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GW Solar Institute
THE GEORGE WASHINGTON UNIVERSITY

Working Paper

Summary for Policymakers

BRIDGING THE SOLAR INCOME GAP

Contents

Note: *The GW Solar Institute developed this working paper to stimulate timely discussion and inform policymakers on tools they can use to increase access and the affordability of solar energy, particularly for lower income households. Future refinements to this document will reflect ongoing feedback and incorporate additional emerging solutions. Please visit solar.gwu.edu to obtain the most recent version.*

JAMES A. MUELLER AND AMIT RONEN

The rapid decline of solar panel costs in recent years has ushered in a solar boom that has not spread uniformly across the spectrum of U.S. household incomes. Despite being more vulnerable to energy costs, lower income Americans have lagged behind more affluent households in adopting solar and realizing its numerous benefits.

To better understand and address this inequity, the GW Solar Institute's 2014 Solar Symposium convened policymakers, industry and business leaders, researchers, and students from across the country for the first national discussion to focus on the barriers to lower income solar deployment and potential solutions to overcome them.

The authors first summarize the emerging themes and recommendations from the 2014 Solar Symposium and then elaborate on them further for the benefit of federal, state, and local policymakers considering ways to address lower income solar barriers. The authors specify several policy recommendations to serve as a starting point for addressing the solar income gap.

Summary of Findings

- Solar energy could alleviate the financial burdens of lower income communities, but targeted policies will be necessary for solar to expand into this underserved market segment.
- Proven policies that make solar more accessible and affordable should be continued, including net energy metering (NEM) and the 30-percent federal Investment Tax Credit (ITC), as well as community development programs such as the New Markets Tax Credit (NMTC).
- Emerging community/shared solar policies are a key tool for expanding the solar marketplace and should be extended in other states.

- More tools to enhance credit, reduce lender risk, and leverage private capital need to be created and funded, including green banks, commercial property assessed clean energy (PACE), and on-bill financing programs.

- Solar should be better integrated into existing energy efficiency and energy assistance programs, including the Weatherization Assistance Program (WAP) and the Low-Income Home Energy Assistance Program (LIHEAP), to incorporate solar generation investments.

- Substantial outreach and education will be necessary to reach lower income communities that are often difficult to reach and unaware of their electricity options. A federally mandated, industry-funded education and outreach program could help meet the necessary scale for these efforts.

- Solar deployments in lower income communities will require utility partners, likely directed through state legislation, utility commissions, or induced through new creative value propositions.

- The solar industry's future growth potential will be limited if the marketplace is not expanded to include lower income households, who are more likely to be renters, live in multifamily units, and have limited access to capital.

WHERE WE ARE TODAY

Since 2008, the cost of photovoltaic (PV) panels has declined by over 80 percent,[1] ushering in a solar boom in which U.S. solar PV electricity generation increased more than twenty-fold since 2010.[2] In 2013 new solar PV electricity generation capacity grew by 4,751 megawatts (792 megawatts residential), accounted for 27 percent of all new electricity capacity additions in the US, and raised the cumulative total of U.S. solar PV capacity to 12,100 megawatts.[3] Preliminary estimates for 2014 suggest another 6,500 megawatts of PV capacity were added to reach 18,600 megawatts of total PV capacity.[4]

I think solar is the people's power. It is the people's power of choice. And what we now need to do as an industry is make sure that solar is available to all people who want to install solar.

Rhone Resch
President and CEO
Solar Energy Industries Association (SEIA)

- **The solar boom has been slow to extend to lower income* neighborhoods**. The 49.1 million households that earn less than $40,000 of income per year make up 40 percent of all US households[5] but only account for less than five percent of solar installations.[6,7] Lower income households face a range of barriers to going solar including:

  - Lower income households are **less likely to own their roof** due to higher rates of living in multi-family buildings and being renters (49.1 percent of lower income households are renters versus 21.8 percent of households with incomes greater than $40,000).[8]
  - Lower income households have **limited access to financing** due to lower savings, less income to borrow against, and lower credit scores that further reduce access to affordable capital.
  - Lower income households are **more likely to live in buildings with deferred maintenance** that require other upgrades before solar investments make sense.
  - Lower income households are **unable to realize the financial benefits of solar directly in cases where utility bills are partially or fully subsidized**.

* In this paper, the term "lower income" means households earning less than $40,000 per year, while the term "low-income" means households earning less than 150 percent of the federal poverty line. The latter follows one of the criteria in the Low-Income Home Energy Assistance Program (LIHEAP) statute, in which the income eligibility threshold is set at the greater of 150 percent of the federal poverty guidelines or 60 percent of the state median income.

- **Electricity costs make up a much larger share of a low-income households' budget compared to more affluent families, even though they use less electricity on average.** Electricity costs account for 5.7 percent of the median low-income family's budget, while only accounting for 1.9 percent of other families' budgets.[9] In dollars spent, a typical low-income family spends an average of $1,272 per year for roughly 10,060 kilowatt-hours of electricity. Other, more affluent families spend $1,558 per year for roughly 11,720 kilowatt-hours of electricity.[10] Overall, low-income families consume less electricity on average, using only 22 percent of the electricity consumed in American homes despite accounting for roughly 25 percent of all housing units.[11]

When there's demand, the marketplace responds and helps fulfill that demand. How do you make [solar] a necessity?

Frank Sesno
Director, School of Media and Public Affairs
The George Washington University

- **The federal government spends billions of dollars on energy assistance programs each year, but they are unable to reach everyone in need and often do not include solar investments.** The U.S. Department of Housing of Urban Development (HUD) expends about $6.3 billion on energy costs each year for federally assisted housing.[12] The Low-Income Home Energy Assistance Program (LIHEAP), which assists low-income families with their home energy bills, has historically only covered about 15 percent of all eligible low-income households.[13] In fiscal year 2014, the federal government provided $3.4 billion to states that administer the LIHEAP program. Other state, ratepayer, and private programs also provide billions of supplemental dollars to help low-income families with energy costs.

- **Unlocking solar energy for low-income communities could generate lasting wealth and meet a large percentage of their power needs**, especially if combined with energy efficiency measures. A 4-kilowatt distributed PV system generates between 5,000 and 6,500 kilowatt-hours of electricity each year, enough to cover more than half of the typical low-income family's needs. If all low-income households went solar, their annual budgets would increase between $17.9 billion and $23.3 billion – income that could be spent on other critical needs or at local businesses rather than utility bills.[14] The installation and operation of a full low-income solar build-out would contribute an additional $18.7 billion of local economic output each year, resulting in roughly 138,000 jobs.[15]

They see solar in their community as a ray of hope. They want to own it. They want the empowerment of making their own energy. They want to bring the jobs to their communities.

Anya Schoolman
Founder and Executive Director
Community Power Network

ADVANCING SOLAR ACCESS AND AFFORDABILITY

Although unique barriers of the lower income solar market necessitate corresponding policies to overcome them, policies that unlock distributed solar broadly are also necessary and act as prerequisites. One clear indication is that roughly three-fourths of the residential solar PV capacity added in 2013 occurred in the five states with leading state-level policies for residential solar installations.[16] While some of these states are among those with the best solar potential, leading states like New Jersey and Massachusetts have relatively poorer solar resources and have a higher population density limiting available space for solar systems. The common factor is that all of them have enacted **policies that facilitate access and reduce the cost of installing solar on rooftops.** This section provides an overview of the key policy drivers that have allowed both residential and non-residential solar installations to double over the past two years, while utility PV installations have more than quadrupled.[17]

Net Energy Metering Policies

Solar's expansion into lower income markets will require fair compensation for solar electricity under any new or existing electricity rate structure. After interconnecting with the grid, customers need access to sell back any excess electricity generated from their solar panels at a fair rate. At the 2014 Solar Symposium speakers and attendees frequently mentioned the ongoing debate between electric utilities and solar customers over net energy metering (NEM) policies. They also refuted the argument from some electric utilities, who have claimed that current NEM policies are a burden to low-income ratepayers because they effectively shift the costs of maintaining the grid from more affluent solar users to non-solar users.

The big policy challenge … is the fight against net metering that's happening in a number of different states, [where] the utility companies and the Koch brothers are pushing back. Their argument is…the people who are left behind are poor people, and they're paying for rich people's solar.

We need to pushback hard to say that it's not just a cost; we need to look at the savings.

DeWitt Jones
Executive Vice President
Boston Community Capital Solar Energy

Tax Incentives

Federal tax incentives have been an essential driver for the rapid growth in solar deployment. The two most valuable tax policies for solar are the 5-year Modified Accelerated Cost Recovery System (MACRS) and the 30 percent Investment Tax Credit (ITC) under Section 48 of the Internal Revenue Code for commercial systems and Section 25D of the Internal Revenue Code for residential systems. If Congress fails to extend the ITC before the end of 2016, the credit for residential systems will expire, and the credit for commercial systems will revert to the permanent 10 percent level. Furthermore, Congressional proposals for reforming the tax code threaten to eliminate these solar provisions entirely.[18] **Providing long-term certainty by extending the 30-percent ITC for multiple years beyond 2016 and maintaining the current accelerated depreciation system are both critical federal policies to enable the expansion of solar into lower income communities.**

Sixteen states also offer additional tax credits for residential solar systems.[19] For example, PosiGen, a company that has developed a low-income leasing model and presented at the 2014 Solar Symposium, utilizes Louisiana's solar tax credits, which provide a 50 percent credit for owned solar systems and a 38 percent credit for leased systems.

Direct Incentives

A direct dollar-per-watt rebate program, scaled to financial needs, has proven to be an effective tool in states that have adequate resources and political will. A number of states have implemented a direct incentive program for solar PV systems.[20] The California Solar Initiative (CSI), for example, has adopted a multi-pronged rebate program. With $2.17 billion of ratepayer funds between 2007 and 2016, CSI seeks to install nearly 2 GW of new solar generation capacity, including 190 MW in low-income solar installations.[21] CSI also has a complementary program, funded by $250 million from natural gas rates, to install 200,000 solar thermal systems, setting aside 10 percent ($25 million) for low-income installations.[22]

- California's New Solar Homes Partnership (NSHP) offers an **Expected Performance-Based Incentive (EPBI) for affordable housing projects, approximately $3.50 per watt for individual residential units and $3.30 per watt for systems on common areas** if the PV system primarily serves the residences.
- California's **$108.3 million Single-family Affordable Housing (SASH) program fully covers the costs of 1-kW systems for very low-income households**, whose income is at or below 50 percent of the median income. For larger systems, the incentive is scaled from $7 to $4.75 per watt, based on taxable income.

- California's **$108.3 million Multi-family Affordable Housing (MASH) program provides incentives to affordable housing building owners** at $1.90 per watt for offsetting common area electric loads and $2.80 per watt for offsetting tenant electric loads.

- California's **solar thermal program provides incentives up to $25.64 and $9.62 per therm[†] displaced each year for its single-family and multi-family components, respectively.** This program phases out automatically with four rate steps.

Community Shared Solar

According to a 2008 National Renewable Energy Laboratory (NREL) analysis,[23] only about 22 percent of residential building roof areas in cooler climates and 27 percent of residential rooftop rooftops in warm/arid climates are suitable for solar. This estimate only takes into account the technical potential available. When other barriers are taken into account, such as whether a home is being rented or the age of the roof, **fewer than 1 in 5 residential roofs are likely to be suitable for solar systems**.

Shared solar works for the other 80 percent of customers [who cannot place solar on their own roofs]. It gives millions of people access to affordable clean energy for the first time.

Hannah Masterjohn
Program Director
VoteSolar

Community solar policies are an emerging solution to enable renters and other households that do not have suitable roofs to invest in and benefit from solar systems. In addition to addressing the renter and multi-family housing challenge, community solar is also a particularly promising solution for lower income communities due to four primary reasons. These community projects (1) are typically larger and more cost effective than individual rooftop systems, (2) allow for partial ownership of solar systems that may better match the need and ability of lower-income families to invest in solar, (3) can be installed on low-value properties, reducing costs and contributing to community redevelopment goals, and (4) can be sited on newer properties that may not have the same deferred maintenance challenges common to many lower-income homes.[24]

- **Nine states plus the District of Columbia have adopted shared renewables policies that allow multiple households to participate in one solar project**, providing renters and other households the opportunity to realize solar benefits on their utility bills. Several other states are actively considering the adoption of similar shared renewable policies.[25]

- **Some electric utilities have developed community solar programs voluntarily without enabling legislation from state legislatures.** These programs, which will be discussed in more detail below, could provide models for encouraging utilities to expand solar access to lower income communities.

UNLOCKING PRIVATE CAPITAL AND FINANCING SOLUTIONS

At the 2014 Solar Symposium, credit enhancement programs that unlock private capital to invest in lower income communities received enthusiastic support. The GW Solar Institute's April Roundtable on expanding low-income solar in the District of Columbia converged on a similar consensus recommendation to create a credit enhancement program in the District. Such a program could leverage the public investment to attract up to ten times as much private sector capital.[26] According to the truSolar Working

[†] One therm equals 100,000 British thermal units (BTU); one BTU is equivalent to the energy required to heat one pound of water by one degree Fahrenheit.

Group, the vast majority of lending institutions (estimated to be as high as 95 percent) are not financing solar projects.

Using public funds to reduce lender risk and attract private capital stretches the public's dollars and could support more solar installations in lower income communities. Such public investments could also educate and engage private capital on these promising market opportunities and ultimately generate a competitive, self-sustaining private market.

Green Banks

We need to look at the other incentives for private capital … like what the green banks are doing to motivate private capital. They are trying to fill a market gap where the private industry won't go because it's a new market, new technology, or there are questions about credit worthiness.

Todd Foley
Senior Vice President
American Council on Renewable Energy

A number of states have established (or are actively pursuing) **green banks to attract and leverage private sector capital to accelerate clean energy deployment.**

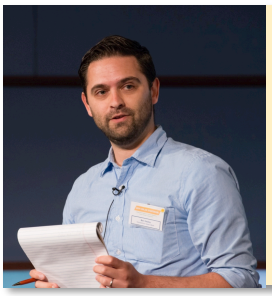
In 2011 Connecticut created the first green bank in the U.S., called the Clean Energy Finance and Investment Authority (CEFIA), which helps to lower financing costs for solar installations. New York Governor Andrew Cuomo announced a $1 billion NY Green Bank in his 2013 State of the State address. With an initial capitalization of $210 million, the NY Green Bank increases the available capital for clean energy projects by addressing specific financing gaps and barriers in capital markets and acting as a credit enhancement provider (i.e. loan guarantees and loan-loss reserves), direct lender (i.e. long-term, low-cost loans), or aggregator.

Although green banks can support commercial property assessed clean energy (PACE) and on-bill programs, we will discuss them separately below due to the emphasis Symposium speakers placed on both of these promising financing options.

Commercial Property Assessed Clean Energy (PACE)

PACE can help low-income households through easy-to-use financing vehicles for building owners that would unlock long-term financing for energy upgrades on multifamily units. **PACE works by allowing property owners to finance qualified energy efficiency and clean energy investments through a voluntary assessment on their property tax bill.** The additional fee on their property tax bill pays for the cost of the improvements over time.

Because of the enforcement and priority of a tax lien on the property, lenders view this as low-risk, similar to municipal debt, and can offer low-cost, long-term financing options. If the property is sold, the repayment obligation automatically transfers to the next owner.



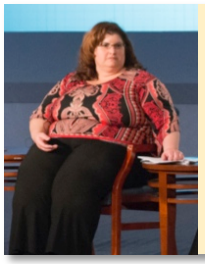
Our PACE program was pitched to the legislature as appropriately senior lien that fits within municipal taxing authority world because it is a public benefit. That clean energy… is a public benefit.

Ben Healey
Associate Director of Outreach
Clean Energy Finance and Investment Authority

On-Bill Financing or Repayment

On-bill programs work by allowing consumers to repay their energy improvement costs over time as a part of their utility bill. **The attraction of on-bill programs is that they can bring a simple solution to the upfront investments that energy efficiency and solar installations require, while giving lenders a more efficient and certain way to be repaid.** Although the exact mechanisms and requirements vary substantially depending on the specific program, 12 states have authorized public funds to create pilot programs or

enacted legislation that requires utilities to offer on-bill programs. An additional 19 states have utility on-bill programs.[27]



How do we make it easy for the consumer to access [the necessary financing]? A potential answer to that is on-bill financing.

Jacqueline Ponti-Lazaruk
Acting Administrator
Rural Utilities Service
U.S. Department of Agriculture

On-bill programs are particularly promising because they are simple for consumers. Many consumers routinely pay their utility bills each month, whether or not they choose to make energy improvements. Also, any resulting energy savings reduce the cost of their electric bills, offsetting the repayment component in part or in full. In programs that utilize service disconnections against non-payment of debts, default rates are lower than they otherwise would be, reducing the cost of long-term capital. Default rates are quite low for on-bill programs, generally under three percent and commonly less than one percent.[28]

On-bill programs require capital and often legislative or regulatory approval to get started. The sources of start-up capital vary by program but include revolving loan funds, appropriated public dollars, utility generated funds, or private funds. The financing can be tied to the customer (loan or lease) or to the meter (tariff). The latter is better suited for rental properties, since the debt (and corresponding energy improvements) stays with a property, instead of the tenants, if they move before the debt is fully repaid.

LEVERAGING EXISTING MODELS AND PROGRAMS

Low-income energy efficiency programs have existed for a longer period of time than low-income solar programs. Not just models to replicate, **integrating solar investments into existing energy efficiency programs present great opportunities to offer more comprehensive energy reduction solutions for low-income households.**

Energy efficiency must be a critical piece as well. Combining these two is the perfect way, particularly for lower income families, to not just bring them into the clean energy economy but to really make an incredible financial impact on their lives.

Beth Galante
Chief Energy Efficiency Officer
PosiGen

A number of successful low-income solar programs have done just that. The California Solar Initiative (CSI), for example, requires an energy audit before becoming eligible for its solar incentives.[29] After the audit, CSI participants receive information on options and incentives for energy efficiency measures specific to their building. This process empowers them with the knowledge necessary to make informed decisions on energy efficiency. Similarly, PosiGen offers its customers positive cash flow beginning in the first year if customers adopt energy efficiency measures along with their solar installations.

As detailed below, energy assistance programs at the federal, state, and local levels also offer opportunities to address the energy needs of low-income households more comprehensively. Rather than just providing a one-time grant that does not solve the underlying problem, using energy assistance programs to fund efficiency and solar measures can reduce energy costs for low-income households permanently.

Other programs for low-income households at the federal and state levels also provide many lessons learned. Symposium participants highlighted affordable housing programs because many of them could be used to install solar on low-income housing units. For instance, the Low-Income Housing Tax Credit (LIHTC) helps finance the development of affordable housing projects to boost the housing stock for low-income households.

Affordable housing projects that include solar installations can qualify for LIHTC, if structured properly, and LIHTC can cover a significant portion of the solar installation costs.[30] For example, the Northeast Denver Housing Center (NDHC) developed an innovative project structure to install solar PV systems for 30 affordable housing units on 12 buildings.[31]

We need to think of the really good models for serving low-income families. Affordable housing--we could have been at this table 30 years ago having a conversation about how do you build good housing that houses those folks who need housing. There were good policy decisions made there. The way the affordable housing has been built has been driven by good government policy.

Erica Mackie
Co-Founder and CEO
GRID Alternatives

Although this working paper highlights the key federal financing programs, we encourage readers to consult at the federal financing guide for clean energy, which was recently updated in September 2014.[32]

Low-Income Home Energy Assistance Program (LIHEAP)

In fiscal year (FY) 2014, the U.S. Department of Human and Health Services (HHS) distributed $3.4 billion to states through the Low-Income Home Energy Assistance Program (LIHEAP) to assist low-income families with their home energy bills. During the Symposium, a number of participants suggested expanding the LIHEAP program to include solar and energy efficiency. Although the President's budget for FY 2014 and FY 2015 requested $50 million of the LIHEAP program to go towards competitive energy burden reduction grants, Congress has yet to pass an appropriations bill that includes this new grant program and must do so before HHS can implement it.

- Under current law, states can **use up to 15 percent of their LIHEAP funds (or up to 25 percent with a waiver approved by HHS) for weatherization activities or other energy-related home repair.** While leading states like California set aside 25 percent of their LIHEAP fund for these activities, on average states only set aside about 10 percent.[33]

- In 2010, California's Department of Community Services and Development (CSD) set aside **three percent of the state's 2009 LIHEAP allocation ($14.7 million) to fund an innovative pilot program to install rooftop solar systems on low-income homes.** This pilot installed solar PV systems, combined with weatherization upgrades, on 545 single-family homes and 14 apartment complexes (937 individual units), benefitting a total of 1,482 low-income households.[34]

Weatherization Assistance Program

The U.S. Department of Energy oversees the Weatherization Assistance Program (WAP), which expects to fund over 33,000 residential energy-efficiency retrofits for low-income families in FY 2015.[35] The *Energy Independence and Security Act of 2007*[36] (EISA) authorized WAP through FY 2012, at a level of $1.4 billion. Although the *American Recovery and Reinvestment Act of 2009*[37] (ARRA) provided a substantial boost to the program, the amount of money appropriated to WAP over the past three years has been below historic funding levels.[38]

EISA authorized up to two percent of the WAP allocation to fund Sustainable Energy Resources for Consumers (SERC) grants to install renewable energy technologies like solar for low-income households. SERC grants are only authorized when the WAP appropriations exceed $275 million, which has not occurred outside of the ARRA funds.

Federal Low-Income Housing Programs

The U.S. Department of Housing of Urban Development (HUD) expends about $6.3 billion on energy costs each year across its portfolio of nearly 5 million units public and federally assisted housing.[39] Of that housing portfolio, 1.1 million units are public housing; 1.4 million units are privately owned assisted housing, and 2.2 million rental units are supported with Section 8 vouchers for tenants.[40] HUD has received commitments for more than 150 megawatts of solar power on its housing stock, exceeding President Obama's call for 100 megawatts as part of his Climate Action Plan.[41]

We have a bottom line challenge as expenditures and appropriation dollars are dropping. We have to get more creative and that's really what the climate action plan challenged us to do. Taking the mainstay programs under our shop, public housing and the HUD assisted multifamily portfolio, and really unlocking opportunities to deploy capital from the private sector.

Trisha Miller
Senior Advisor, Office of Economic Resilience
U.S. Department of Housing and Urban Development

Section 108 loan guarantees within the Community Development Block Grant (CDBG) program help local governments finance economic development and housing rehabilitation. The interest rates are close to the Treasury rate and are backed by pledges of current and future CDBG allocations. Although the acquisition of real property is an eligible activity for this program, the exact extent to which solar installations qualify as real property under this program still needs more clarification. Unlike the Internal Revenue Service's May 2014 proposal, which narrowly defined real property for solar real estate investment trusts (REITs),[42] HUD's Community Planning and Development (CDP) office affirmed that, as part of President Obama's announced executive actions for solar on September 18, 2014,[43] Section 108 funding can be used for clean energy and energy efficiency projects under current guidelines. HUD also plans to release a renewable energy toolkit in early 2015 to provide further clarification.

The Federal Housing Administration (FHA) insures loans made by FHA-approved mortgage lenders for both single family and multifamily homes. FHA insurance protects lenders from losses that result from defaults on mortgages, thereby lowering the risk and cost of loans to homeowners. Although FHA does not receive Congressional appropriations, covering its operating costs through self-generated income instead, it has insured over 34 million properties since it was founded in 1934. Relevant FHA programs include:

- **FHA's Energy Efficient Mortgage Program** provides insurance to finance or refinance homeowner mortgages to cover the costs of efficiency improvements by incorporating them into the overall loan.
- **FHA's PowerSaver Pilot 203(k) Mortgage** is a pilot program, expiring on May 4, 2015, to insure homeowner loans that finance energy improvements, including solar systems on their homes.
- **Title I Home and Property Improvement Loans** insure loans for property improvements to owners with good credit histories. The maximum loan amount is $25,000 for single and multifamily structures. Any loan over $7,500 must be secured with the property mortgage.
- **FHA and Fannie Mae expanded their Green Preservation Plus** (formerly named Green Refinance Plus) financing program in May 2014 to improve the energy and water efficiency of multifamily properties.[44] The program offers financing or refinancing of existing Fannie Mae loans for multifamily affordable housing owners. Under the recent expansion, owners can use the equity in the housing property, up to five percent of the loan amount, to cover the costs of the energy and water efficiency improvements.

Federal Rural Energy Programs

The U.S. Department of Agriculture is the lead agency for a host of programs that support development of cleaner energy sources in rural America. Many of these programs benefit from receiving funds allocated in the multiyear Farm Bill that are not subject to the annual federal appropriations process.

- The **Rural Energy for America Program (REAP)** for agricultural producers and rural small businesses helps to finance and install solar energy systems, as well as energy efficiency improvements, on non-residential buildings. REAP has two main components:
  - **The Renewable Energy System and Energy Efficiency Improvement Guaranteed Loan and Grant Program** enhances credit through loan guarantees and also provides grants. The maximum guarantee amount per loan is $25 million. The loan guarantee combined with grants cannot exceed 75 percent of total eligible project costs.
  - **The Energy Audit and Renewable Energy Development Assistance Grant** provides grant support to entities that conduct energy audits and provide information on renewable energy on rural and agricultural producers. Eligible entities include: State, tribal, local government or their instrumentalities, land grant colleges, universities and other institutions of higher learning, rural electric cooperatives, and public power. The maximum grant amount under this program is $100,000.

- **The Energy Efficiency Conservation Loan Program (EECLP)** is a new $250 million loan program for rural utilities to support their customers with energy efficiency and distributed solar installations. EECLP is only available to rural utility providers to relend and invest on the customer's side of the meter. The rate on these loans is one percent above the Treasury rate. This program is expected to help deploy more distributed solar and wind projects.

- **The Rural Energy Savings Program (RESP)**, which the *Agricultural Act of 2014*[45] established and authorized up to $75 million annually for five years (FY 2014-2018), provides zero percent interest loans for rural cooperatives and municipal utilities to operate on-bill programs. They can charge customers up to three percent to cover administration expenses and defaults.

- **The Rural Development Multi-Family Housing Energy Efficiency Initiative** scores rural development grants for new construction and retrofit projects based on efficiency measures and on-site energy generation levels. It also scores projects higher if the party who will oversee operations and management after construction holds a certified credential for green property management.

- **Assistance to Rural Communities with Extremely High Energy Costs** provides grants and loans to improve energy generation facilities serving communities where in which the average residential home energy costs are at or above 275 percent of the national average.

- **The Rural Utilities Service Electric Program's loans and loan guarantees** help to finance the construction of electric distribution, transmission, and renewable generation facilities on the utility side of the electric meter. These loans are made to corporations, states, municipalities, utility districts, and cooperatives that provide retail electricity to rural areas.

Community Development Finance Programs

The U.S. Department of the Treasury manages the Community Development Financial Institutions (CDFI) Fund, which works to empower underserved and distressed communities with increased economic opportunity and community development investments. The CDFI Fund directly invests and supports CDFIs that provide financial services to underserved populations and communities.

- **The New Markets Tax Credit (NMTC) program allocates tax credits to Community Development Entities (CDEs) to bring private investment to low-income communities.** The NMTC is 39 percent of the original investment, distributed over seven years at five percent during the first three years and six percent during the final four years. A wide range of projects qualifies for the NMTC, including green building retrofits and distributed renewable energy installations. The *American Taxpayer Relief Act of 2012*[46] authorized the NMTC through 2013 at a level of $3.5 billion per year. *The Tax Increase Prevention Act of 2014*[47] extended the NMTC for one-year through 2014. The Joint Committee on Taxation (JCT) estimates that a two-year extension at $3.5 billion per year would cost about $1.8 billion over ten years.[48]

- The *Small Business Jobs Act of 2010*[49] authorized the **CDFI Bond Guarantee Program to issue bonds that support CDFIs making economic development investments in underserved communities.** It offers long term financing at low cost, spread over 29.5 years, and can be combined with both LIHTC and NMTC. The CDFI Bond Guarantee Program was authorized through FY 2014.

Storm Water Management Programs

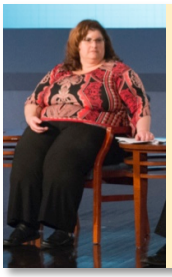
Storm water management concerns create competition for roof space between green roofing and solar. The solution is a solar garden – not solar installed over green roofing. We're integrating the solar into the green roof system.

Jon Hillis
Vice President
Prospect Solar

As urban centers work to improve the management of storm water runoff, **there is emerging competition for roof space between solar systems that produce energy and green space that retains water**. Prospect Solar, part of the Symposium's Innovation Showcase, proposes combining solar with green roofs, which act as the ballast and potentially increase the efficiency of the solar panels through a cooler environment. Some cities have established credits for on-site storm water retention investments. The District Department of the Environment (DDOE), for example, has established a storm water retention credit trading market to stimulate investment.

EXPANDING EDUCATION AND OUTREACH

Even with positive cash flows and enabling polices, reaching low-income households still presents a challenge. In addition to simplified processes to go solar, substantial resources will be necessary to support outreach and education campaigns. Many bulk-purchasing initiatives have included an education component, but questions remain about how to scale those efforts into a broad national campaign.



It goes further back to education and a value proposition of why solar works and where it works. Solar is still seen as something new, when it's not.

Jacqueline Ponti-Lazaruk
Acting Administrator
Rural Utilities Service
U.S. Department of Agriculture

Bulk Purchasing

A bulk purchase is when community members form a group and use their collective buying power to save on the total cost of going solar. The group uses a competitive bidding process to select a single company that will install systems on all of the participating homes. Each participant signs his or her own contract with the installer, but everyone gets the bulk discount savings of about 20 to 30 percent off the cost of a solar system.

Bulk purchasing does not have to be limited to one geographic area and can even be facilitated through national organizations. At the Symposium, Rhone Resch suggested that the American Association for Retired Persons (AARP), for example, could offer a group purchase to its 37 million members.

The Solarize model is another proven pathway that uses education and outreach to harness bulk-purchasing power and spur low-income solar investments. Solarize typically works when an organization issues a request for proposals (RFP) and then pre-selects a single company to serve as the certified Solarize installer. The organizer, often a non-profit, local institution, or government entity, recruits participants to sign up for the bulk purchase within a certain time period and then the chosen supplier provides site visits and educates each customer on how to go solar. Another Solarize variant that could work for some low-

income families is to have an employer aggregate the upfront cost, acquire low cost financing, and deduct loan repayments through its payroll system.

Bulk leasing provides another potential pathway. Due to its simplicity and predictability, many residential solar installations in the U.S. use the leasing model, in which a 3rd party owns and installs the solar system and offers the homeowner a long-term, fixed Power Purchasing Agreement (PPA) that provides savings on electricity. Like the Solarize model, the organizer, often a non-profit, local institution, or government entity, recruits participants to sign up for the bulk lease rate within a certain time period and then the chosen supplier provides site visits and installs the solar systems.

A big thing I have noticed is the lack of awareness of how cheap this is and actually how much is really out there. We have discovered through the SunShot program that solar really clusters.

Mike Carr, Principle Deputy Assistant Secretary
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Federal Commodity Check-off Program

Another idea suggested at the Symposium was to create a solar check-off program. Check-off programs typically work through **mandatory assessments on producers to fund broad industry-wide research and education campaigns.** In 2007 the Subcommittee on Energy and Environment of the House Committee on Science on Technology considered a check-off program for solar during a hearing on the *Solar Energy Research and Advancement Act of 2007* championed by former Representative Gabrielle Giffords.[50]

There have been a couple of energy check-off programs, including the Propane Education and Research Council (PERC) and the National Oilheat Research Alliance (NORA). In addition, Congress passed the *Commodity Promotion, Research and Information Act of 1996*[51] to promote generic commodities, specifically within the agricultural sector. While check-off programs faced court challenges for being unconstitutional under the First Amendment's "free speech" clause, legal experts believe these challenges will not prevail ultimately.[52]

POLICY RECOMMENDATIONS

This notion that we have a free market, that really is a misnomer. Our markets are driven by policy. Bringing the benefits of solar and other technologies to low-income people, it's also a function of policy, so we really do need to get the policy right.

Todd Foley
Senior Vice President
American Council on Renewable Energy

Policy, I agree, is really important. I think it does have to be done at every single level: at the federal, at the state, and at the local level. And they need to come together so that they are complementary in nature.

Carol Werner
Executive Director
Environmental and Energy Study Institute

Continue and Expand Proven Policies

Before discussing new ideas or policies for expanding solar in lower income communities, we first highlight a few key policies that, if changed or allowed to expire, would greatly impact solar economics and make it much more difficult to tackle low-income solar barriers:

- **Continue state net energy metering**. These policies allow consumers to sell electricity back to the electric grid when their solar production exceeds their demand. This is a bedrock policy that must

continue to sustain a residential solar market. Other models could also work, as long as the reimbursement rate for solar system owners reflects the full range of costs and benefits of solar.

- **Extend the 30 percent federal ITC beyond 2016 and make it transferable.** The ITC has been an important driver for deploying solar and should continue. Allowing the credit to be traded or transferred would expand its reach, achieving similar policy results as a refundable credit.[53] Although a refundable credit structure would be simpler, attracting bipartisan support would be more difficult.

- **Extend the NMTC and CDFI Bond Guarantee Program.** The NMTC spurs private investment in economically distressed areas and seeks to provide low-cost, patient capital necessary for economic development in these areas. A recent report found that NMTC investments have generated nearly $118 billion in economic activity between 2003 and 2012, and the corresponding tax receipts of that activity more than pay for the program.[54]

- **Fully fund HUD and USDA financing programs.** As summarized above, HUD and USDA have a number of existing financing programs that could help deploy significantly more solar in lower income communities. Congress should support these efforts and provide sufficient funding through its annual appropriations process.

- **Maintain funding for DOE Solar Energy Technologies Program.** The market transformation component of the DOE SunShot Initiative addresses market barriers, enables state and local governments to adopt solar energy programs, and forges external partnerships.

Fully Integrate Solar into Energy Efficiency and Energy Assistance Programs

Solar investments are complementary with existing energy efficiency programs and could greatly enhance reductions of energy demand and costs for lower income communities. A comprehensive energy reduction effort, which addresses both supply and demand needs of lower income Americans, could provide longer-term solutions that reduce the strain on energy assistance programs with an increased scope.

- **Restore and maintain historic funding levels for WAP and reduce restrictions on solar generation.** The current $275 million threshold for using WAP funds for solar should be eliminated, since the historic average for WAP is approximately $250 million per year in 2014 dollars. The two percent ceiling for funds being spent on solar should be raised substantially to provide more flexibility to state agencies to use WAP funding strategically.

- **Get states to use 25 percent of allocated LIHEAP funds for energy reduction.** Three different approaches could allow a quarter of LIHEAP funding to be used more strategically:
  - A new condition for receipt of LIHEAP funds that states use 25 percent of received funds for energy reduction efforts like low-income solar investments.
  - Withhold the difference between 25 percent of the previous year's LIHEAP funds and the actual amount that states used for energy reduction purposes, redirecting those funds to a federal low-income green bank or existing low-income energy financing programs.
  - Advocate for energy reduction programs in each state.

- **Shift utility systems benefit charges for low-income from rate reduction to energy reduction.** A number of states and utilities charge ratepayers to fund their low-income programs that typically provide reduced rates to low-income consumers. A portion of those funds should be reallocated toward energy reduction programs to encourage the adoption of efficiency measures and solar.

[Unlocking private capital for low-income solar] is going to require getting the green banks … to not be anecdotal about it. They're going to have to say 'we're going to take a third of our portfolio and focus on that.' If you're doing one at a time anecdotally, who gives a damn?

Scott Sklar
President
The Stella Group

Create More Tools to Enhance Credit and Leverage Private Capital

At the Symposium a wide range of stakeholders advocated for more credit enhancement programs that leverage private capital investment in low-income solar. The April Roundtable on expanding low-income solar in the District of Columbia converged on similar recommendations, coupled with the use of pioneering community solar options available in DC.

- **Establish a federal low-income green bank.** Although New York, Connecticut, California, and Hawaii have created state credit enhancement programs for solar, a federal green bank could unlock financing for more solar in states that are unable to create their own green bank and provide additional market certainty and growth opportunities. It could also help promote the standardization of contracts across the nation that could lower solar soft costs.

- **Establish more state credit enhancement programs.** Pushing for credit enhancement programs at the state level should be done in parallel with establishing the federal green bank. The consensus recommendations from the April Roundtable on low-income solar in the District of Columbia found:

  > *A direct dollar-per-watt rebate program that incentivizes low-income participation and community solar projects, combined with a loan guarantee program that unlocks the necessary capital for these projects would stretch limited government dollars the farthest, provide the greatest certainty and opportunity for local solar installers, help reduce the energy burden on DC's most vulnerable citizens, and drive the most economic development by increasing wealth in lower income District communities.*[55]

- **Expand commercial PACE.** Local governments often have to pass authorization for the taxing and bonding authorities needed to make PACE work. Green banks can also help fund commercial PACE programs, since many local governments may not be in a position to take on more bonding debt to cover the upfront costs of the program. Credit support from green banks could include direct loans, loan guarantees, or insurance products.

[PACE] essentially turns a PPA into something that to an investor looks like municipal debt. So the bottom line is PACE is here; it works; it's growing rapidly.

Bracken Hendricks
Chief Executive Officer
Urban Ingenuity

- **Expand on-bill repayment.** To scale up on-bill programs, attracting third-party financiers will be critical. Green banks can set up loan guarantees or loan loss reserves specifically to expand on-bill repayment programs with third-party capital.

Ten buildings that we financed and did solar all at one time… gave us great economies of scale. We got some good pricing based on that, and we had to get a loan. Making loans on all of these separate little systems would have been very difficult. But when we combined them altogether so we could aggregate one loan, and one accountant, and one set of legal fees, so we had some really great scale.

Jared Lang
Sustainable Development Manager
National Housing Trust

Community Solar Legislation

Larger community solar arrays not only provide access to those who have unsuitable roofs for solar systems but also lower costs through economies of scale and risk reductions. Symposium participants repeatedly cited community solar policies, in concert with complementary financing policies, as critical for expanding low-income solar. However, state legislation is typically necessary to allow community solar projects and other thorny issues like tax treatments, existing state regulations, and securities also need to be addressed.

We recommend widespread adoption of state legislation and regulatory policies that allow for community solar projects based on the following proven policies:

There are benefits to building bigger scale. There are great economic opportunities when we can combine a mixture of incomes within a certain development. There are economic opportunities and when we do build big, we overcome the issue of scale. The bigger the footprint, we can put solar panels on all of the rooftops.

Thomas Lee
Program Director
Enterprise Community Partners

- **Power Purchase Agreements (PPA)**. This model is arguably the simplest and the most promising for lower income households. Participants purchase amounts of power from a community solar array at a fixed price. The cost of the purchased solar electricity is added to the customer's monthly bill, while the amount of purchased solar electricity is deducted from the consumer's total electricity usage. Participants receive net savings on their bill from the start.

- **Panel Ownership**. Participants purchase panels at a community solar project and receive all corresponding benefits from the panel's solar electricity production. The upfront costs, without supporting policies, are likely insurmountable for most lower income households.

- **Panel Leasing.** Participants pay an upfront cost for a long-term lease of panels at a community solar farm. Similar to the ownership model, the upfront costs are likely insurmountable for most lower income households without supporting policies.

- **Direct Investment in Projects.** Participants form a partnership through a Limited Liability Company to co-invest in a specific community solar project. The risk, complexity, and upfront cost of this model present significant barriers to lower income households.

Partnerships with Utilities

A pilot concept…put solar on a certain number of rooftops in a very challenged low-income community…. The utility would integrate all of the solar generation into its local grid and then spread the benefits of that solar across the entire low-income community within the geographical boundary.

Another revenue source is utilities' write-offs of uncollectible utility bills. They are interested in this as a means to reduce their write-offs.

Greg Hale
Senior Advisor to Chairman of Energy and Finance
New York State Governor's Office

As the traditional electricity suppliers with deep ties to their customers, local utilities could play a major role in facilitating low-income solar investments. Unfortunately, many utilities have chosen to impede distributed generation rather than embrace it.

To facilitate a partnership with utilities, we recommend utilities and their regulators focus on the following areas:

- **Better coordination at the state levels** to get utilities commissions to act in the public's interest. States, in which the legislatures and utilities commissions have been extremely proactive, are among the leaders in terms of total solar deployment, as well as low-income solar deployment in some cases.

- Developing new, **creative programs to share solar benefits with utilities** is also a particularly promising avenue to explore further. **On-bill repayments** of solar projects could significantly lower credit risk, if tied to utility shutoffs, and provide an incentive to utilities as a way to reduce uncollectible bills on electricity bills.

- **States could also set low-income solar targets.** For states with a solar carve-out in their renewable portfolio standard (RPS), there are a few potential approaches to consider:
  - A premium value assigned to solar renewable energy credits (SRECs) generated installations serving lower income customers.
  - A mandate that a certain percentage (e.g. 10 to 20 percent) of the solar standard serve low-income customers. The noncompliance penalty on utilities would need to be set higher for this compliance category than the general alternative compliance payment.

Allocate Significant Resources to Education and Outreach Efforts

Poor people typically don't have much decision making power, even if they're interested. Solutions to this: simplify, simplify, simplify. And put money into outreach and coordination.

Annie Harper
Coordinator
Yale Community Carbon Fund

Despite the solar industry's recent success, misinformation and general lack of awareness persist. Significant resources to fund a national outreach and education campaign are needed.

We recommend establishing **a federal solar check-off program, which pools mandatory assessments together for general solar education and outreach.** The U.S. solar industry is expected to grow and produce 10 gigawatts of new capacity annually by 2016.[56] A mandatory assessment of 0.5 cents per watt, would generate $50 million per year. This fee would constitute one percent of DOE's 2020 SunShot goal for the cost of modules, and only one-third of one percent for its goal for total installation costs. Considering customer acquisition costs are expected to remain higher than 30 cents per watt,[57] this program would be valuable to the industry. The mandatory assessment would ensure there are no free riders, as this fund would help the industry at large.

CONCLUSION

To continue the momentum that the solar industry has gained over the past few years, policymakers must extend successful solar policies and develop additional targeted policies that unlock the private capital needed to support low-income solar investments. To continue growing beyond early adopters who are generally more affluent, the solar industry has to reach households across the income spectrum, while also becoming independent of government subsidies over time.

I don't think it's a hard sell at all. If we enable people … to meaningfully participate and make these choices, I think the public is already there. It's the regulators, the policymakers, and the utilities and others that are used to the old regimes that are blocking this.

Jerry Bloom
Partner
Winston & Strawn LLP

Symposium attendees agreed that the expansion of solar for all would reduce the energy burden on the nation's most vulnerable citizens and provide a long term and self-sustaining economic driver in lower income communities. These benefits should not be difficult to realize, given the number of proven policies and initiatives, existing complementary programs to leverage, and the support of Americans for solar energy across the political spectrum.

James A. Mueller is the Director of Research at the GW Solar Institute. Amit Ronen is the GW Solar Institute's Director.

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The **GW Solar Institute** at the George Washington University (GW) identifies, creates, and shares pragmatic solutions to the public policy barriers preventing the adoption and scale of solar energy. Partnering with GW faculty and solar experts from around the world, the GW Solar Institute conducts research projects spanning a wide range of disciplines that include engineering, business, economics, law, and policy.

Leveraging its close proximity to key Washington institutions and relationships with influential stakeholders, the GW Solar Institute provides policymakers with objective, strategic, and accessible analysis on the many complex issues surrounding solar energy. The GW Solar Institute also works with a rising generation eager to contribute to a clean energy economy, providing educational opportunities and training to GW's diverse student body. For more information please visit **solar.gwu.edu**

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