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Scaling Equitable Solar Finance

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Executive Summary

Driven by dramatic declines in up-front cost, **the U.S. solar photovoltaics (PV) industry has taken off** over the past decade, growing from 1 gigawatt of installed capacity in 2009 to 89 gigawatts in 2020—or enough capacity to power roughly 19 million homes. The industry is expected to **double in size over just the next 5 years**.[1] Much of the growth has been driven by large, utility-scale projects that can produce 5 megawatts or more of power—enough to power at least 1,000 homes. The cost of electricity produced by these projects has decreased by more than 70 percent since 2010. As of Q3 2020, development costs of large, utility-scale solar PV power plants were under $1 per watt, down by more than 70 percent from 2010.[2] A robust array of investors has come forward to efficiently deliver capital to these kinds of utility-scale projects including large banks, insurance companies, pension funds, and others.

But **low- and moderate-income communities, including communities of color, are at risk of being left behind** in the transition to clean energy. Mission-driven solar project developers and financial institutions have been working alongside energy justice advocates to open up solar access for these communities, using strategies ranging from community solar, to solar installations on affordable multifamily housing, to distributed solar and storage programs, and more. Their goals go **beyond simply generating more green energy** to **advancing social equity by**:

- empowering communities to control their energy future
- stabilizing energy prices, saving money, and building wealth for low-income families
- creating quality jobs
- improving health by reducing pollution
- providing energy resilience for vulnerable communities

Mission-driven actors are successfully deploying a **wide variety of strategies** to meet these goals, from helping low-income homeowners get solar—and sometimes battery storage, to developing solar projects serving affordable rental housing and community facilities, to building larger "shared solar" projects to which households from across the community can subscribe.

However, **the financing ecosystem does not work nearly as well for these "mission driven" solar projects as it does for utility-scale projects**. For home rooftop solar, even if low-income consumers have a home and suitable roof, they may fail to qualify for federal tax incentives, lack adequate credit to qualify for a loan—or the mission-driven lenders seeking to serve them may not be adequately capitalized to make long-term loans. For mission-driven commercial or community-scale projects, assembling nearly every component of the project capital stack—whether bridging early-stage costs, attracting tax credit equity investors, securing long-term debt, or coming up with sponsor equity and filling gaps—can present challenges. A variety of obstacles contribute to the scarcity of financing for low-income solar, including small project sizes, lack of developer balance sheet capacity, both real and perceived issues with credit risk, elevated technical assistance needs, and greater subsidy requirements to pursue goals such as deep energy affordability, climate resilience, or job creation. Still other obstacles are regulatory: for example, not all states allow community solar projects or Power Purchase Agreements, common strategies used for providing low-income solar—and the potential for regulations to shift over time creates risks that mission-driven projects can ill afford.

This report synthesizes information garnered from 47 key informant interviews, four focus group discussions involving 60 stakeholders, and a review of the substantial existing literature on low-income solar finance to assess the current landscape of mission-driven solar development in the United States, examine the roles that community-based financial institutions could play, and recommend public investments and policy changes that could help to scale the provision of equitable solar finance. **Key recommendations** for policymakers and funders in the renewable energy and community development fields that emerge from this process include the following:

- **Help to capitalize and support community-based lenders** to provide flexible, low-cost, and long-term financing to mission-driven solar projects—including providing guarantees or other forms of credit enhancement.
- **Provide federal support for equitable solar**, including a grant-in-lieu-of-credits option for the Investment Tax Credit to improve access to this critical government subsidy.

- **Develop pools of government and philanthropic support** that can complement financing from community-based lenders to complete the capital stack for mission-driven projects, as well as to support education and technical assistance to both consumers and potential project sponsors.
- **Create a national Renewable Energy Credits program** that includes social equity targets to provide a baseline of support for clean energy generation.
- **Change utility regulations to remove barriers** to low-income solar projects; lower permitting costs; provide greater certainty for developers, consumers and owners; and measure progress toward equity in renewable energy policy implementation.

The Promise—and the Challenge

A dramatic decline in the cost of solar has driven exponential growth.

Over the past decade, the U.S. solar photovoltaics industry has taken off, growing from 1 gigawatt of installed capacity in 2009 to 89 gigawatts in 2020.[3] Projections anticipate that the solar PV industry will continue to grow in the coming decades. The U.S. Energy Information Administration estimates that nearly $650 billion will be spent on solar PV system deployment from 2019 to 2050.[4] Similarly, the Solar Energy Industries Association (SEIA) and Wood Mackenzie Power & Renewables forecast that installed PV capacity in the United States will more than double in the next five years, adding sufficient capacity to power an additional 19 million homes.[5]

Dramatic declines in cost are the main driver of this exponential growth. Solar photovoltaic cells that cost $77 per watt in 1977 now cost only $0.13 per watt,[6] and 'soft' costs such as installation labor, system design, installer margins, and permitting and inspection costs have also dropped. As of Q3 2020, total development costs of large, utility-scale solar PV power plants were under $1 per watt, down by more than 70 percent from 2010.[7]

However, despite the increasing affordability and cost effectiveness of solar, there are still some key limitations. Residential solar prices have also dropped steeply over time but remain much higher than for utility-scale projects, at around $2.85 per watt.[8] Additionally, the cost of energy storage—critical for projects with resilience goals—remains too high to be affordable for many, with installed prices ranging from $800 to $1,300 per kWh of storage capacity (a typical home would need at least 5 to 10 kWh of storage).[9]

Low-income and BIPOC communities are in danger of being left behind.

Low-income communities, including many communities of color, are in danger of being left behind as the rest of the nation goes solar, due to a variety of challenges in access. Rooftop systems, the way in which many higher-income homeowners access solar, are out of reach for many low-income households. Only 47 percent of households with under $50,000 in income own their home,[10] and many other households face barriers relating to roof shading, inadequate roof space, or rooftops that need structural modifications in order to support a PV system.[11] Additional financing challenges further restrict the ability to serve low-income customers. First, many do not have sufficient taxable income to access the federal renewable energy Investment Tax Credit (the "ITC").[12] Second, credit challenges can prevent some borrowers from accessing a loan even from a mission-driven consumer lender. Third, especially in states with low electricity cost, the term of financing may need to be quite long (15 years or more) for higher-cost solar projects to be cash-flow positive for the borrower. Barriers to affordability can be magnified if the goal of the project is to provide resiliency, since battery storage costs, while declining rapidly, remain high.[13] Worse, depending on the utility rate design of their state, low-income households can even end up paying to help subsidize solar for higher-income customers, while they themselves are unable to access it.[14]

As a result of these challenges, residential adopters of rooftop solar have a median income that is 54 percent, or $32,000, higher than all U.S. households and 17 percent (about $13,000) higher than owner-occupied households generally.[15] Progress is being made—as of 2018, three states (CT, LA, and NJ) had reached "income parity," meaning that PV adopter median incomes are equal to or below that of other owner-occupied households[16]— but rooftop solar PV systems remain out of reach for many low-income households.

Mission-driven actors are seeking to advance important social equity goals through solar energy.

Mission-driven solar developers are responding to the social justice challenge posed by unequal access to solar energy, working to ensure that low-to-moderate income and disadvantaged communities are not left behind in the green energy transition. Beyond merely providing access to solar energy, these developers tend to seek at least one or more of the following additional goals:

- **Improving energy affordability and price certainty.** In the United States, low-income households pay a disproportionate share of their incomes for energy, and thus stand to benefit the most from the price certainty and energy affordability that solar PV typically delivers.[17] According to 2017 home energy data, low-income households spend an average of 17.8 percent of their income on electricity—almost six times the average for non-low-income households (3.1 percent).[18] Providing low-income households with access to solar power can help alleviate this energy burden with electricity at lower rates.[19] Further, low-income households are most vulnerable to uncertain and rising energy prices; solar energy generation can provide households with foreseeable and stable energy costs.

  It is important to note that despite dramatically declining costs, it is still far from certain that a given low-income household will save money by "going solar." Energy cost savings are most difficult to achieve where utility rates are already low, when resiliency through energy storage is also a goal, or when energy assistance programs are already subsidizing the cost of energy. Rooftop solar can be especially difficult to generate savings, given its higher cost per watt of installation, as well as the possibility that roof or electrical upgrades will also be needed to support installation. Long-term costs of equipment replacement and disposal should be factored into the cost of solar. Furthermore, long-term shifts in energy pricing or utility policy (discussed in more detail later in this document) can impact whether a solar customer will save money over the long term. For all of these reasons, mission-driven projects that seek to reduce and stabilize energy bills for low-income households may need significant subsidies.

- **Building resilience.** Low-income communities and disadvantaged communities are disproportionately impacted by climate events,[20] as most dramatically evidenced by the months-long power outages in Puerto Rico following Hurricane Maria, but also in other recent events such as the California wildfires and Texas freeze. Solar and storage installations can help to build much-needed climate resilience for low-income communities, providing a reliable power supply after a disaster or outage.

- **Promoting community control and wealth building.** Community-owned solar installations provide communities and community institutions with a greater degree of control over their energy future—and ensure that the transition to a clean economy is done in a way that strengthens these communities, and builds wealth for them, rather than negatively impacting them. Stakeholders hold divergent views on whether community ownership is desirable. Critics note the financial risks that may come with ownership and suggest the key focus should simply be on whether low-income households are saving money. On the other hand, as Shalanda Baker puts it in her book, *Revolutionary Power*:[21]

  "In my experience, 'easy' climate solutions might actually threaten to leave marginalized communities even more marginalized… Solving the climate crisis requires that we turn the playbook on its head, introduce new players—those who were tagged as losers in the prior two centuries—and bring their concerns, hopes, and dreams to the forefront in the design of the new system…I argue that people of color, poor people, and Indigenous people must …actively engage in the creation of the new energy system so as to upend the embedded and unequal power dynamics that are a direct outgrowth of the current energy system."

- **Promoting racial justice.** Many fossil-fuel-based energy projects disproportionately harm communities of color, for example through air pollution that contributes to disparities in the incidence of respiratory disease. Mission-driven solar developers see building solar projects in and for communities of color as a way of redressing this harm.

- **Job creation.** The solar industry has seen sustained job growth, with employment increasing 167 percent over the past decade; median wages exceed $15 per hour across the most common job types, even for entry-level positions.[22] Observers have argued that solar developers should be willing to pay prevailing wages for solar jobs;[23] ensuring a diverse workforce with advancement opportunities across racial, ethnic and gender lines is also an important social equity goal.[24] Low-income solar programs can incorporate workforce development goals that provide job training opportunities and direct pathways to quality solar jobs for workers from low-income

communities.[25] Further, solar generation enables economic development in communities with high energy costs, particularly rural areas lacking natural gas and dependent on trucked-in propane. Manufacturing and other industry may become feasible when solar generation is present.

Existing Strategies for Low-Income Solar

Mission-driven actors have used a variety of strategies to help low-income communities access solar PV. Each strategy has different strengths and limitations.

- **Distributed rooftop solar—homeowner purchase.** A number of community-based lenders have developed loan products to finance homeowners purchasing rooftop solar installations, including low-income and credit-challenged homeowners. Often, these products take the form of consumer loans that are unsecured or secured only by the solar equipment, generally with terms of 10 years or longer. In most cases lenders will also support energy efficiency upgrades, which often have better economics than solar PV and can be combined into one loan. Some notable examples in this space include:
  - » Inclusive Prosperity Capital's "Smart-E" loan program. The platform assists credit unions, Community Development Financial Institution (CDFI) loan funds, and other community-based lenders to make solar loans by providing an online workflow management platform, contractor vetting, and a standardized loan product for low-income and credit-challenged homeowners enabled by loan loss reserves. The program is active in 3 states (CT, MI, CO) with 16 participating lenders; it has served over 22,000 customers with strong portfolio performance.
  - » A number of credit unions have strong solar consumer loan products including Cooperativa Jesus Obrero in Puerto Rico; VSECU in Vermont; and Clean Energy Credit Union (national field of membership).
  - » Some states allow Residential Property-Assessed Clean Energy (PACE) loans, where the loan is secured as a part of the property tax assessment on the home. These loans can serve customers with more challenged credit but may also carry higher interest rates.

  Due to the access challenges already described earlier in this paper, however, these programs cannot provide a complete solution to helping low-income households go solar.
- **Distributed rooftop solar—solar lease and PPA models.** In solar leasing or Power Purchase Agreement (PPA) models, a solar developer maintains ownership of the rooftop system. The homeowner either leases the equipment from the developer or purchases power by the kilowatt-hour. The chief advantage of this structure, compared to direct ownership by the homeowner, is that the developer can then monetize the Investment Tax Credit (ITC) and pass the savings along to the homeowner through a lower rate, providing an indirect way for low-income homeowners to benefit from this subsidy. Furthermore, maintenance is the responsibility of the developer/installer.
  - » A notable mission-driven player in this space is PosiGen, which has served over 16,000 customers in three states (LA, CT, NJ). PosiGen targets low-income homeowners with high energy burdens, offering a 20-year, fixed-price solar lease in combination with energy efficiency improvements. The average customer is saving $500 per year—but the model depends not only on federal tax credits but other state supports including sales of Renewable Energy Credits or elevated incentives.
  - » GRID Alternatives provides low- to no-cost solar installations through its Single-Family "Solar for All" program. Project funding typically consists of 20 percent low cost debt from foundations, 50 percent traditional debt from Community Development Finance Institutions, and 30 percent federal tax credit equity. Projects are further dependent on state supports such as Renewable Energy Credit sales or revenues from cap and trade programs such as California's.
  - » A start-up nonprofit in Puerto Rico, Barrio Eléctrico, is seeking to replicate the PosiGen solar leasing but add battery storage to provide power resiliency. The highly distributed nature of rooftop solar makes it an ideal way to provide resiliency to low-income communities.

A primary barrier to scaling this model is regulatory—not all states allow solar leases or PPAs. While these models provide a way for low-income homeowners to access the ITC, low-income customers can face similar barriers to accessing solar leases and PPA models as they do with direct rooftop solar ownership. There can also be some customer hesitancy to enter a leasing agreement, although it is possible to structure the agreement to allow for customer purchase of the system after the tax credit compliance period has ended. This hesitancy is sometimes justified—a greater level of consumer protections is generally in place when it comes to a household's utility bill than is afforded that household in a solar lease or PPA, and not all providers of solar leases and PPAs are mission-driven actors with consumer protection at the heart of their business.

- **Community solar.** Community solar—also called solar gardens or shared solar—is a system where multiple users are able to purchase electricity from an (often) off-site solar facility.[26] In this way, participants ("subscribers") are able to buy a portion of the energy output without needing to pay any of the upfront installation costs or provide the physical space—nor do they have to worry about whether their own home is suitable for solar.[27] Community solar can refer to a distant solar project with multiple users or to a more locally controlled, in-community solar project.[28] Due to economies of scale, the cost per installed watt of community solar can be significantly lower than for rooftop systems. The community solar space enjoys the involvement of a large number of mission-driven actors, including but not limited to these examples:
  - » Groundswell produces mixed-income community solar projects where low-income households qualify for affordable rates, supported in part by other subscribers who pay the average market rate. Groundswell is also a lead partner in the "LIFT Solar Everywhere" initiative, a research and demonstration program seeking to scale accessible community solar and energy efficiency programs for low-income households.
  - » GRID Alternatives focuses on low-income community solar projects that seek both energy savings and workforce development goals for these communities. It has partnered with community-based nonprofit organizations, Tribes, affordable housing providers, and government and utility partners.
  - » Both Co-op Power and Cooperative Energy Futures develop cooperatively-owned community solar projects where member households have a say in decision-making over the management of the projects.
  - » EnerWealth Solutions builds shared solar plus storage projects where stored energy is deployed during peak electricity cost periods to reduce overall costs to subscribers. Projects are also structured so that revenues support small and minority landowners as well as community-based nonprofits.

  Some actors are working to add a greater resiliency component to the shared solar model through the development of microgrids, connecting multiple homes, businesses and community facilities together with shared solar and storage. Various efforts are under way in Puerto Rico to develop microgrids; another example is the Hunters Point Community Microgrid project in San Francisco.

  Not all state regulatory regimes support or allow community solar, reflecting a broader challenge in which state utility regulations can inhibit solar development, as we discuss in more detail later on. Community solar projects also have different subscriber and billing models. While some utilities will work with community solar developers to allow on-utility-bill payment of community solar subscriptions, others will not, resulting in cumbersome dual billing systems.
- **Solar installations for affordable multifamily housing.** Solar PV systems can also be installed on-site on community development infrastructure like affordable multifamily housing properties.[29] Often, these projects are structured similarly to other community solar projects, but they are worth a special mention because of the role that the affordable housing owner can play

in supporting their development. Some notable examples and initiatives in this space include, but are not limited to:

» In Denver, Colorado, the Denver Housing Authority (DHA) received a 15-year loan from the Enterprise Community Loan Fund (a CDFI) to build a 10-acre community solar project.[30]

» NHT Renewable, an affiliate of the National Housing Trust, has worked to support the installation of 5 megawatts of solar on 50 affordable housing properties since 2014, using a portfolio financing approach in which a single entity is set up to own and manage solar installations on multiple properties.

» There are also opportunities to serve manufactured housing parks in the same way. An example is the Mascoma Meadows Resident-Owned Community in New Hampshire. Project financing included state grants and debt from the New Hampshire Community Loan Fund, a CDFI.

» The Clean Energy Group Resilient Power Project is looking specifically at how to deploy solar and storage to affordable housing properties, as well as critical community facilities such as Federally Qualified Healthcare Centers, fire stations, and the like.

Some barriers specific to this space can include the need for significant property-by-property feasibility analysis when seeking to develop solar onsite. There can also be a "split incentive" issue: the tenant pays the electricity bill so the owner lacks the incentive to invest in energy-cost-saving improvements like solar beyond measures addressing common-area electricity use. Further, complicated capital waterfalls in some affordable properties make it difficult for housing owners to capture savings from energy investments. Instead, savings go to housing subsidy providers (like USDA and HUD) instead of paying for the system.

The Existing Financing Ecosystem and Its Challenges

To understand the financing challenges faced by mission-driven solar projects, it may be helpful to first briefly review how large, utility-scale solar facilities are built and financed. These projects are generally 5 megawatts or more in size, with the largest projects reaching hundreds of megawatts. Sophisticated developers ("sponsors") with large balance sheets will acquire or lease land for the project—around 5 to 10 acres of land per megawatt of capacity.[31] The developer will secure a multiyear contract with the local utility to be the "off-taker" (purchaser) of the electricity, who will then resell the power to end-users at regular rates. The developer will utilize an experienced team—whether in-house or contracted—for Engineering, Procurement, and Construction work, as well as ongoing operations and maintenance. For financing, the typical capital stack will be put together as follows:

- First, **tax credit equity**—driven by the federal renewable energy Investment Tax Credit (ITC)—will provide around 26 to 30 percent of project costs.[32] Typically, the developer will set up a single-project entity that is the vehicle through which investors with tax appetite (such as large banks) invest equity to claim the credits. These investors favor large project sizes of at least $50 to $75 million, and projects with reputable, "bankable" sponsors.[33]
- Second, **project debt** will be sized off of net operating income, using a debt coverage ratio. Lenders generally underwrite only to revenue that is fully contracted with a creditworthy counterparty.
- Income from **Renewable Energy Credits** (RECs) can boost the revenue stream to increase the amount of serviceable debt. RECs represent the "green aspect" of the power produced and are purchased by utilities as a way of meeting renewable energy production requirements imposed by state regulators.[34]
- The remaining project costs are typically covered by **sponsor equity** invested by the developer. In a few cases this equity investment has had returns enhanced through Opportunity Zone incentives, when the project is in an eligible area.

- During the project development phase, before tax credit equity and permanent debt come into the stack, projects may be financed by a combination of sponsor equity, acquisition, and predevelopment financing that may be provided at a corporate or project level, and construction financing.

For utility-scale projects a robust, efficient financing ecosystem is in place. With a low cost-per-watt to develop, and large project sizes over which to spread transaction costs for closing financing, such projects can be economically competitive with no public support other than the Investment Tax Credit and the favorable tax treatment of depreciation such projects receive. Large financial institutions such as Bank of America, Wells Fargo, U.S. Bank, and JP Morgan Chase are leading investors in the tax credit equity market for these types of projects. Other large institutions such as KeyBank, Santander, and HSBC are leading debt providers; often debt financing is provided through mini-perm structures before developers sell projects to investors with long-term horizons. These long-term asset owners include utilities, pension funds, insurance companies, and private equity funds.[35]

For mission-driven projects, however, the financing ecosystem is much more challenging. Broadly speaking, these challenges are related to:

- **Smaller project scale**, which can result in both higher cost-per-watt of construction, higher transaction costs as a percent of total development costs, and difficulty in reaching the minimum deal size desired by many investors and lenders. Transaction costs, particularly legal, audit, tax accounting and appraisal costs related to monetizing tax credits, can render smaller projects infeasible. Construction costs can also be high in areas with aging substation infrastructure, where developers must pay for interconnection upgrades.
- **Real or perceived credit risk of end users.** Many low-income households or projects located in low-income communities have a hard time meeting the credit requirements needed for long-term, low-cost financing.[36] For solar projects, where the hard collateral provides poor protection to lenders and investors, the key to protecting the investment is maintaining a reliable revenue stream—a major reason why lenders and investors prefer projects with utility offtakers. The perceived risk that low-income offtakers might not pay their solar bill can make both investors and lenders reluctant to fund mission-driven deals. Solstice has been developing an "EnergyScore" that initial research suggests will better predict credit risk for solar consumer customers.
- **Technical assistance needs.** For projects seeking to promote community ownership, significant community outreach and education may be required before the project can proceed (imagine, for example, working with resident leaders of a resident-owned manufactured housing park to discuss the possibility of a community solar development serving the park). As noted by the Low-Income Solar Policy Guide, "Often the targets of scams, customers in low-income communities may be distrustful of claims relating to energy bill savings." Other mission driven projects, such as rooftop solar on an affordable multifamily housing property or community health clinic, have additional technical feasibility work that may be needed (for example to assess building rooftop condition). Projects with nonprofit sponsors require complicated legal and accounting work to set up the affiliated entities needed to monetize the tax credit. All of these projects may require technical assistance to help the community or community organizations to assess project benefits and costs in relationship to community goals.
- **Sponsor balance sheet strength.** Nonprofit or community-controlled project sponsors may not have the balance sheet capacity to provide the required sponsor equity to a project—or the capacity to take on corporate debt that could then be redeployed as sponsor equity. Many of these sponsors require soft financing or grant support to be able to build capacity, meet working capital needs, and assemble a pipeline.
- **Elevated project costs to promote certain mission goals.** Mission-driven actors may have goals for energy savings that could require deeper subsidy than is available through the ITC alone, or they may be seeking to promote workforce development and job creation goals that cost more—or increase perceived project riskiness—relative to using mainstream contractors. Resilience-oriented projects require battery storage—which has some potential to generate greater savings through peak demand reduction, but also adds significantly to upfront costs.

These challenges can manifest themselves across all of the components of the capital stack:

- For *early-stage project financing*, sponsor balance sheet capacity as well as elevated feasibility and pre-development costs both come into play. In theory, Community Development Finance Institutions (CDFIs) excel at providing risk-stage capital to mission-driven projects, underwriting the ability of their borrowers to get to permanent financing. For example, this role is commonly played by CDFIs in the affordable housing development space. However, very few CDFIs are involved in providing this financing in the mission-driven solar development space, possibly due to a lack of familiarity.
- Bringing *tax credit equity* to mission-driven deals faces myriad challenges, starting with the fact that the structures most often used to bring this equity to low-income deals—solar lease/PPA structures and community solar projects—are not allowed in many states. Even where it is allowed, in many cases, such as when the project owner is a non-profit, the ITC cannot be accessed directly. Instead, sponsors must put into place complicated third-party-ownership structures involving substantial transactions costs, greatly eroding the value of the credits. These structures can further raise concerns for community members desirous of community control, greatly increasing the time and costs to educate them about the nature of the investor agreement. Perhaps the greatest challenge, however, is simply the reluctance on the part of investors to place tax equity in small and mission-driven deals that carry additional perceived risk (e.g. offtaker risk, developer risk) and high transaction costs while failing to meet minimum deal size requirements. These challenges were widely felt by our interviewees. The combination of these challenges can be great enough that some mission-driven actors have in fact forgone the ITC for some deals (including, for example, several solar projects serving resident-owned manufactured housing parks declined to use the ITC).
- The need for *long-term debt* is accentuated with community-controlled projects, since the community organization is the long-term asset owner and sale to another owner goes against the goals of the project. The problem is that many lenders—and especially many community-based lenders, who from a mission perspective are most inclined to invest in such projects—are not able to provide long-term debt, because they too struggle to access long-term capital. As a result, some interviewees reported that many mission-driven/community-controlled projects are currently taking on both refinancing and interest rate risk to get the deal done. Cost of debt is also an issue, and also an area where CDFIs are not always price competitive despite their willingness to look at mission-driven projects. This latter challenge is particularly true of CDFI loan funds, which face relatively high costs of capital compared to depository institutions. Yet many credit unions, despite their lower cost of funds, do not have the project-finance background required to invest in these types of projects, and must also manage regulatory concerns. A further issue is that as many lenders will only underwrite to fully contracted revenues, they may be unwilling to lend for a term that exceeds the length of the revenue contract, or to lend to projects with floating-rate power purchase agreements, as occurs in some community solar projects.

  Credit enhancements can play an important role in facilitating long-term debt. Currently the most used programs are at the REAP grant and guarantee and the Business & Industry guarantee at the U.S. Department of Agriculture. However, projects in urban areas are not able to access these programs (nor are all projects in rural areas).
- *Sponsor equity* functions as the "gap filler" for mainstream, market rate projects—but for reasons discussed above, mission-driven projects tend to have both larger gaps and more financially limited sponsors. "Back leverage" loans (corporate loans to developers whose proceeds can then be placed into a project as equity) are less likely to work for mission-driven projects, given both the potential issues with sponsor creditworthiness, and the need for truly concessionary capital to play the "gap filler" role. As a result, for mission-driven projects, some or all of the sponsor equity, as well as any additional project subsidies required to achieve deeper energy affordability, must be provided by philanthropic or state and local government sources. Instead, most mission-driven developers appear to rely on state funding

programs to fill gaps, but states vary widely in the supports they provide, not only in terms of whether they offer any grant support, but also in pricing of Renewable Energy Credits. Pricing varies widely from state to state, ranging between only $10 all the way up to $400 per megawatt hour.

While a space with these kinds of financing challenges seems ripe for a combination of government, philanthropic, and CDFI intervention, the reality is that the latter two sectors have played a limited role to date in domestic low-income solar finance. Leading CDFIs that have engaged in financing mission-driven, low-income-focused solar projects include, but are not limited to, Blue Hub Capital, Coastal Enterprises Inc. (and its subsidiary Bright Community Capital), Self-Help, and Enterprise Community Loan Fund. However, a recent survey conducted by the Richmond Federal Reserve Bank found only 22 CDFIs, out of 205 respondents, reporting any clean energy lending activity during 2019 and 2020—and more than half of those lenders engaged only in consumer lending. On the philanthropic side, Kresge Foundation has provided a guarantee for low-income solar and storage financing, as well as support for a number of mission-driven actors. Kresge and other foundations also collaborated to create the Community Investment Guarantee Pool. MacArthur Foundation has made investments in the space, including a $5 million investment in Housing Development Fund, a CDFI, to lend for clean energy in multifamily affordable housing. Hewlett Foundation has also supported efforts to train and support community-based lenders in the United States to engage in clean energy finance. Many interviewees did not feel, however, that the scale of philanthropic sector involvement was commensurate with the scale of the problem.

Regulatory and Policy Barriers

Regulatory barriers, especially but not limited to state utility regulations and local zoning practices, present significant challenges for developing low-income solar projects. Other literature has extensively discussed these complex challenges and we try to summarize and highlight some of the key issues here.

- As of 2020, according to the Institute for Local Self-Reliance's "Community Power Scorecard:"[37]
  - » 31 states did not have policies in place allowing shared solar (community solar) projects, making community solar not possible to implement
  - » 27 states did not have utility renewable energy procurement requirements
  - » 19 states lacked simplified interconnection rules to facilitate interconnection of solar installations to the grid
  - » 7 states lacked customer-friendly net metering policies, and 44 states did not have a feed-in tariff for distributed renewable energy
- Similarly, 20 states do not make legal provisions for solar Power Purchase Agreements and leases—and 7 of these states outright prohibit them, effectively taking away any possibility to use third-party-ownership strategies to monetize the investment tax credit.[38]
- Levels of partnership and support for mission-driven projects can vary greatly depending on the utility and reflect broader policies such as whether utilities are subject to renewable energy procurement requirements. According to the Low-Income Solar Policy Guide,[39] actions that utilities could take—but that many don't—to support these projects could include:
  - » facilitating customer education, engagement, and enrollment
  - » allowing on-bill payment of community solar bills or on-bill financing of distributed rooftop solar
  - » facilitating siting and interconnection for solar projects that will serve low-income customers
  - » enabling virtual net metering for community solar subscribers
- While electricity pricing levels generally affect the viability of any solar project, a particular concern we heard from interviewees about low-income solar projects is that low-income energy assistance programs, by further subsidizing the cost of energy, reduce the cost-savings benefits from solar energy that low-income customers might otherwise receive. Potentially, funds from such assistance programs might be better invested in energy retrofits and solar projects to achieve long-term,

sustainable cost reductions for these consumers. Interviewees discussed similar challenges with affordable housing utility allowances, where if a resident's utility bills decrease due to solar or energy efficiency improvements, their rent will increase by a corresponding amount.[40]

- Local zoning and development codes can create barriers to solar development.[41] Solsmart offers a toolkit for local zoning agencies to update their documents and processes to be more solar-friendly.

Utility company opposition to rooftop and community-controlled solar is one driver of these regulatory barriers, as such developments both pose technological challenges for grid operations while threatening utilities' ability to profit from existing and new capital investments (including their own solar power plants).[42]

Creating long-term predictability within the regulatory environment is also critically important. For example, changes to net metering rules, or decisions to impose minimum grid connection charges that are made after customers have signed up for solar, could create unexpected costs that low-income solar consumers can ill afford.

Recommendations for Scaling LMI Solar Finance

The ecosystem developments we describe above still require both public action and philanthropic investment to succeed. Low- and moderate-income (LMI) solar finance faces unique challenges to scale including:

- smaller projects sizes with higher transaction and constructions costs
- real or perceived credit risks from LMI offtakers
- difficulty in utilizing the ITC
- inconsistent policy environment across the country with powerful incumbents actively working against solar access
- higher levels of technical assistance required to develop projects

The result is the lack of a well-developed financing sector with streamlined financial infrastructure and funding mechanisms targeted for LMI solar. Below we outline key high-level recommendations for scaling equitable solar finance:

- **Facilitate engagement by community-based lenders in low-income solar finance.** Community-based lenders need more knowledge to engage effectively in the solar project finance space—for most, it is an asset class to which they are new, and one where designing the underwriting approach requires nontraditional approaches to project cash flows and collateral. However, they also have the mission orientation, community connections, and in some cases, the tolerance for risk, that could help them to play crucial roles. Several strategies could help unlock the potential for these lenders to support mission-driven solar projects:
  - » *Training* programs can help to broaden the pool of community-based lenders with a basic working knowledge of solar finance opportunities and mechanisms.
  - » *Core operating support for leading community-based financial institutions to serve as capital aggregators* could help those institutions who are already capable solar lenders grow into a core part of the financial infrastructure that pools investment from various sources and flows it out to worthy mission-driven solar projects. The leading community-based lenders in the space already serve as a sort of aggregation mechanism, in that they are accessing a diverse range of capital—from government or philanthropic sources, impact investment, investment from other financial institutions, and in some cases deposits—and redeploying it to mission-driven projects. A mix of institution types including CDFIs, loan funds and credit unions could provide a diverse and robust set of lead actors.
  - » *Promoting partnership and collaborations between community-based financial institutions around solar finance.* There may be opportunities for community-based lenders to partner with one another, as well as with state or local green banks, to create further efficiencies and opportunities. For example, CDFIs commonly participate in aggregating vehicles together. A lead CDFI could create a master participation agreement and provide the expertise in underwriting and structuring for the remaining CDFI partners to invest in projects in targeted LMI areas of the CDFIs.

This would reduce the costs for lenders who are not experts in solar finance but want to participate. Shared operating platforms that make it easier for community-based lenders to do the work of solar lending are another key strategy, such as the Smart-E platform for consumer clean energy lending.[43]

- **Help to capitalize and support community-based lenders to provide flexible, low-cost, and long-term financing to mission-driven solar projects.** Multiple vehicles could be considered to flow capital to community-based lenders such as credit unions and CDFIs, who could then provide a variety of debt products to mission-driven solar developers. A mix of low-cost, flexible loan products is needed, ideally including working capital, early-stage predevelopment and acquisition financing, construction debt, and long-term permanent debt. For community-based lenders to offer this full mix of products, they would require in turn a mix of equity and grants; non-recourse, unsecured debt for early-stage project finance loans; and long-term, low-cost debt to be able to originate and hold permanent project debt. Credit enhancement tools will also help lenders to lend deeper into the community while facilitating their efforts to raise capital.
  - » Legislation for a National Green Bank (Clean Energy and Sustainability Accelerator) is proposed to work with state and local green banks, and comes with a requirement that 40 percent of its capital be invested in "climate-impacted communities." Community-based lenders could help both to deploy funds rapidly and to ensure that the most vulnerable communities are well served. Program legislation and regulations should ensure that CDFIs and other mission-driven, community-based lenders can directly access accelerator resources to scale equitable clean energy lending programs.
  - » The CDFI Fund has had special pools of money carved out for purposes such as healthy food financing and assisting people with disabilities. Clean Energy set-asides for the CDFI Fund and the CDFI Bond Guarantee Program could help community-based lenders cover capital requirements as well as access long-term financing to fund mission-driven solar projects. Similar accommodations might be created under the New Markets Tax Credit and Low-Income Housing Tax Credit programs.
  - » Various Department of Energy (DOE) programs should be explored for potential to provide financing to low-income solar projects. One option might be relaunching the Energy Efficiency and Conservation Block Grant Program—in particular, its competitive grants program for nonprofits during the Great Recession, which helped to spur the development of several innovative clean energy lending programs. Alternatively, DOE could consider establishing a prize program for social equity-focused solar funds out of the Solar Energy Technologies Office.
  - » The philanthropic sector could increase deployment of grants and Program-Related Investments (PRIs) to capitalize CDFIs engaged in low-income solar lending. Such investments might also help CDFIs to leverage increased Community Reinvestment Act (CRA)-motivated investments from banking partners, now that revised CRA regulations encourage banks to invest in clean energy projects.
  - » Credit enhancement will also likely need to play a role in supporting these capital flows. Mechanisms such as funded reserves, unfunded commitments from foundations, or stand-by credit agreements could remove or reduce counter-party credit risk and could be aggregated to provide support for certain project types. Programs like the USDA REAP and Business & Industry guarantee programs are very helpful but do not provide broad enough access for mission-driven solar projects, especially those in urban areas. A DOE program that could potentially play a role might be the Loan Programs Office, which has $4.5 billion in loan guarantees available for renewable energy projects. Community-based lenders could potentially serve as a capillary system utilizing the guarantee to deploy capital to mission-driven projects.

- **Provide a grants-in-lieu option for the Investment Tax Credit.** Many interviewees highlighted reforming the ITC as critical, since its current structure is regressive, providing much greater benefits to high-income populations. Multiple studies have noted the ITC structure does not work well for low-income solar, and at least one other study—along with numerous interviewees here—recommended that the credit be made refundable, to help low-income customers benefit from the full value of the credit without having to resort to complicated ownership structures.[44] A further consideration might be to deepen the ITC for projects meeting certain mission-based criteria around serving low-income communities. During the last recession, the Treasury Department 1603 program provided grants in lieu of tax credits. Such a program could level the playing field for mission-driven developers to be able to participate in the largest source of subsidy financing available for solar development today.
- **Develop pools of government and philanthropic support that can complement financing from community-based lenders to support mission-driven projects.** For many projects and project sponsors, some level of grant support is needed to complete the capital stack beyond the financing that community-based lenders can provide. Additionally, grant support is needed for the training and technical assistance work that can help to make a deal bankable—whether that is vetting contractors for rooftop installation jobs, helping mission-driven solar developers build their operational capacity, or educating communities and consumers about their clean energy options. Providers of these "development services" could include community-based lenders, specialized platforms like Smart-E, specialized TA providers like SolarOne, and business service organizations. Both DOE and philanthropic programming should seek to provide some reliable means of access to grant supports for these various and important purposes.
- **Create a national Renewable Energy Credits program to provide a baseline of support for clean energy generation.** A national renewable energy portfolio standard would require retail electricity suppliers nationally to provide a minimum percentage of clean energy. This standard would be accompanied by the creation of a national RECs market in which such credits could be bought, sold, and traded. Such a market could provide a reliable and consistent stream of revenue to solar projects across states, reducing the unevenness of where solar energy has been able to gain market penetration. Importantly, such a program should implement a requirement that a certain percentage of this generation go to low-income markets and/or achieve other metrics for social equity.
- **Remove barriers in utility regulations to low-income solar projects.** Regulatory redesign at the federal, state, and local level should provide consistent support for solar projects while reducing complexity for installers, investors, and off-takers. For example, currently, too many states do not allow mission-driven developers to build community solar projects, or for solar Power Purchase Agreements or leases. Too often, permitting and interconnection issues create project delays and add costs. Utilities may need additional incentive to facilitate things like on-bill payment for community solar customers. Beyond removing barriers, regulators also need to provide certainty for solar projects, to avoid creating unexpected costs that low-income solar consumers and mission-driven project owners can ill afford. Such changes are needed to create an environment that could attract capital at scale and unlock opportunities to bring solar PV benefits to LMI communities. Social equity needs to be a key component of the regulatory redesign process. A recent report by the Initiative for Energy Justice outlines specific tools to measure progress toward equity in renewable energy policy implementation.[45]

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Appendix: Interview List

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2. Anne Hoskins, SunRun
3. Beth Galante, PosiGen
4. Brian Volkmann, Affinity Plus Credit Union
5. Caitlin Rood, Mercy Housing
6. Dana Clare Redden, Solar Stewards
7. David Ryan, Fleet Development
8. Dewitt (Dick) Jones, Blue Hub Capital
9. Esther Toporovsky, NYC Housing Partnership
10. Fran Lutz, Community Investment Guarantee Pool
11. Frank Altman, Community Reinvestment Fund
12. Janaka Casper, Community Housing Partners
13. Javier Rua, Puerto Rico Solar and Storage Association
14. Jeff Lesk, New Partners Community Solar
15. Jeffrey Schub, Coalition for Green Capital
16. Jen Leybovich, Main St. Launch and CDFI Climate Crisis Working Group
17. Jessica Bailey and Laura Laumont, Greenworks
18. Joe Evans, Kresge Foundation
19. John Balbach, MacArthur Foundation
20. Jonathan Abe, Sunwealth
21. Jorge Gaskins and Lauren Rosenblatt, Barrio Eléctrico
22. Josh Earn, National Housing Trust
23. Kerry O'Neill, Inclusive Prosperity Capital
24. Kevin Porter and Paul Bradley, ROC USA
25. Krista Egger, Enterprise Community Partners
26. Leslie Reid, Madison Park Development Corporation
27. Lynn Benander, Co-Op Power
28. Melanie Santiago-Mosier, Vote Solar
29. Melissa Malkin-Weber, Self Help
30. Michelle Moore and Emily Robichaux, Groundswell
31. Monica Belz, Kaua'I Government Employees Credit Union
32. Nate Dick, Preservation of Affordable Housing
33. Nate Hausman and Warren Leon, Clean Energy States Alliance (CESA)
34. Nicole Steele, National Community Solar Partnership
35. Niels Zellers, Bright Community Capital (BCC)
36. Paula Planthaber, NeighborWorks America
37. Peter Hellwig, Atmos Bank
38. Rebeca Schaaf, Stewards of Affordable Housing for the Future
39. Rebecca Chilton, Leyline Renewable Capital
40. Rob Miller, VSECU
41. Ryan Sheehy, Fleet Development
42. Seth Mullendore and Mariele Mango, Clean Energy Group
43. Stephen Brown, Capital Assets Sustainable Energy Development
44. Timothy DenHerder Thomas, Cooperative Energy Futures
45. Tina Poole Johnson, Opportunity Finance Network (OFN)
46. Tom Figel, GRID Alternatives
47. Yesenia Rivera, Solar United Neighbors

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