of Tax Equity Commitments from U.S. Bancorp Community Development Corporation.* Houston, TX, 14 March 2017. Website. <<https://www.sunnova.com/newsroom/sunnova-secures-80-million-of-tax-equity-commitments-from-us-bancorp-community-development-corporation/>>.
- The Energy Programs Consortium (EPC); The National Association of State Energy Officials (NASEO).** *WHEEL: A Sustainable Solution for Residential Energy Efficiency.* 13 June 2012. PDF. <https://www.naseo.org/Data/Sites/1/documents/committees/financing/documents/WHEEL_Primer.pdf>.
- The Solutions Project.** *U.S. Cities Committed to 100% Clean Energy.* n.d. Website. 20 December 2017. <<http://thesolutionsproject.org/>>.
- The World Bank Group: Public-Private-Partnership in Infrastructure Resource Center.** *Power Purchase Agreements (PPAs) and Energy Purchase Agreements (EPAs).* 20 December 2017. Database. <<https://ppp.worldbank.org/public-private-partnership/sector/energy/energy-power-agreements/power-purchase-agreements>>.
- Trabish, Herman K.** *What makes a successful utility-led community solar program?* 8 June 2017. Website. <<https://www.utilitydive.com/news/what-makes-a-successful-utility-led-community-solar-program/442663/>>.
- U.S. Department of Energy.** *Federal Financing Programs for Clean Energy.* 20 December 2017. PDF. <<https://www.energy.gov/sites/prod/files/2016/05/f32/Federal%20Financing%20Programs%20for%20Clean%20Energy.pdf>>.
- U.S. Department of Energy.** *Financing Energy-Efficient Homes.* 20 December 2017. Website. <<https://www.energy.gov/energysaver/incentives-and-financing-energy-efficient-homes/financing-energy-efficient-homes>>.
- U.S. Department of Energy: Energy Efficiency & Renewable Energy.** *Homeowner's Guide to Going Solar.* 20 December 2017. Website. <<https://www.energy.gov/eere/solar/homeowner-s-guide-going-solar>>.

- U.S. Department of Energy: Energy Efficiency & Renewable Energy.** *Property Assessed Clean Energy Programs*. 20 December 2017. Website. <<https://www.energy.gov/eere/slsc/property-assessed-clean-energy-programs>>.
- U.S. Department of Energy: Energy Efficiency & Renewable Energy.** *Underwriting Guidelines for Residential Loan Programs*. 20 December 2017. Website. <<https://www.energy.gov/eere/slsc/underwriting-guidelines-residential-loan-programs>>.
- U.S. Department of Energy: Energy Efficiency & Renewable Energy; Solar America Communities.** *A Guide to Community Solar: Utility, Private, and Non-profit Project Development*. 1 November 2010. PDF. <<https://www.nrel.gov/docs/fy11osti/49930.pdf>>.
- U.S. Department of Energy: Energy Efficiency & Renewable Energy.** *Integrating Photovoltaic Systems into Low-Income Housing Developments: A Case Study on the Creation of a New Residential Financing Model and Low-Income Resident Job Training Program*. 1 September 2011. PDF. <<https://www.nrel.gov/docs/fy11osti/51075.pdf>>.
- U.S. Department of Housing and Urban Development.** *Multifamily Weatherization Initiative*. 26 April 2010. PDF. <https://www.hud.gov/sites/documents/FSWEATHER_PROC_MF_BUILDING.PDF>.
- U.S. Department of Housing and Urban Development: Policy Development and Research (PD&R).** *Consolidated Planning/CHAS Data*. 26 May 2017. Website. <<https://www.huduser.gov/portal/datasets/cp.html>>.
- U.S. Energy Information Administration.** *Annual Electric Power Industry Report (EIA-861)*. 6 November 2017. Data File. <<https://www.eia.gov/electricity/data/eia861/>>.
- U.S. Energy Information Administration.** *Most states have Renewable Portfolio Standards*. 3 February 2012. Website. <<https://www.eia.gov/todayinenergy/detail.php?id=4850#>>.
- U.S. Environmental Protection Agency.** *Solar for All: Making it Happen in Low-Income Communities*. 13 April 2016. PDF. <https://www.epa.gov/sites/production/files/2017-06/documents/0122_lowincomesolarpolicy_votesolar.pdf>.
- Wade, Dana T. and Mike Sorohan.** *FHA to Halt Insuring Mortgages on Homes with PACE Assessments*. 8 December 2017. Website. <<https://www.mba.org/mba-newslinks/2017/december/mba-newslink-friday-12-8-17/residential/fha-to-halt-insuring-mortgages-on-homes-with-pace-assessments>>.
- Wesoff, Eric.** *Residential Solar Financier Sunnova Offers New Loan-Like Product*. 18 March 2015. Website. <<https://www.greentechmedia.com/articles/read/residential-solar-financier-sunnova-offers-new-loan-like-product#gs.qZq2odc>>.
- Wesoff, Eric.** *Update: Sunrun Announces Pricing of Its Securitized Portfolio of Residential Solar Rooftops*. 1 July 2015. Website. <<https://www.greentechmedia.com/articles/read/10-takeaways-sunruns-securitized-portfolio-of-residential-solar-rooftops#gs.Ptwe5xk>>.
- World Green Building Council.** *Creating an Energy Efficient Mortgage For Europe: A Review of Building Performance Indicators that Impact Mortgage Credit Risk*. 1 October 2017. Report. <http://www.worldgbc.org/sites/default/files/EeMAP%20Technical%20Report%20on%20Building%20Performance%20Indicators%20that%20Impact%20Mortgage%20Credit%20Risk_0.pdf>.